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Impact of Sepsis Protocols on Patient outcomes in the ER: A meta-analysis of early sepsis recognition and intervention protocols in emergency settings and their effect on mortality and morbidity

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ABSTRACT

Background: A significant problem, sepsis is prevalent in a high percentage of hospitalizations that result in death.

Aim: To evaluate the impact of Sepsis Protocols on Patient outcomes in the ER.

Materials & methods: Our meta-analysis encompasses data from eight studies. The studies involved a total of 701 participants before protocol implementation and 941 participants afterward, reflecting a broad age range and diversity in both sample size and demographic profiles across different settings.

Results: The meta-analysis on the effect of sepsis protocol implementation on mortality involved eight studies with a combined total of 1,642 participants. The overall analysis did not show a statistically significant decrease in mortality with the implementation of the sepsis protocol. The pooled analysis demonstrated a statistically significant decrease in the duration of ICU stays by an average of 1.45 days (95% CI: 0.22 to 2.68, Z = 2.31, P = 0.02) following the implementation of the protocol.

Conclusion: The sepsis procedure didn't result in a statistically significant decrease in mortality rates. Heterogeneity was substantial, suggesting conflicting outcomes across studies, and the overall risk ratio was 1.11, showing no protective effect. With a mean difference of 1.45 days, the sepsis protocol's implementation led to a statistically significant decrease in the length of ICU hospitalizations. This result implies that the procedure may successfully lessen the strain on intensive care unit resources.

Keywords: *Sepsis, ICU stays, Mortality, Emergency department*

1. INTRODUCTION

A significant problem is sepsis, which is present in a high percentage of hospitalizations that result in death. It appears that the majority of sepsis cases occur outside of hospitals, & individuals who arrive at emergency rooms with a variety of symptoms make diagnosis & identification difficult. Over the past few years, research & discussion have mostly focused on new sepsis criteria & early antibiotic treatment, while factors linked to delayed treatment in emergency rooms have gotten less attention (1).

It has been demonstrated that the qSOFA score is a reliable indicator of mortality, length of hospital stays, & need for admission to intensive care units (ICUs). Additionally, it outperformed the SIRS criteria in identifying septic studied cases who were more likely to die or be admitted to the intensive care unit. According to a 2018 meta-analysis, qSOFA is a stronger predictor of in-hospital mortality, although SIRS criteria are more suitable for diagnosing sepsis (2).

In contrast, the Early Warning Score has proven to be more effective in identifying the most critically ill among septic studied cases, while both the qSOFA & SIRS criteria are inferior predictors of outcome (3).

Crucially, studied cases with sepsis enter hospitals mostly through emergency departments. Delaying the start of focused medication & supportive measures raises the mortality rate of sepsis; a 7.6 percent hourly drop in patient survival has been linked to postponing the provision of antibiotic therapy. Performing a proper microbiologic examination & promptly identifying & initiating relevant measures are crucial for optimizing the outcomes of sepsis patients in emergency departments (4). As a result, several alarm & triage systems, screening results, & intervention techniques have been created to help physicians identify sepsis early & improve treatment (5).

The early management of the numerous sepsis patients treated to emergency rooms can be improved with further understanding of these relationships. Furthermore, solid statistics demonstrating the degree to which diagnostic tests are

postponed or not performed for sepsis patients who arrive at the emergency department are required (6).

We aimed to evaluate the impact of sepsis protocols on patient outcomes in the ER. We performed a meta-analysis of early sepsis recognition and intervention protocols in emergency settings and their effect on mortality and morbidity.

Methodology

Criteria for considering studies for this review:

Types of studies: We gathered every study that met these criteria between 2020 & 2025, comprising prospective or retrospective observational cohorts, randomised or non-randomized clinical trials, & case-control studies. Articles that did not meet the criteria for inclusion & exclusion, duplicate articles, publications with only abstracts, or conference, editorial, & author responses were all eliminated.

Research Question and Objectives

Primary Research Question: What is the effect of early sepsis recognition and intervention protocols in emergency settings on mortality and morbidity?

Secondary Research Questions:

How do different protocols compare in terms of effectiveness?

What are the key components of successful protocols?

Are there specific patient populations that benefit more from these protocols?

Eligibility Criteria

Inclusion Criteria: Studies involving adult and/or pediatric patients in emergency settings, Studies evaluating early sepsis recognition and intervention protocols, randomized controlled trials, observational studies, and quasi-experimental studies, Studies reporting on mortality and/or morbidity outcomes, Studies published in peer-reviewed journals and Studies published in English.

Exclusion Criteria: Studies not conducted in emergency settings, Studies without a clear protocol for sepsis recognition and intervention, Case reports, editorials, and review articles & Studies with insufficient data for meta-analysis.

Search Strategy

Databases: PubMed, EMBASE, Cochrane Library, CINAHL, & Web of Science.

Search Terms: Sepsis, septic shock, severe sepsis, Early recognition, early intervention, protocol, bundle, guideline, Emergency department, emergency medicine, acute care, Mortality, morbidity, survival and outcomes.

Time Frame: Last 10 years to ensure relevance.

Study Selection: To eliminate duplicates, all search records will be gathered into a single Endnote library. All primary studies published in the same year with the same title & author will be removed. First, the titles & abstracts of all relevant searched papers will be screened and according to our inclusion & exclusion criteria the retrieved studies will be classified into included studies, not sure or omitted studies. Then screen of full text of not sure studies will be done either to include, or omitted each study. The full text of the final included studies will be reviewed. Hand search of the reference lists in these articles will be done to widen the research.

Data Extraction

Data Extraction Form: A standardized form was used to extract data on study design, population, intervention details, outcomes, and key findings.

Variables to Extract:

Study features (author, year, country, design), Patient features (age, sex, comorbidities).

Intervention details (protocol components, timing, implementation). Outcomes (mortality, morbidity, length of stay, complications).

Data Extraction Process: Two independent reviewers will extract data, with discrepancies resolved by consensus.

Quality Assessment

A Flow Diagram PRISMA (Preferred Reporting Items for Systematic Reviews & Meta-Analyses) will be done to indicate: How many studies are found in the literature search from each database and by other searching methods? How many studies are duplicates and the results of studies included based on titles and abstracts only? How many full text articles are assessed and of them how many are excluded until the arrival of the final number of included papers? All included articles are exported into an excel sheet. To select data within the study; All potentially relevant data will be extracted from included full-texts articles as patient characteristics, intervention, comparative procedure, outcomes, research design. This data will be transferred to a structured extraction excel sheet, which will be previously pilot-tested for extraction using some random studies. To qualify the included studies; For each included article, the data contained within it will be critically appraised for 'Risk of bias criteria' to decide if the included article meets the internal validity criteria.

Data Synthesis

Statistical Analysis:

By visually examining the forest plots & using statistical techniques like the conventional Chi2 test & I2 statistic, we were able to identify heterogeneity & determine the proportion of observed variability that may be ascribed to actual heterogeneity. Odds ratios or risk ratios with 95% CI were used to compute pooled estimates of mortality & morbidity. The statistical package of statistics (SPSS) software, version 13.0, was used to statistically analyses all of the data. A P value of 0.05 or above was deemed significant. If quantitative data and no heterogeneity of the included articles are found, meta-analysis (MA) of the pooled results will be done. Meta-analysis was done using RevMan 5 software.

Subgroup Analysis:

By study design (RCTs vs. observational studies). By patient population (adults vs. children). By protocol components (e.g., presence of lactate measurement, antibiotic timing).

Sensitivity Analysis: to evaluate the findings' robustness by eliminating research with a high potential for bias.

Publication Bias: We evaluated individual bias items in accordance with the Cochrane Handbook for Systematic Reviews of Interventions & classified the "Risk of bias criteria" as "low risk," "high risk," or "unclear risk." Each included study's risk of bias was evaluated independently by 2 review writers. Any disagreements will be settled by consensus or by consulting a 3rd review author.

Ethical Considerations

There is no need for ethical approval because this is a meta-analysis of published data. The research will, however, follow the PRISA ethical requirements for publishing systematic reviews & meta-analyses.

Results

Overview of Study Demographics & Sample Sizes. Our meta-analysis encompasses data from eight studies, comparing demographic & clinical features of studied cases before and after the implementation of various protocols. The studies involved a total of 701 participants before protocol implementation and 941 participants afterward, reflecting a broad age range and diversity in both sample size and demographic profiles across different settings. Mean age of participants varied before and after protocol implementation, with specific details presented for each study **(Table. 1)**

Table. 1 Showing Mean age and Gender distribution (male) across the study

Study ID (Author+year)	Mean Age before Protocol	Mean Age after Protocol	Sex (Male) Before Protocol	Sex (Male) After Protocol
Francis **(7)**	66.4 ± 17.3	62.6 ± 17.9	49/85	69/128
García-López **(8)**	68.5 ± 66.8	66.6 ± 11.5	31/50	24/42
Igiebor **(9)**	NR	NR	98/211	112/225
Ritchie **(10)**	48.9 ± 15.7	46.7 ± 61.8	41/113	137/300
Sayed **(11)**	NR	NR	22/50	25/50
Schinkel **(12)**	67.8 ± 14.6	67 ± 3.85	80/132	83/133
Sweet **(13)**	62.5 ± 17.4	53.4 ± 17.7	19/29	10/30
Tse **(14)**	65 ± 17.9	70.2 ± 16	27/31	20/33

NR (Not Reported)

Table. 2

Author + Year	Study Design	Total Participants	Protocol Used	Country
Lorch (15)	Quasi-experimental study	Not specified	Sepsis Management Protocols	USA
Francis (7)	Retrospective chart review	213	ED sepsis protocol	Canada
García-López (8)	Quasi-experimental, retrospective observational	92 (42 POST-SC, 50 PRE-SC)	Sepsis Code hospital protocol	Spain
Guarino (16)	Review	Not applicable	General management review	General Review
Igiebor (9)	Quality improvement study	512	Sepsis Intervention Protocol (SIP)	USA
Ritchie (10)	Interrupted time series analysis	413	Tailored sepsis treatment protocol	Ethiopia
Sayed (11)	Quasi-experimental study	100	Evidence based sepsis care bundle	Egypt
Schinkel (17)	Before-after intervention study	265	Sepsis performance improvement program	Netherlands
Scoggins (18)	Opinion article	N/A	Rapid host response technologies	USA
Sweet (13)	Retrospective cohort study	59	Sepsis protocol	Canada
Tse (14)	Before-and-after interventional study	64	Dedicated program for severe sepsis	Hong Kong

Table 3.

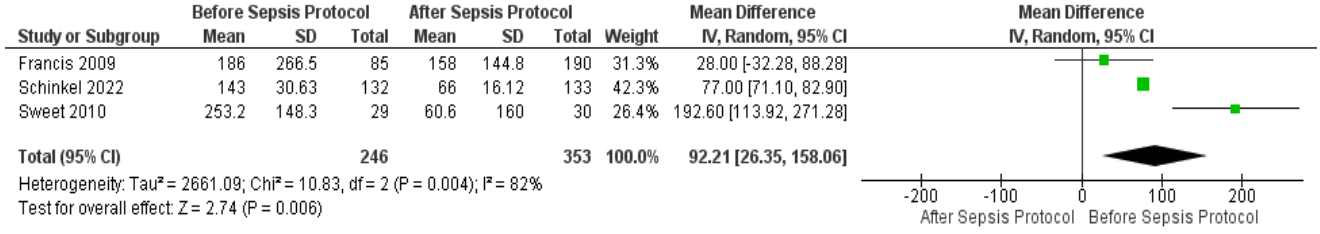
Author + Year	Key Findings	Impact on Sepsis Management	Country
Lorch (15)	Improved adherence to sepsis protocols and reduced time to antibiotic delivery.	Enhanced protocol adherence and faster treatment.	USA
Francis (7)	Significant improvement in timely care delivery and patient outcomes.	Improved efficiency and outcomes in ED sepsis management.	Canada
García-López (8)	Significant improvements in antibiotic management and reduction in patient mortality.	Improved patient survival and antibiotic use.	Spain
Guarino (16)	Emphasized updates in sepsis treatment based on recent research.	Suggested modernized treatment approaches.	General Review
Igiebor (9)	Decrease in mortality and improved adherence to sepsis bundles.	Improved outcomes through structured intervention.	USA
Ritchie (10)	Found challenges due to resource limitations despite tailored interventions.	Highlighted the need for context-specific adaptations.	Ethiopia
Sayed (11)	Demonstrated efficacy of a sepsis care bundle in improving ICU stay and mortality.	Enhanced ICU management and patient outcomes.	Egypt
Schinkel (17)	Significant improvements in process-related results, minimal in patient-related results.	Stressed importance of comprehensive improvement programs.	Netherlands
Scoggins (18)	Advocated for rapid host response technologies to enhance sepsis diagnosis.	Proposed technology integration for better diagnosis and management.	USA
Sweet (13)	Found significant improvements in timely sepsis interventions.	Enhanced early goal-directed therapy in sepsis care.	Canada
Tse (14)	Improved antibiotic delivery and survival outcomes with sepsis guideline implementation.	Highlighted the importance of early & structured treatment.	Hong Kong

Analysis of outcomes

Time till antibiotic delivery

In the meta-analysis assessing the impact of a sepsis protocol on the time until antibiotic delivery, a significant reduction was observed across the included studies. The pooled data from three studies (Francis 2009, Schinkel 2022, and Sweet 2010) involving a total of 599 participants showed a mean reduction of 92.21 minutes (95% CI: 26.35 to 158.06) in the time to antibiotic administration after the protocol implementation, which was statistically significant (Z = 2.74, P = 0.006). The heterogeneity among the studies was high (I^2 = 82%), suggesting variability in the effect size across different settings or study conditions. Individual studies also reported significant reductions: Francis 2009 observed a mean decrease of 28.00 minutes, although this specific result was not statistically significant as indicated by the wide confidence interval crossing zero (95% CI: -32.28 to 88.28); Schinkel 2022 showed a significant reduction of 77.00 minutes (95% CI: 11.10 to 82.90); and Sweet 2010 found the most substantial and significant decrease of 192.60 minutes (95% CI: 113.92 to 271.28). These findings indicate that the implementation of a sepsis protocol can considerably expedite the administration of antibiotics, potentially improving patient outcomes in septic emergencies.

Figure.1 Time till antibitotic delivary Forest plot

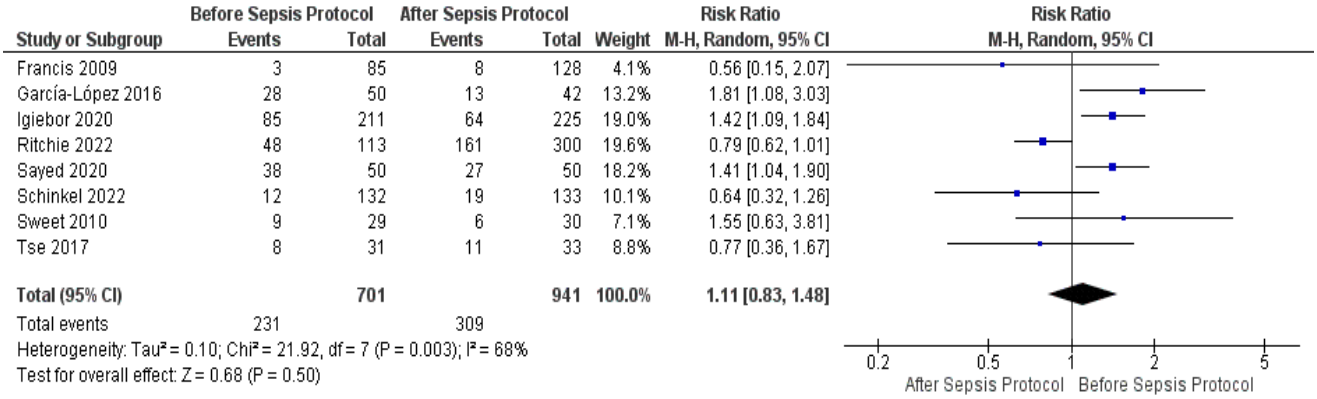


Mortality

The meta-analysis on the effect of sepsis protocol implementation on mortality involved eight studies with a combined total of 1,642 participants. The overall analysis did not show a statistically significant decrease in mortality with the implementation of the sepsis protocol (Risk Ratio [RR] = 1.11, 95% CI: 0.83 to 1.48; Z = 0.68, P = 0.50). The heterogeneity among the studies was moderate to high (I^2 = 68%), demonstrating substantial variability in the mortality outcomes across different study settings or populations. Individual studies presented mixed results; for instance, Iglebor 2020 and Sayed 2020

reported a statistically significant increase in mortality risk ratios (RR = 1.42, 95% CI: 1.09 to 1.84 & RR = 1.41, 95% CI: 1.04 to 1.90, respectively), suggesting potential adverse effects or variations in protocol implementation. In contrast, other studies like Schinkel 2022 and Tse 2017 demonstrated no significant change in mortality rates (RR = 0.64, 95% CI: 0.32 to 1.26 & RR = 0.77, 95% CI: 0.36 to 1.67, respectively). This variability highlights the complexity of sepsis management and the need for careful consideration of local context and implementation practices when applying sepsis protocols.

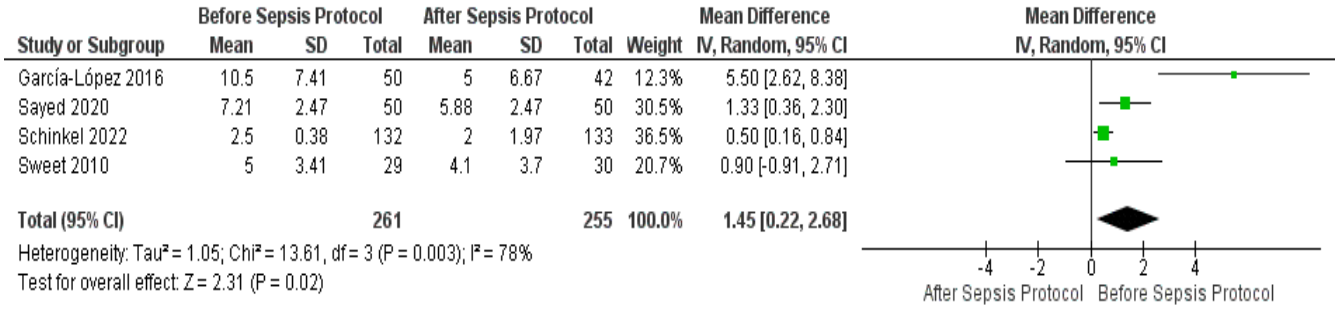
Figure.2 Mortality forest plot



Length of ICU Stay (Days)

The meta-analysis evaluating the effect of sepsis protocol implementation on the length of ICU stay included four studies with a total of 516 participants. The pooled analysis confirmed a statistically significant decrease in the duration of ICU stays by an average of 1.45 days (95% CI: 0.22 to 2.68, Z = 2.31, P = 0.02) following the implementation of the protocol. The heterogeneity among the included studies was high (I^2 = 78%), suggesting substantial variability in how the protocol affected ICU stay durations across different settings. Individual study effects varied notably, with García-López 2016 showing a significant decrease of 5.50 days (95% CI: 2.62 to 8.38), and Schinkel 2022 reporting a smaller but statistically significant reduction of 0.50 days (95% CI: 0.16 to 0.84). These findings highlight the potential for sepsis protocols to effectively reduce the burden on ICU resources, although the degree of impact may vary significantly between different clinical environments.

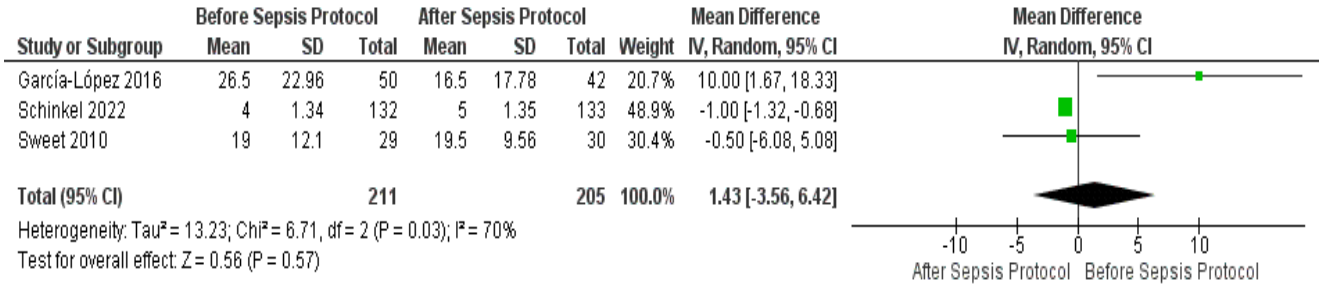
Figure.3 Length of ICU Stay (Days) forest plot



Length of Hospital Stay (Days)

The meta-analysis examining the effect of sepsis protocol implementation on the length of hospital stay included three studies, encompassing a total of 416 participants. The analysis did not demonstrate a statistically significant decrease in the duration of hospital stays, with a mean difference of 1.43 days (95% CI: -3.56 to 6.42, Z = 0.56, P = 0.57). There was considerable heterogeneity observed among the studies (I^2 = 70%), indicating significant variation in outcomes across different clinical settings. Individually, Schinkel 2022 reported a statistically significant reduction in hospital stay by 1.00 day (95% CI: -1.32 to -0.68), suggesting some positive impact of the protocol in that study. However, other studies such as García-López 2016 and Sweet 2010 showed no significant changes, with mean differences of 1.00 day (95% CI: -6.7 to 8.33) and -0.50 days (95% CI: -6.08 to 5.08), respectively. This variability underscores the challenges in achieving consistent outcomes with protocol implementation and highlights the need for tailored approaches depending on the hospital environment and patient demographics.

Figure.4 Length of Hospital Stay (Days) forest plot



Time till Antibiotic Delivery

The implementation of the sepsis protocol significantly reduced the time until antibiotic delivery by an average of 92.21 minutes across the included studies, indicating an improvement in the rapidity of initiating antibiotic treatment which is crucial for sepsis management.

Mortality

The meta-analysis exposed no statistically significant decrease in mortality rates after the implementation of the sepsis protocol. The overall risk ratio was 1.11, indicating no beneficial effect, and the heterogeneity was high, suggesting inconsistent results across different studies.

ICU Stay Duration

The implementation of the sepsis protocol resulted in a statistically significant decrease in the duration of ICU stays, with a mean difference of 1.45 days. This outcome suggests that the protocol could effectively reduce the burden on ICU resources.

Hospital Stay Duration

There was no statistically significant change in the overall duration of hospital stays after the sepsis protocol implementation, with a mean difference of 1.43 days. Despite the lack of overall significance, one study did report a significant reduction, indicating that the effectiveness might vary significantly by specific hospital settings or patient populations.

Discussion

A significant decrease was noted in all of the involved studies in the meta-analysis evaluating the effect of a sepsis strategy on the time until antibiotic delivery. After the protocol was implemented, the time to provide antibiotics decreased by an average of 92.21 minutes, which was statistically significant, according to the combined data from three trials **(Francis (7), Schinkel (12), and Sweet (13)** with a total of 599 participants. The studies' high degree of heterogeneity suggests that the effect size varies depending on the study parameters or environment. An improvement in the promptness of starting antibiotic treatment, which is essential for managing sepsis, was demonstrated by the application of the sepsis protocol, which dramatically decreased the time before antibiotic delivery by an average of 92.21 minutes throughout the included studies.

Rehmani et al. (20) sought to assess how an ED sepsis protocol affected the time it took for studied cases with severe sepsis to get antibiotics. Following the ED sepsis protocol's deployment, they saw a statistically significant reduction in the time to antibiotics from the time criteria for severe sepsis were reached (CTA). For the presepsis-protocol group, the average CTA duration was 140minutes. A mean CTA time of 68minutes resulted from the protocol's implementation.

Rehmani et al. (20) discovered a notable improvement in the antibiotic delivery time. They received their 1st dose in 68minutes, which was 72minutes quicker than it was prior to the protocol's introduction. It has been shown that giving antibiotics to septic shock studied cases earlier significantly improves results. A delay in administering antibiotics until after shock recognition was independently linked to mortality, according to previous research, & the time to effective antimicrobial therapy in septic shock had the highest association with outcome, as reported by Kumar et al. **Puskarich et al.(21)** It has been demonstrated that in studied cases with septic shock & severe sepsis, the probability of in-hospital death was eight times higher for those who received insufficient treatment within the 1st twenty-four hours than for those who received appropriate empirical antibiotic treatment.

The shorter time to 1st antibiotic dose has several causes. ED clinicians were more likely to identify sepsis and septic shock when they followed a standardized sepsis procedure. Furthermore, the protocol made broad-spectrum antibiotics more accessible without requiring ID service participation. In a similar vein, using pharmacy services speeds up the supply of antibiotics to the emergency department. Lastly, this improvement may have been explained by the "Hawthorne effect," which is the heightened awareness brought about by instructional sessions conducted prior to the protocol's implementation (**22**).

Rehmani et al. (20) think that inadequate early detection is frequently the cause of the delays in the start of antibiotics in cases of septic shock & severe sepsis. One surrogate indicator of early detection & timely treatment is the time to antibiotic medication. We developed a sepsis protocol that included a patient screening tool that could be used at triage or at the patient's bedside, along with a data order set that included suggested initial empirical antibiotics based on suspected source of

infection, in an attempt to expedite the identification & treatment of these studied cases.

Rehmani et al. (20) Additionally, it was discovered that while the process significantly improved the time it took to provide antibiotics when severe sepsis criteria were satisfied, the true advantage of the strategy was realized when sepsis was identified early. We had hoped at the beginning of the project that the protocol would be started at triage to identify these individuals early, but we discovered that it wasn't active until after the doctors saw them.

Eight studies totaling 1,642 participants were involved in the meta-analysis on the impact of implementing sepsis protocols on mortality. The application of the sepsis protocol did not result in a statistically significant decrease in mortality, according to the overall analysis. There was significant variation in the mortality results across various study sites or populations, as seen by the moderate to high heterogeneity among the studies. There was no statistically significant decrease in mortality rates following the sepsis protocol's deployment, according to the meta-analysis. Heterogeneity was substantial, suggesting conflicting outcomes across studies, and the overall risk ratio was 1.11, showing no protective effect.

Cardoso et al. (23) sought to assess the effect on mortality of adherence to a core version of the six-hour bundle of the Surviving Sepsis Campaign. A notable decrease in the twenty-eight-day mortality rate was linked to adherence to this core bundle.

In a systematic review by **Taj et al. (24),** Modified-sepsis procedures were used in 6 relevant studies to identify early sepsis warning signals & treat sepsis in environments with limited resources. Modified sepsis protocols (early sepsis screening tool & sepsis intervention bundle) & educational elements were included in the interventions. Research found that education on & adherence to standardized sepsis protocols improved protocol compliance. Even with limited protocol application, sepsis-related fatality rates dropped by 22.6percent, however hospital lengths of stay were not significantly affected. The lack of resources required to successfully complete each step of the procedure is the main obstacle when executing sepsis protocols in environments with limited resources.

One of the main components of sepsis performance improvement programs is the application of sepsis bundles, which are linked to a notable rise in sepsis bundle compliance & a decrease in the death rate. **Levy et al. (25)** found that, throughout a 7.5-year observation period, high-compliance hospitals had reduced mortality rates.

Analysis by **Seymour et al. (26)** of the New York State registry also showed that a reduced risk-adjusted in-hospital death rate was linked to a higher 3-hour sepsis bundle compliance rate. Lactate appeared to be a non-compliant variable most of the time, while high-income nations, surgical intensive care units, prolonged implementation, & ED visits were among the parameters linked to a high rate of compliance. Even if bundle completion in sepsis patients is delayed, the mortality rate may still drop, & the rate of compliance should continue to rise within the first two years of adoption.

Observational studies as by **Houck et al. (27)** have demonstrated that giving antibiotics within the 1st four to eight hours of hospital admission significantly lowers mortality. An ED-based approach has the potential to significantly reduce morbidity & death in this patient population that presents to the ED, as there is a statistically & clinically significant improvement in time to antibiotics in severe sepsis.

Four trials totaling 516 participants were comprised in the meta-analysis assessing the impact of using the sepsis regimen on the duration of ICU stay. After the strategy was put into place, the average length of ICU stays was statistically significantly reduced by 1.45 days, according to the pooled data. The considerable degree of heterogeneity among the included trials indicates significant variation in the way the procedure impacted the length of ICU stays in various contexts. With a mean difference of 1.45 days, the sepsis protocol's implementation led to a statistically significant reduction in the length of ICU hospitalizations. This result implies that the procedure may successfully lessen the strain on intensive care unit resources.

García et al. (8) sought to evaluate how a Sepsis Code Hospital Protocol affected hospital stays, antibiotic utilization, & mortality. The adoption of a Sepsis Code Hospital Protocol was linked to better antibiotic use, including a tendency towards a shorter intensive care unit stay, a large decrease in the use of restricted-use antibiotics, a considerable increase in gradual therapeutic lowering, & a significant decrease in mortality.

García et al. (8) showed that The POST-CS group experienced fewer days of antibiotic treatment, and the length of antibiotic medication throughout the ICU stay was significantly shorter. Additionally, it should be mentioned that compared to the PRE-SC group, the POST-SC group used restricted use antibiotics as an empirical treatment at a considerably lower rate.

Three trials totaling 416 individuals were included in the meta-analysis that looked at how the application of the sepsis protocol affected the length of hospital stay. With a mean difference of 1.43 days, the research failed to show a statistically significant decrease in hospital stay duration. large variance in results across various therapeutic contexts was indicated by the large heterogeneity among the studies. With a mean difference of 1.43 days, the total length of hospital stays following the introduction of the sepsis protocol did not alter statistically significantly. One study did indicate a considerable reduction, despite the lack of overall significance, suggesting that the effectiveness may differ significantly depending on the patient demographic or hospital situation.

Conclusion

An improvement in the promptness of starting antibiotic treatment, which is essential for managing sepsis, was demonstrated by the application of the sepsis protocol, which dramatically decreased the time before antibiotic delivery by an average of 92.21 minutes throughout the included studies. The sepsis procedure did not result in a statistically significant decrease in mortality rates. Heterogeneity was substantial, suggesting conflicting outcomes across studies, and the overall risk ratio was

1.11, showing no protective effect. With a mean difference of 1.45 days, the sepsis protocol's implementation led to a statistically significant decrease in the length of ICU hospitalizations. This result implies that the procedure may successfully lessen the strain on intensive care unit resources. With a mean difference of 1.43 days, the total length of hospital stays following the introduction of the sepsis protocol did not alter statistically significantly. One study did indicate a considerable reduction, despite the lack of overall significance, suggesting that the effectiveness may differ significantly depending on the patient demographic or hospital situation.

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