

Brief Report

Bridging the Gap: Evaluating pen-to-needle time for reserve antibiotics in sepsis management at a tertiary hospital in Sri Lanka
Comparison with 2021 Surviving Sepsis Campaign recommendations

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Abstract

The 2021 Surviving Sepsis Campaign guidelines emphasise the importance of early antibiotic administration in sepsis. This study aimed to evaluate the pen-to-needle time for reserve antibiotics in patients with sepsis at the National Hospital of Sri Lanka (NHSL). A four-month prospective observational audit was conducted from March 2022, analysing the prescription and administration times of reserve antibiotics in patients with sepsis in inpatient wards and intensive care units (ICUs). Of the 50 cases involving reserve antibiotics, 66% were prescribed for septic patients. Alarming, only 6% of these antibiotics were administered within one hour, and 22% were delayed beyond 24 hours. ICU administration times were generally faster (4-12 hours in 65.3% of cases) compared to wards (≥ 24 hours in 33.3%).

This audit reveals substantial delays in reserve antibiotic administration in patients with sepsis. Expedited access strategies, such as streamlined authorisation protocols, are needed to improve adherence to SSC guidelines and optimise patient outcomes.

Keywords: *Sepsis, Surviving Sepsis Campaign, pen-to-needle time, reserve antibiotics, antimicrobial stewardship*

Introduction

Sepsis, a life-threatening condition resulting from dysregulated host response to infection, demands rapid and effective intervention. The 2021 Surviving Sepsis Campaign (SSC) guidelines, building upon previous iterations, highlight the importance of early antibiotic administration to improve patient outcomes.¹ These guidelines emphasise that every hour of delay in antibiotic administration in sepsis is associated with increased mortality.^{2,3}

At the National Hospital of Sri Lanka (NHSL), a 3000-plus-bed tertiary care hospital, the management of sepsis presents unique challenges. The hospital's antibiotic stewardship programme requires consultant microbiologist authorisation for reserve antibiotics, crucial for combating antimicrobial resistance. However, this process may inadvertently delay critical treatment in sepsis, potentially compromising adherence to the SSC guidelines.

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This study aimed to evaluate the pen-to-needle time for reserve antibiotics in patients with sepsis at NHSL, focusing on the interval between prescription and administration. This study seeks to identify areas for improvement and promote timely antibiotic administration in this high-risk patient population.

Methods

This prospective observational audit was conducted at NHSL over four months from March 2022. A standardised checklist was used to collect data on patients with sepsis who received reserve antibiotics (colistin, cefoperazone-sulbactam, levofloxacin, linezolid, voriconazole, amphotericin B, daptomycin). The checklist included the unit (ward or ICU), the date and time of antibiotic prescription, and the date and time of administration. Nursing officers were instructed to record the administration time. Patient identification details were omitted for anonymity.

The main outcome measure was the pen-to-needle time, defined as the interval between antibiotic prescription and administration. Data was analysed to determine the proportion of antibiotics administered within one hour, as recommended by the SSC guidelines, and to identify factors contributing to delays.

Results

Out of the 50 cases that required reserve antibiotics, 33 (66%) were prescribed for patients with sepsis. Alarming, only 3 (6%) of these antibiotics were administered within one hour, as recommended by the SSC guidelines. Of the 50 cases, 11 (22%) were delayed beyond 24 hours.

In the ICU setting, 65.3% of reserve antibiotics were administered within 4-12 hours. However, in the wards, 33.3% were delayed beyond 24 hours. Delays were primarily attributed to the time required for authorisation from the consultant microbiologist and processing at the pharmacy.

Table 1: Pen-to-needle time for reserve vs other groups of antibiotics

		Not given	0-1 hours	1-4 hours	4-12hours	12- 24 hours	>24 hours	Frequency of each antibiotic use	Total no. of cases
Reserve	Colistin	2 (4%)	2 (4%)	1 (2%)	7 (14%)	-	-	12 (24%)	50
	Cef-sulbactam	-	-	1 (2%)	7 (14%)	-	-	8 (16%)	
	IV Levofloxacin	-	-	-	1 (2%)	1 (2%)	3 (6%)	5 (10%)	
	O. Levofloxacin	-	1 (2%)	-	3 (6%)	1 (2%)	-	5 (10%)	
	IV Linezolid	-	-	2 (4%)	4 (8%)	-	-	6 (12%)	
	O. Linezolid	-	-	1 (2%)	-	2 (4%)	2 (4%)	5 (10%)	
	IV Voriconazole	-	-	1 (2%)	1 (2%)	-	-	2 (4%)	
	Amphotericin B	-	-	-	-	-	5 (10%)	5 (10%)	
	Daptomycin	2 (4%)	-	-	-	-	-	2 (4%)	
Percentage		8%	6%	12%	46%	8%	20%	100%	
Non-reserve	Teicoplanin	-	9 (15.8%)	1 (1.8%)	-	-	-	10 (17.6%)	57
	Ticarcillin-sp	-	9 (15.8%)	1 (1.8%)	-	-	-	10 (17.6%)	
	IV Amikacin	-	8 (14.0%)	-	-	-	-	8 (14.0%)	
	Meropenem	-	9 (15.8%)	1 (1.8%)	-	-	-	10 (17.6%)	
	Piperacillin-Tazobactam	-	8 (14.0%)	-	-	-	-	8 (14.0%)	
	IV Clindamycin	-	4 (7.0%)	-	-	-	-	4 (7.0%)	
	IV Ciprofloxacin	-	4 (7.0%)	-	-	-	-	4 (7.0%)	
	IV Ceftazidime	-	3 (5.2%)	-	-	-	-	3 (5.2%)	
Percentage			94.6%	5.4%				100%	

Table 2: Pen-to-needle time comparison of ICUs and wards									
		Not given	0-1 hours	1-4 hours	4-12hours	12- 24 hours	>24 hours	Frequency of each antibiotic use	Total no. of cases
Wards	Colistin	1 (4.2%)	1 (4.2%)		1 (4.2%)			3 (12.6%)	24
	Cef-sulbactam				2 (8.4%)			2 (8.4%)	
	IV Levofloxacin				1 (4.2%)	1 (4.2%)	1 (4.2%)	3 (12.6%)	
	Or Levofloxacin				1 (4.2%)	1 (4.2%)		2 (8.4%)	
	IV Linezolid			1 (4.2%)	1 (4.2%)			2 (8.4%)	
	Oral Linezolid			1 (4.2%)		2 (8.4%)	2 (8.4%)	5 (21%)	
	IV Voriconazole							0	
	Amphotericin B						5(21%)	5 (21%)	
	Daptomycin	2 (8.4%)						2 (8.4%)	
Percentage		12.6%	4.2%	8.4%	25.2%	16.8%	33.6%	100%	
ICU	Colistin	1 (3.8%)	1 (3.8%)	1 (3.8%)	6 (23%)			9 (34.6%)	26
	Cef-sulbactam			1 (3.8%)	5 (19.2%)			6 (23.0%)	
	IV Levofloxacin						2 (7.7%)	2 (7.7%)	
	Oral Levofloxacin		1 (3.8%)		2 (7.7%)			3 (11.5%)	
	IV Linezolid			1 (3.8%)	3 (11.6%)			4 (15.4%)	
	Oral Linezolid							0	
	IV Voriconazole			1 (3.8%)	1 (3.8%)			2 (7.6%)	
	Amphotericin B							0	
	Daptomycin							0	
Percentage		3.8%	7.6%	15.2%	65.3%		7.7%	100%	

Discussion

The findings of this audit reveal substantial delays in reserve antibiotic administration at NHS in patients with sepsis, deviating from the 2021 SSC recommendations. The observed delays, primarily due to the cumulative time taken for document preparation for authorisation, getting the required signatures and issuing drugs from the pharmacy, highlight the need for streamlined protocols.

The contrast between the recommended one-hour administration time and the actual administration times underscores the challenges in implementing guidelines in resource-limited settings. The 66% prescription rate for reserve antibiotics in sepsis cases emphasises the urgency of minimising delays in this critical patient population.

The faster administration times in ICUs compared to wards suggest differences in resource availability and workflow. However, even in ICUs, the 4 to 12 hour delay for most reserve antibiotics is a significant concern.

The observed delays align with previous studies that have identified similar challenges in antibiotic administration.⁴ However, the specific focus on sepsis and adherence to the Surviving Sepsis Campaign guidelines provides valuable insights into the practical implications of these delays.

Based on our findings, the following recommendations are proposed:

1. Pharmacy workflow optimisation for sepsis: Prioritise the processing and delivery of reserve antibiotics for patients with sepsis, implementing dedicated pharmacy support for critical units.⁵
2. Education and training: Provide ongoing education and training for healthcare professionals on the importance of timely antibiotic administration in sepsis, emphasising the 2021 Surviving Sepsis Campaign guidelines.
3. Continuous performance monitoring: Implement a system for continuous monitoring of pen-to-needle time and other key performance indicators related to sepsis management.

Conclusion

This audit highlights significant delays in reserve antibiotic administration in sepsis patients at NHSL, significantly deviating from the 2021 Surviving Sepsis Campaign recommendations. Expedited access strategies, education and training for health care professionals and continuous performance monitoring are urgently needed to improve adherence to these guidelines and optimise patient outcomes in sepsis.

Declarations

Conflict of interest: There are no conflicts of interest

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Ethics Statement: A standardised checklist was used to collect data. Patient identification details were not collected to maintain anonymity

Author contributions: All the authors contributed to the final manuscript. The audit was designed by HAAOT and MK. HAAOT, MPKG, RDVC, and KDLF carried out the data collection. Manuscript writing was done by HAAOT.

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