

Stepwise Implementation of an Antimicrobial Stewardship Program in a Surgical Intensive Care Unit : A Single-Center Retrospective Cohort Study

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INTRODUCTION

- Antimicrobial stewardship programs (ASPs) in intensive care units (ICUs) aim to optimize antibiotic use without adversely affecting patient outcomes.
- From July 2023, infectious disease specialists reviewed electronic medical records (EMR) three times weekly for patients receiving meropenem or imipenem and provided recommendations (record-based ASP). From November 2024, a multidisciplinary team including an infectious disease specialist, a pharmacist, and an ASP nurse monitored all antibiotic use and provided recommendations three times weekly (round-based ASP).
- We evaluated the effect of a stepwise ASP on antimicrobial use and multidrug-resistant organism isolation in a surgical ICU.

METHODS

Period

- ① **Period 1 Pre-ASP** 2022.7-2023.6
② **Period 2 Record-based ASP** 2023.8-2024.10
③ **Period 3 Round-based ASP** 2024.12-2025.11

- Outcomes included antibiotic use, measured as days of therapy (DOT) per 1,000 patient-days, and multidrug-resistant organism isolation from clinical specimens.
- Antibiotic use measured as days of therapy (DOT) per 1,000 patient-days, Incidence rate ratios (IRRs) and 95% CI were estimated using Poisson regression analysis.
- The months in which each ASP intervention was introduced were excluded from the analysis as a washout period. (2023.7, 2024.11)

RESULTS

- Total antibiotic use decreased from 1,109.1 DOT per 1,000 patient-days in Period 1 to 947.9 in Period 2 (IRR, 0.85; 95% CI, 0.83-0.88), and with a further reduction to 815.2 in Period 3 (IRR, 0.74; 95% CI, 0.71-0.77). [Table 1] [Figure 1]
- The largest reduction was observed in second-generation cephalosporin (Period 2 vs. Period 3; IRR, 0.27; 95% CI, 0.19-0.37), followed by reductions in quinolone (Period 1 vs. Period 3; IRR, 0.31; 95% CI, 0.26-0.38), second-generation cephalosporin (IRR, 0.34; 95% CI, 0.25-0.48), and type 2 carbapenem (IRR, 0.43; 95% CI, 0.37-0.50), with most evident in Period 3. [Table 1] [Figure 1]
- The acceptance rate was higher in Period 3 than in Period 2. [Table 2]
- The isolation rate of multidrug-resistant *Acinetobacter baumannii* decreased across study periods. [Table 3]
- After adjustment for potential confounders, there was no significant difference in mortality across study periods. [Figure 2]

[Table 1] Antibiotic use

	Period2 vs Period1 IRR (95% CI)	Period3 vs Period1 IRR (95% CI)	Period3 vs Period2 IRR (95% CI)
Total antibiotic	0.85 (0.83-0.88)	0.74 (0.71-0.77)	0.86 (0.82-0.90)
Quinolone	0.67 (0.59-0.75)	0.31 (0.26-0.38)	0.47 (0.39-0.57)
1st Cephalosporin	0.99 (0.88-1.11)	0.57 (0.49-0.66)	0.57 (0.49-0.67)
2nd Cephalosporin	1.29 (1.07-1.56)	0.34 (0.25-0.48)	0.27 (0.19-0.37)
Type 2 Carbapenem	0.76 (0.69-0.85)	0.43 (0.37-0.50)	0.56 (0.48-0.66)
Glycopeptide	0.67 (0.60-0.75)	0.60 (0.53-0.69)	0.90 (0.78-1.04)
Ertapenem	0.67 (0.56-0.81)	0.54 (0.42-0.68)	0.80 (0.62-1.02)

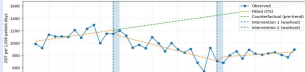
[Table 2] Record-based ASP and Rounding-based ASP data

Variable	Record-based ASP (Period 2)	Rounding-based ASP (Period 3)	p-value
Study duration	15 months	12 months	—
Total ASP Interventions	87	962	—
Monthly ASP Interventions	5.8/month	80.2/month	<0.001
Accepted Interventions	71 (81.6%)	926 (96.3%)	<0.001
Non-accepted Interventions	16 (18.4%)	36 (3.7%)	

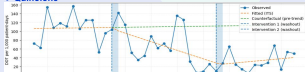
RESULTS

[Figure 1] Antibiotic use trend

• Total antibiotic



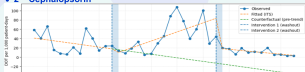
• Quinolone



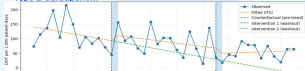
• 1st Cephalosporin



• 2nd Cephalosporin



• Type 2 Carbapenem

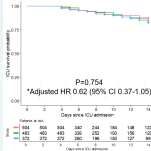


[Table 3] Isolation rate of multidrug-resistant organisms

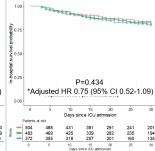
	Period 1 Incidence (95% CI)	Period 2 Incidence (95% CI)	Period 3 Incidence (95% CI)	Period2 vs Period1 IRR (95% CI)	Period3 vs Period1 IRR (95% CI)	Period3 vs Period2 IRR (95% CI)
MRAB	6.9 (4.9-9.3)	2.7 (1.6-4.3)	0.5 (0.1-1.7)	0.39 (0.22-0.69)	0.07 (0.02-0.29)	0.18 (0.04-0.77)
MRPA	0.7 (0.2-1.7)	0.3 (0.0-1.1)	0.0	0.49 (0.09-2.66)	N/A	N/A
MRSA	1.3 (0.6-2.6)	1.3 (0.5-2.5)	1.4 (0.5-3.1)	0.97 (0.37-2.59)	1.10 (0.38-3.16)	1.13 (0.39-3.25)
CRE	0.8 (0.3-1.9)	0.5 (0.1-1.4)	0.5 (0.1-1.7)	0.58 (0.14-2.44)	0.58 (0.11-3.01)	1.00 (0.17-6.00)
VRE	0.7 (0.2-1.7)	1.1 (0.4-2.3)	0.7 (0.1-2.1)	1.70 (0.50-5.81)	1.10 (0.25-4.90)	0.64 (0.17-2.49)

[Figure 2] Mortality

• 14-days ICU mortality



• 28-days ICU mortality



*Adjusted HR (age, sex, department category, DNR state, SAPS)

CONCLUSIONS

Stepwise ASP implementation in the surgical ICU was associated with reduced antibiotic consumption and decreased multidrug-resistant *Acinetobacter baumannii* isolation rates. Compared with the record-based ASP period, the round-based ASP period demonstrated a higher acceptance rate and greater reduction in antibiotic use, particularly in antibiotics commonly prescribed for surgical prophylaxis. Despite these effects, no significant impact on mortality was observed.