RES-116

Healthcare Resource Utilization of Ceftolozane/Tazobactam in Hospitalized Patients: Real-World Insights From the SPECTRA Study

Emre Yucel[1]; Alex Soriano[2]; David L. Paterson[3]; Florian Thalhalmmer[4]; Stefan Kluge[5]; Pierluigi Viale[6]; Mike Allen[7]; Brune Akrich[8]; Jessica Levy[1]; Huina Yang[9]; Sunny Kaul[10]

[1]Merck & Co., Inc., Rahway, NJ, USA; [2]Hospital Clinic, Barcelona, Spain; [3]The University of Queensland, Queensland, Australia; [4]Medizinische Universität Wien, Spitalgasse, Austria; [5]University Medical Center Hamburg-Eppendorf, Hamburg, Germany; [6]Università di Bologna – Via Zamboni, Bologna, Italy; [7]MSD (UK) Limited, London, United Kingdom; [8]MSD France, Puteaux, France; [9]Tan Tock Seng Hospital, Singapore; [10]Royal Brompton & Harefield NHS Foundation Trust, London, United Kingdom

Background

Novel antibiotics such as ceftolozane/tazobactam (C/T) play a critical role in the treatment of serious gram-negative infections, especially in hospitalized patients. Despite their increasing use, there is a lack of comprehensive data on healthcare resource utilization (HCRU) associated with these agents, particularly when considering the timing or rank of antibiotic initiation during treatment. Understanding prescribing patterns and HCRU by rank of initiation is essential to optimizing antibiotic stewardship, improve patient outcomes, and efficiently allocate healthcare resources.

Objectives

The primary objectives of this subanalysis of the SPECTRA study were to describe the prescribing patterns of C/T in hospitalized patients and to evaluate HCRU metrics, including hospital length of stay (LOS) and 30-day readmission rates, stratified by the rank of C/T initiation. This analysis aims to provide real-world evidence to support clinical decision-making and economic evaluations of novel antibiotic therapies.

Methods

The SPECTRA study was a multicenter, observational study conducted between 2016 and 2020 across 7 countries: Austria, Australia, Germany, Italy, Mexico, Spain, and the United Kingdom (UK). The study population included hospitalized patients aged 18 years or older who received at least 48 hours of C/T treatment for suspected or confirmed gram-negative infections (N=617). The rank of C/T initiation was defined by the chronological order of C/T administration relative to other gram-negative antibacterial agents used for the index infection, ranging from first to sixth or more. HCRU endpoints included 30-day all-cause readmission, 30-day infection-related readmission, total hospital LOS, and post-C/T LOS. Descriptive statistics were used to summarize the data, including median values, means, standard deviations, and 95% confidence intervals.

Results

Patient distribution by rank of C/T initiation

Among the 617 patients included in the analysis, 171 (27.7%) received C/T as the first, 167 (27.1%) as the second, 119 (19.3%) as the third, 76 (12.3%) as the fourth, 44 (7.1%) as the fifth, and 40 (6.5%) as the sixth or later antibiotic.

Readmission rates

The 30-day all-cause readmission rate was highest in patients who received C/T as the second antibiotic, at 13.8%. The highest 30-day infection-related readmission rate was observed in the fifth initiation group, at 18.2%. These findings suggest that patients receiving C/T later in their treatment course may experience higher rates of readmission, indicating more complex clinical scenarios and the potential need for targeted interventions.

Hospital LOS

The median hospital LOS was longest in patients who received C/T as the sixth or later antibiotic, with a median of 60 days. Overall, the median hospital LOS across all patients was 42 days. The median post-C/T LOS was 6 days, highlighting the need for continued care and monitoring after completion of C/T therapy to support recovery and reduce the risk of readmission.

Additional observations

A notable number of patients remained hospitalized 30 days after the last dose of C/T, particularly in the first, third, and fourth initiation groups. This prolonged hospitalization underscores the complexity of managing serious infections and the associated resource demands. More data were observed regarding cystic fibrosis and patients in critical care, to be disclosed in following publications.

Table 1. Patient demographics and baseline characteristics (N=617)

Characteristic	Value/summary
Age, years[a]	
Number with data	609
Mean (SD)	57.4 (17.3)
Median	59.0
Range	18-89
Gender[a]	
Male	404 (65.5%)
Female	213 (34.5%)
Height, cm	
Number with data	475
Mean (SD)	169.5 (13.1)
Median	170.0
Weight, kg	
Number with data	493
Mean (SD)	73.5 (19.7)
Median	70.2
Body mass index (BMI), kg/m²	
Number with data	469
Mean (SD)	25.6 (6.7)
Median	25.0
Immunocompromised status[b]	268 (43.4%)
Transplant patients	160 (25.9%)
At least 1 comorbidity[c]	510 (82.7%)
Common comorbidities[c]	
Heart disease	180 (29.2%)
Chronic kidney disease	122 (19.8%)
Acute kidney injury	63 (10.2%)
Chronic pulmonary disease	180 (29.2%)
Cystic fibrosis	64 (10.4%)
Liver disease	77 (12.5%)
Diabetes mellitus	155 (25.8%)
Previous care setting[d]	
Home/community	495 (80.2%)
Other hospital	73 (11.8%)
Skilled care facility	35 (5.7%)

[a]Age and gender data are based on available records; some missing data exist.
[b]Immunocompromised status includes patients with hematologic malignancy, solid tumor, or transplant.
[c]Comorbidities are not mutually exclusive; patients may have multiple conditions.
[d]Previous care setting reflects the location before index hospitalization.

Table 2. 30-day all-cause and infection-related readmission rates by rank of C/T initiation (N=617)[a]

Readmission type	First initiation (N=171)	Second initiation (N=167)	Third initiation (N=119)	Fourth initiation (N=76)	Fifth initiation (N=44)	Sixth+ initiation (N=40)	Total (N=617)
30-day all-cause readmission, No, n (%)	92 (53.8%)	98 (58.7%)	62 (52.1%)	30 (39.5%)	22 (50.0%)	14 (35.0%)	318 (51.5%)
30-day all-cause readmission, Yes, n (%)	10 (5.8%)	23 (13.8%)	10 (8.4%)	10 (13.2%)	8 (18.2%)	2 (5.0%)	63 (10.2%)
30-day infection-related readmission, No, n (%)	95 (55.6%)	110 (65.9%)	67 (56.3%)	34 (44.7%)	23 (52.3%)	15 (37.5%)	344 (55.8%)
30-day infection-related readmission, Yes, n (%)	6 (3.5%)	9 (5.4%)	4 (3.4%)	5 (6.6%)	6 (13.6%)	0	30 (4.9%)

[a]"Not applicable" patients (died during index hospitalization or still hospitalized 30 days post-C/T) are excluded from the percentages.

Figure 1. Median hospital LOS by rank of C/T initiation

Rank of C/T initiation	Median hospital LOS, days	Q1; Q3, days
First	41	17.0; 66.0
Second	30.5	17.0; 59.0
Third	43	24.0; 71.0
Fourth	53	29.0; 77.0
Fifth	43	25.5; 75.0
Sixth+	60	40.5; 84.0
Total	42	22.0; 71.0

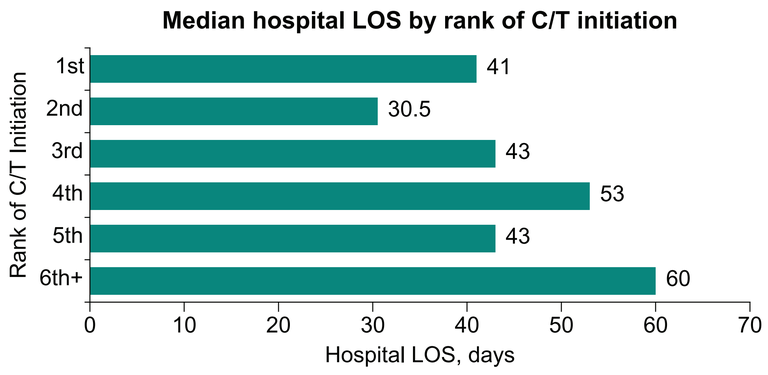
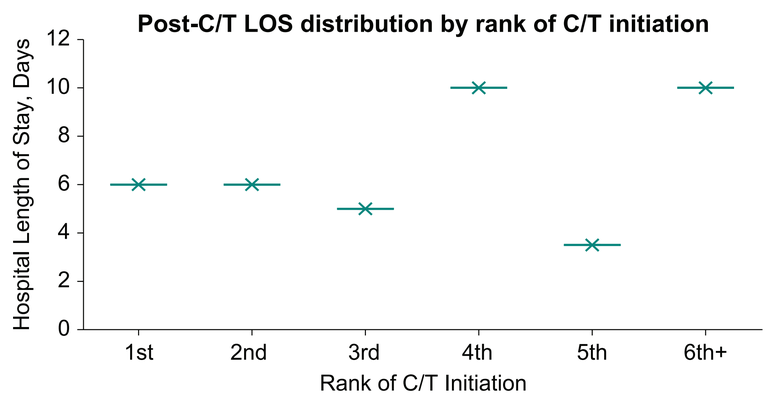


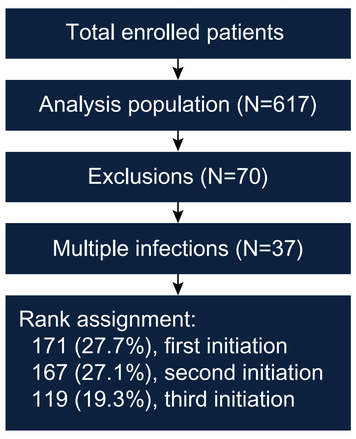
Figure 2. Post-C/T LOS distribution by rank of C/T initiation[a]

Rank of C/T initiation	Median post-C/T LOS, days	Q1; Q3, days
First	6	1.0; 28.0
Second	6	1.0; 18.0
Third	5	1.0; 28.0
Fourth	10	1.0; 31.0
Fifth	3.5	1.0; 26.5
Sixth+	10	1.0; 28.0
Total	6	1.0; 25.0

[a]Post-C/T LOS is defined as days from last dose of C/T to hospital discharge or death; some values imputed for patients hospitalized >30 days post-C/T.



Patient inclusion and rank assignment process



1. **Initial enrollment:** 687 patients enrolled across 7 countries (Austria, Australia, Germany, Italy, Mexico, Spain, UK)
2. **Analysis population:** 617 patients met inclusion criteria
   - Age ≥18 years
   - Received ≥48 hours of C/T treatment
   - Last dose of C/T ≤30 days before data abstraction
   - Microbiological sample within ±14 days of index infection
   - Positive culture with gram-negative pathogen
3. **Exclusions:** 70 patients excluded due to C/T use outside treatment period for index infection
4. **Multiple infections:** 37 patients (6.0%) had multiple infections; only first infection analyzed
5. **Rank assignment:** Patients categorized by rank of C/T initiation relative to other gram-negative antibacterials for index infection
   - First initiation: C/T first antibacterial
   - Second initiation: C/T second antibacterial
   - Third, fourth, fifth, or sixth or more, accordingly
6. **Subgroups for analysis:**
   - Empiric therapy (C/T started within 48 hours of suspected infection)
   - Definitive therapy (C/T started after culture results)
   - Patients with undetermined timing or C/T given within 2 days after microbiological sample but no prior antibacterial excluded from some analyses
7. **Final cohort:** 617 patients distributed as:
   - 171 (27.7%), first initiation
   - 167 (27.1%), second initiation
   - 119 (19.3%), third initiation
   - 76 (12.3%), fourth initiation
   - 44 (7.1%), fifth initiation
   - 40 (6.5%), sixth or more initiation

Discussion

This analysis demonstrates that HCRU varies significantly depending on the rank of C/T initiation in hospitalized patients. Early initiation of C/T (as the first antibiotic) was associated with lower readmission rates and shorter hospital stays, whereas later initiation correlated with increased resource utilization, likely reflecting more severe or complicated infections. These findings emphasize the importance of timely and appropriate use of novel antibiotics to optimize clinical outcomes and reduce healthcare burden. The results also support the role of antibiotic stewardship programs in guiding the sequencing of antibiotic therapies

Limitations

This study include its observational design and potential confounding factors, as well as missing data in some patient subgroups.

Conclusions

HCRU differs markedly by the rank of C/T initiation in hospitalized patients with gram-negative infections. Appropriate use of C/T may reduce hospital LOS and readmission rates, thereby improving patient outcomes and reducing healthcare costs. Further research is warranted to explore optimal timing and sequencing of novel antibiotics to enhance both clinical and economic outcomes, considering also other vulnerable situations such as patients under critical care or with cystic fibrosis. These real-world findings provide valuable insights for clinicians, hospital administrators, and policymakers involved in managing serious infections.

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