Infection and Drug Resistance

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ORIGINAL RESEARCH

Real-World Use and Treatment Outcomes of Ceftaroline Fosamil in Patients with Complicated Skin and Soft Tissue Infection: A Multinational Retrospective Study

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Background: Ceftaroline fosamil is approved for the treatment of complicated skin and soft tissue infections (cSSTI) and community-acquired pneumonia (CAP); however, data on its real-world use and effectiveness in Europe and Latin America are currently limited. This retrospective observational study assessed ceftaroline fosamil use and treatment outcomes in adults hospitalized with cSSTI or CAP treated with ceftaroline fosamil in a usual care setting in Europe and Latin America. Results for patients with cSSTI are reported.

Methods: Data from patients with cSSTI who received ≥4 consecutive intravenous ceftaroline fosamil doses up to May 31, 2019, were collected from sites in Brazil, Colombia, France, Greece, Italy, and Spain. Patient characteristics, clinical management, hospitalization information, microbiological diagnosis, and clinical responses were summarized descriptively. Healthcare resource use variables were evaluated by clinical response to ceftaroline fosamil.

Results: Data for 132 patients were included (58.3% male; mean age 58.5 years). Most common lesions were cellulitis/fasciitis (62.1%), abscess (34.1%), and post-surgical wounds (19.7%). Pathogens most frequently identified were methicillin-resistant (18.2%) and methicillin-susceptible *Staphylococcus aureus* (17.4%). Median (range) ceftaroline fosamil treatment duration was 8 (2–60) days (daily doses of 1200 [400–2400] mg); 78 patients (59.1%) received monotherapy. In total, 75 (56.8%) patients had additional antibiotics after ceftaroline fosamil. Clinical response occurred in 118 (89.4%) patients. All-cause 30-day readmission occurred in 13 (9.8%) patients, and all-cause 30-day mortality in 7 (5.3%). Clinical response to ceftaroline was associated with >25% shorter length of hospital and intensive care stay, and with ~40% lower hospital costs, versus non-responders.

Conclusion: Ceftaroline fosamil was effective in treating adults with cSSTI and clinical response to ceftaroline fosamil was associated with reductions in healthcare resource use compared with non-responders, in Europe and Latin America.

Clinicaltrials.gov Identifier: NCT04198571.

Keywords: antibiotics, real-world evidence, efficacy, healthcare resource use

Introduction

Complicated skin and soft tissue infections (cSSTI) encompass a wide spectrum of clinical presentations, including infected ulcers, infected burns, and major abscesses.[1] cSSTI are among the most rapidly increasing reasons for hospitalizations,[2] representing a significant clinical and economic burden to healthcare systems.[3]

Received: 19 December 2023
Accepted: 20 June 2024
Published: 4 July 2024

The most common bacterial cause of cSSTI is *Staphylococcus aureus*, including methicillin-resistant *S. aureus* [MRSA].[1] MRSA prevalence varies by geographical region, with some parts of Latin America exhibiting particularly high rates of MRSA-associated SSTIs.[4] Vancomycin has traditionally been the gold-standard therapy for treatment of MRSA infections, and still remains a recommended option under current SSTI treatment guidelines.[5–7] However, vancomycin is associated with a number of disadvantages, including poor tissue penetration, nephrotoxicity, and a requirement for therapeutic drug monitoring.[6,8] Moreover, the global prevalence of vancomycin-resistant *S. aureus*, vancomycin-intermediate *S. aureus* (VISA), and heterogeneous VISA (hVISA) is generally reported to be increasing, including in countries in Europe, Asia, and America.[9,10] hVISA numbers in Latin America are reported to be relatively low, but rising, although data from Latin American countries are recognized to be grossly underrepresented.[11,12] Increasing prevalence of resistant strains will potentially reduce the effectiveness of vancomycin treatment in the coming years.[9] Therefore, there is a need for alternative options for the treatment of infections suspected to be caused by MRSA.

The fifth-generation cephalosporin ceftaroline fosamil exhibits in vitro activity against Gram-positive pathogens, including both methicillin-susceptible *S. aureus* (MSSA) and MRSA, streptococci (including multidrug-resistant *Streptococcus pneumoniae*), as well as common (non-extended-spectrum β-lactamase-producing) Gram-negative organisms (excluding *Pseudomonas aeruginosa*).[13,14] Ceftaroline fosamil is widely approved for the treatment of cSSTI or community-acquired pneumonia (CAP) in adults and children. The standard recommended adult dose is 600 mg every 12 h by 1 h intravenous infusion; a high-dose regimen (600 mg every 8 h by 2 -h intravenous infusion) is recommended in some regions (although not currently approved in the US) for patients with cSSTI caused by *S. aureus* with ceftaroline minimum inhibitory concentration 2 or 4 mg/L.[13,14]

Ceftaroline fosamil has been demonstrated to be an effective treatment for patients hospitalized with cSSTI or CAP, including those at risk of treatment failure and/or with contraindications to commonly used antibiotics,[15–23] and modeling data indicate that, at standard doses, it achieves greater pharmacokinetic/pharmacodynamic target attainment than vancomycin, linezolid, daptomycin, or ceftriaxone against *S. aureus* in simulated patients with cSSTI.[24]

Data on real-world use and effectiveness of ceftaroline fosamil in treating patients with cSSTI or CAP in a usual care setting in Europe and Latin America are currently limited. Therefore, this study assessed ceftaroline fosamil usage patterns, healthcare resource use, and treatment outcomes in adult patients hospitalized with cSSTI or CAP in a real-world usual care setting in Europe and Latin America. Results for patients with cSSTI are presented here.

Methods

Study Design and Patients

This was a multicenter, observational, retrospective chart review study (NCT04198571), conducted at hospital sites in Brazil, Colombia, France, Greece, Italy, and Spain.

Hospital records of adult patients with cSSTI who received ≥4 consecutive intravenous doses of ceftaroline fosamil on or before May 31, 2019 were included. Diagnostic criteria for cSSTI are included in the Supplementary Appendix. Patients were excluded if their medical records were missing documentation of cSSTI according to the diagnostic criteria, details of ceftaroline fosamil dosing, details of response to treatment, reason for discontinuation of treatment, or discharge date and status information. Patients with cSSTI complicated by the presence of orthopedic or joint replacement prostheses, and patients with known or suspected endocarditis, osteomyelitis, or septic arthritis were also excluded.

Ethics

The study protocol was approved by the relevant local independent Ethics committees and/or institutional review boards (IRBs) for each of the sites in this multicentre study (details for each site provided in the Supplementary Appendix). Informed consent was waived for most sites due to the retrospective nature of the research; for the remaining sites, informed consent forms were obtained from patients (Supplementary Appendix). The study was conducted under conditions guaranteeing strict patient anonymity and total data confidentiality and according to the principles of the Declaration of Helsinki.

Analyses

Data on patient, disease, and treatment characteristics, and clinical and healthcare-resource-use outcomes data, were extracted from hospital records of eligible patients from 3 months before the index hospital admission until 30 days after hospital discharge date or death, whichever occurred first.

Clinical response was defined as ≥20% reduction from baseline infection area and cessation of spread measured by total infection area, and determined via retrospective analysis of available patient imaging following treatment, compared with baseline images. Clinical cure was a subset of clinical response, and was defined as no further intravenous antibiotic, switch to an oral antibiotic, or intravenous antibiotic treatment streamlining/de-escalation at any time after the index dose, prior to hospital discharge, in patients who had achieved clinical response. Clinical failure was defined as treatment modification due to an adverse event, drug–drug interaction, insufficient response (followed by switch), death due to index infection, death due to other cause, or relapse/recurrence.

Patient characteristics, clinical management, and responses to treatment were summarized descriptively; healthcare resource use was evaluated by response to treatment (ie, clinical response or no clinical response) to ceftaroline fosamil. No a priori hypotheses were specified; a formal sample size calculation was therefore not applicable.

Results

Patient and Disease Characteristics

A total of 132 patients with cSSTI were included (58.3% male; mean age, 58.5 years [excluding three patients >90 years]) (Table 1). The most frequent comorbidities present at index hospitalization were diabetes mellitus, cancer/malignancy, and peripheral vascular disease. In total, 108 (81.8%) patients lived independently (with or without support) (Table 1). The most common infection subtypes were cellulitis/fasciitis, abscess, and post-surgical wound (Table 1). In

Table 1 Demographic and Baseline Characteristics and Isolated Pathogens of Patients with cSSTI at Index Hospitalization

Characteristic	Patients (N = 132)
Age, years	
Mean (SD)	58.5 (18.4)
Median (range)	62 (21–88)
Mean (SD) of those ≤90 years	58.5 (18.4)
≤65 years	83 (62.9)
>65 years	49 (37.1)
Sex, n (%)	
Male	77 (58.3)
Female	55 (41.7)
Country, n (%)	
Brazil	10 (7.6)
Colombia	41 (31.1)
France	20 (15.2)
Greece	42 (31.8)
Italy	17 (12.9)
Spain	2 (1.5)
Mean (SD) weight, kg[a]	78.0 (18.6)
Mean (SD) BMI, kg/m^2[b]	27.2 (6.3)
Type of residence/cohabitation pre-index admission, n (%)[c]	
Nursing home or extended care facility	8 (6.1)
Living independently	78 (59.1)
Living with care support (family, friend, hired support)	30 (22.7)
Other	2 (1.5)

(*Continued*)

Table 1 (Continued).

Characteristic	Patients (N = 132)
Type of cSSTI[d,e]	
Cellulitis/fasciitis	82 (62.1)
Abscess	45 (34.1)
Post-surgical wound	26 (19.7)
Post-traumatic wound	9 (6.8)
Decubitus ulcer	5 (3.8)
Diabetic leg ulcer	5 (3.8)
Peripheral vascular disease ulcer	3 (2.3)
Bite	1 (0.8)
None of the above	2 (1.5)
qSOFA conducted, n (%)	
Yes	40 (30.3)
qSOFA component assessment, n (%)	
Glasgow Coma Scale <15	4 (10.0)
Systolic blood pressure <100 mmHg	9 (22.5)
High respiration rate (≥22 breaths per min)	9 (22.5)
Patient required isolation, n (%)	
Yes	10 (7.6)
Mean (SD) duration of isolation, days	25.8 (11.2)
Isolated pathogens[f,g]	
MRSA	24 (18.2)
MSSA	23 (17.4)
Gram-negative bacilli	12 (9.1)
Staphylococcus coagulase negative	8 (6.1)
Streptococcus pyogenes	4 (3.0)
Enterococcus faecalis	2 (1.5)
Other/none of the above	53 (42.7)

Notes: [a]n = 67 (data unavailable for 65 patients). [b]n = 60 (data unavailable for 72 patients). [c]n = 118 (data unavailable for 14 patients). [d]n = 131 (data unavailable for one patient). [e]Percentages add up to >100% as patients may have had more than one type of cSSTI. [f]Pathogens isolated in ≥2 patients. [g]n = 108 (data unavailable for 24 patients).

Abbreviations: BMI, body mass index; cSSTI, complicated skin and soft tissue infections; MRSA, methicillin-resistant *Staphylococcus aureus*; MSSA, methicillin-susceptible *S. aureus*; qSOFA, quick Sepsis-related Organ Failure Assessment; SD, standard deviation.

total, 33 (25.0%) patients had recurrent cSSTI at their index hospitalization. Thirty-seven (28.0%) patients underwent surgery (defined as significant surgical interventions only) related to the index infection.

At admission, four patients (3.0%) had septic shock and during the index hospitalization, 29 (22.0%) patients developed sepsis, of whom 12 (9.1%) had severe sepsis and seven (5.3%) had septic shock. In total, 40 patients underwent a quick Sepsis-related Organ Failure Assessment at admission (Table 1). The most frequently identified pathogens were MRSA and MSSA (Table 1).

Treatment Characteristics

Data on ceftaroline fosamil treatment during the index hospitalization are shown in Table 2. Median (range) duration of ceftaroline fosamil treatment was 8 (2–60) days at daily doses of 1200 (400–2400) mg. Ceftaroline fosamil was used empirically (ie, in the absence of definitive microbial pathogen identification) in 84 (63.6%) patients and as first-line therapy in 44 (33.3%) patients. Macrolides were most frequently given as first-line therapy (23/87 [26.4%]). The median (range) number of lines of therapy of other antibiotics given prior to ceftaroline fosamil was 2 (1–10) (Table S1). In total, 78 (59.1%) patients received ceftaroline fosamil monotherapy. When used in combination, the most frequently co-

Table 2 Details of Ceftaroline Fosamil Treatment in Patients with cSSTI During Index Hospitalization

Treatment Variable	Patients (N = 132)
Ceftaroline fosamil line of therapy, n (%)	
1	44 (33.3)
2	30 (22.7)
3	34 (25.8)
≥4	24 (18.2)
Median (range) duration of treatment, days[a]	8 (2–60)
Median (range) time from admission to first dose, days	1 (0–60)
Median (range) time from symptom onset to first dose, days[b]	7 (0–64)
Median (range) daily dose, mg	1200 (400–2400)
Treatment type, n (%)[c]	
Empiric	84 (63.6)
Definitive/specific	43 (32.6)
Ceftaroline fosamil as monotherapy/combination therapy, n (%)	
Monotherapy	78 (59.1)
Combination therapy[d]	54 (40.9)
Aminoglycoside	2 (3.7)
Beta-lactam	4 (7.4)
Carbapenem	7 (13.0)
Ceftriaxone	1 (1.9)
Cephalosporin	2 (3.7)
Glycopeptide	15 (27.8)
Macrolide	2 (3.7)
Beta-lactam/combination	3 (5.6)
Quinolone	3 (5.6)
Sulfonamide	8 (14.8)
Clindamycin	1 (1.9)
Other	1 (1.9)
Administration location, n (%)	
Intensive care unit	11 (8.3)
General ward	114 (86.4)
At home	14 (10.6)
Outpatient setting	2 (1.5)
Medical clinic	14 (10.6)

Notes: [a]n = 131 (data unavailable for 1 patient). [b]n = 101 (data unavailable for 31 patients). [c]n = 127 (data unavailable for 5 patients). [d]n = 34 (data unavailable for 20 patients).
Abbreviation: cSSTI, complicated skin and soft tissue infections.

administered antibiotics were glycopeptides (n = 15 [27.8%]) (Table S2). In total, 11 (8.3%) patients required admission to the intensive care unit (ICU) (Table 2).

In total, 75 (56.8%) patients had their treatment modified following treatment with ceftaroline fosamil; where reasons for treatment switch were provided, the most frequently recorded was the result of susceptibility test/pathogen identification (n = 14 [18.7%]) (Table S3). The antibiotics most frequently administered after switching from ceftaroline fosamil were quinolones (n = 28 [37.3%]), clindamycin (n = 21 [28.0%]), and ceftriaxone (n = 15 [20.0%]).

Clinical Outcomes

Clinical response occurred in 118 (89.4%) patients; of the 42 cases with clinical response where response time was documented, clinical response within ≤3 days occurred in 20 (16.9%) patients and >3 days in 22 (18.6%) patients (Table 3). Clinical failure occurred in 14 (10.6%) patients; the most common reason for clinical failure was insufficient response (Table 3).

No patients died as a result of the index infection. Thirty-day all-cause mortality occurred in seven (5.3%) patients.

Table 3 Clinical Outcomes of Ceftaroline Fosamil Treatment in Patients with cSSTI

Outcome Measure	Patients (N = 132)
Response to treatment, n (%)	
Clinical response[a]	118 (89.4)
Clinical failure[b]	14 (10.6)
Reason for failure	
Insufficient response	10 (71.4)
Relapse or recurrence	3 (21.4)
Treatment modification due to AE	1 (7.1)
Mean (SD) time to clinical response, days[c]	4.5 (3.9)
Early clinical response, n (%)	
No response	14 (10.6)
Response >3 days	22 (18.6)
Response ≤3 days	20 (16.9)
Time to response unknown	76 (64.4)
Clinical cure achieved, n (%)[d,e]	
Yes	72 (54.5)
No	32 (24.2)
Unknown	28 (21.2)
Mean (SD) time to clinical cure, days[f]	7.1 (5.2)
Mean (SD) time to ≥20% reduction from baseline area, days[g]	3.7 (1.8)
Mean (SD) time to cessation of spread measured by total infection area, days[h]	3.2 (4.1)
Mean (SD) time to cessation of spread measured by infection length and width, days[i]	2.7 (1.9)
Discharge status	
Died in hospital	6 (4.5)
Discharged to a nursing home or extended care facility	23 (17.4)
Discharged to independent living (with or without support)	101 (76.5)
Other	2 (1.5)
Re-hospitalized within 30 days of initial discharge	
Yes	13 (9.8)
No	99 (75.0)
Unknown	20 (15.2)
Median (range) number of re-hospitalizations for those re-hospitalized	1 (1–4)
Vital status at end of follow-up	
Patient still alive	98 (74.2)
Patient deceased	9 (6.8)
Unknown	25 (18.9)

Notes: [a]Defined as ≥20% reduction from baseline infection area and cessation of spread measured by total infection area. [b]Defined as any one of the following: treatment modification due to AE, drug–drug interaction, insufficient response (followed by switch), death due to index infection, death due to other cause, or relapse or recurrence. [c]n = 42 (time to clinical response unknown for 76 patients). [d]n = 104 (clinical cure status unknown for 28 patients). [e]Defined as no further intravenous antibiotic, switch to an oral antibiotic, or intravenous antibiotic treatment streamlining/de-escalation at any time after the index dose, prior to hospital discharge in patients who had achieved clinical response. [f]n = 59 (time to clinical cure unknown for 13 patients). [g]n = 41 (time to ≥20% reduction from baseline area unknown for 77 patients). [h]n = 36 (time to cessation of spread measured by total infection area unknown/unavailable for 96 patients). [i]n = 30 (time to cessation of spread measured by infection length and width unknown/unavailable for 102 patients).

Abbreviations: AE, adverse event; cSSTI, complicated skin and soft tissue infections; SD, standard deviation.

Overall, 13 (9.8%) patients were readmitted to hospital within 30 days of initial discharge. Of those readmitted, the cause of readmission was due to the index infection in three (23.1%) and due to other reasons in 10 (76.9%) patients (Table 3).

Healthcare Resource Use

Overall mean (standard deviation [SD]) duration of index hospitalization was 19.4 (23.0) days. Mean (SD) duration of ICU stay was 1.1 (4.5) days (Table 4). Clinical response to ceftaroline fosamil was associated with shorter length of stay in hospital and in the intensive care unit, as well as with ~40% lower hospital costs compared with non-responders (Table 4).

Table 4 Healthcare Resource Use in Patients Hospitalized with cSSTI According to Clinical Response to Ceftaroline Fosamil

Outcome Measure	Clinical Response to Ceftaroline Fosamil[a]			
	Response (n = 118)		No Response (n = 14)	
Length of stay, days	Mean (SD)	Median (range)	Mean (SD)	Median (range)
In hospital	18.6 (23.7)	11 (3–162)	26.2 (14.8)	25 (5–58)
In ICU[b]	1.1 (4.6)	0 (0–41)	1.5 (3.2)	0 (0–10)
Hospital costs, USD				
Standard hospital[c]	5196.2 (9070.4)	1904.3 (250.9–58,904.8)	8991.7 (7673.5)	8185.6 (418.2–24,987.6)
Advanced-level hospital[b,d]	20,257.2 (36,809.7)	7281.0 (1130.8–263,640.4)	35,134.3 (29,681.8)	31,859.8 (1884.6–97,256.1)

Notes: [a]Clinical response defined as ≥20% reduction from baseline infection area and cessation of spread measured by total infection area. [b]n = 14 patients with response and n = three non-responders were reported to receive ICU/advanced-level hospital care. [c]Standard hospital cost: total time in hospital multiplied by per diem rate of standard hospital general ward. [d]Advanced hospital cost: total time in hospital multiplied by per diem rate of hospitals providing the highest level of medical services.

Abbreviations: cSSTI, complicated skin and soft tissue infections; ICU, intensive care unit; SD, standard deviation; USD, US dollars.

Discussion

This retrospective study provides evidence on real-world treatment patterns, healthcare resource use, and treatment outcomes of ceftaroline fosamil for the treatment of patients hospitalized with cSSTI in Europe and Latin America. Ceftaroline fosamil provided effective treatment of cSSTI, whether used as monotherapy or combination therapy.

Ceftaroline fosamil was used empirically in approximately half of patients. In clinical practice, antibiotic therapy is typically empirical in patients admitted to hospital with cSSTI, with the choice of drug guided by disease severity, local pathogen resistance patterns, and individual drug safety profiles.[25] Initial treatment failure can result in prolonged duration of hospital stays, increased antibiotic usage, and greater hospital costs.[25,26] Therefore, the appropriate choice of initial antibiotic therapy is key to achieve an early response and possibly early discharge, thus reducing hospital expenditure, particularly in patients at risk of treatment failure.[27] Most SSTI treatment guidelines recommend that initial management includes empirical antibiotic therapy with coverage against MRSA.[7,28,29]

Ceftaroline fosamil was given as first-line therapy in 33% patients, which is in line with data from another observational study, The Clinical Assessment Program and Teflaro® Utilization Registry (CAPTURE), a multicenter registry study of contemporary use of ceftaroline fosamil in the USA.[30] Despite not predominantly being used as first-line therapy in the current study, ceftaroline fosamil demonstrated high (89%) clinical response rates, which is broadly consistent with previous clinical and real-world studies.[21–23,30]

In the pivotal Phase III CANVAS 1 and 2 trials in adults with cSSTI, ceftaroline fosamil at the standard adult dose (600 mg every 12 h [adjusted for patients with renal impairment]) was shown to be non-inferior to 1 g of vancomycin plus 1 g of aztreonam every 12 h.[21,22] An integrated analysis of these trials demonstrated similar clinical cure rates for ceftaroline fosamil (91.6%) and vancomycin plus aztreonam (92.7%), including in patients with MRSA infections (93.4% and 94.3%, respectively).[31]

In the Phase III COVERS trial (which also included patients with MRSA infections), a 50% higher dose of ceftaroline fosamil (600 mg every 8 h by 2-h intravenous infusions, adjusted for renal function) was non-inferior to vancomycin plus aztreonam in patients with cSSTI with extensive cutaneous involvement, including evidence of systemic inflammation or underlying comorbidities associated with impaired immune response. Clinical cure occurred in 86.6% of patients treated with ceftaroline fosamil and 85.3% of those treated with vancomycin plus aztreonam (difference 1.3%; 95% confidence interval 4.3–7.5%).[23]

While clinical trials remain the gold standard for assessing the efficacy and safety of any new drug therapy, it is important to also examine real-world evidence when evaluating its potential for use in clinical practice. The efficacy of ceftaroline fosamil is supported by real-world observational data from the CAPTURE study.[30] Overall clinical success rate in patients with acute bacterial skin and skin-structure infections (ABSSSI) was 85%, with high success rates observed for all infection types, including in patients with significant comorbidities, such as diabetes mellitus, peripheral vascular disease, and obesity. Moreover, clinical success rate was similar regardless of whether ceftaroline fosamil was

given as monotherapy or combination therapy, or as first-line or second-line therapy, lending additional support to the findings from the present study. The data from the CAPTURE study therefore support the findings from the current study, demonstrating that ceftaroline fosamil is an effective treatment for patients with cSSTI.

In the current study, both overall length of hospital stay and ICU length of stay were decreased in patients with clinical response to ceftaroline fosamil (compared to those with clinical failure), with associated reductions in overall healthcare costs. While the observed healthcare resource use reductions cannot be ascribed solely to ceftaroline fosamil given the lack of comparator group, and the use of combination therapy in ~40% of patients, they are nevertheless encouraging, and in line with other published data from US hospital settings.[32–34] A large retrospective observational study in adults with cSSTI found that ceftaroline fosamil-treated patients had significantly lower average length of hospital stay and inpatient costs compared with vancomycin, daptomycin, tigecycline, or linezolid.[33] Additionally, a 3-year budget impact model estimated the total cost of care for treating a patient with ABSSSI to be $395 lower with ceftaroline fosamil compared with vancomycin plus aztreonam.[32] Furthermore, a multicenter, retrospective, comparative cohort study in adults with ABSSSI found that discharge readiness at day 3 was higher in patients receiving ceftaroline fosamil than those receiving vancomycin; however, no differences in infection-related length of stay were demonstrated.[34] The variations in the reported impact of ceftaroline fosamil on healthcare resource use across these analyses may reflect differences in the patients studied, the design of the analyses, and in healthcare services in Europe and Latin America compared with the USA.[35]

Other cSSTI treatment options include vancomycin, which has traditionally been used as first-line therapy for MRSA infections; however, poor tissue penetration can reduce its efficacy in severe infections.[36] Furthermore, it is associated with nephrotoxicity, necessitating therapeutic drug monitoring,[36] which in turn impacts healthcare resource use.

The anti-MRSA agent, linezolid has good tissue penetration and offers the possibility of early intravenous-to-oral switch and, consequently, early discharge;[37] but its safety profile includes the risk of drug interactions with some common classes of medicines[38] and furthermore it is associated with high acquisition cost, which may be prohibitive in some geographical regions.

The relatively new lipoglycopeptide antibiotics dalbavancin and oritavancin also have anti-MRSA activity and offer potential pharmacokinetic advantage over vancomycin (ie, an extended half-life, paving the way for single dosing); however, glycopeptides are also associated with high acquisition cost.[39] Additionally, the extended terminal half-life may potentially be detrimental in the case of a severe adverse event.[40]

Ceftaroline fosamil, with its positive efficacy, safety, and cost-effectiveness profile therefore represents a viable option in the armamentarium of antibiotics for treating cSSTIs, and it is included in current SSTI treatment guidelines as a strongly recommended treatment option for coverage of MRSA.[7,28,29]

This retrospective chart review study has limitations inherent to the study design. Specifically, if required data were not captured in the patient's medical records, they had to be recorded as unknown for the purposes of analysis. Furthermore, an unknown number of patients may have been excluded due to not meeting the study-qualifying requirement of having had at least four consecutive intravenous doses of ceftaroline fosamil. This requirement was included in the study protocol for alignment with the CAPTURE study; it is considered unlikely that many patients were excluded based on this criterion alone. The lack of a comparator treatment group represents another limitation in terms of the conclusions that can be drawn from the healthcare resource use analyses, as the observed resource use reduction following clinical response with ceftaroline fosamil could be expected with successful treatment regardless of the antibiotic used. Finally, the inclusion of patients who had received a variety of different combination therapies with overlapping Gram-positive and Gram-negative coverage, while representative of real-world patients and treatment characteristics, has potential for confounding of clinical and health economics outcomes.

Conclusion

In summary, the results from this real-world study give further support to previous clinical and real-world findings and provide valuable insights into the effectiveness of ceftaroline fosamil in patients with cSSTI in usual care settings in Europe and Latin America.

Abbreviations

ABSSSI, acute bacterial skin and skin-structure infection; CAP, community-acquired pneumonia; CAPTURE, the Clinical Assessment Program and Teflaro® Utilization Registry; cSSTI, complicated skin and soft tissue infections; ICU, intensive care unit; hVISA, hetrogenous vancomycin-intermediate *Staphylococcus aureus*; MRSA, methicillin-resistant *S. aureus*; MSSA, methicillin-sensitive *Staphylococcus aureus*; SD, standard deviation; VISA, vancomycin-intermediate *S. aureus*.

Data Sharing Statement

Upon request, and subject to certain criteria, conditions, and exceptions (see https://www.pfizer.com/science/clinical-trials/trial-data-and-results for more information), Pfizer will provide access to individual de-identified participant data from Pfizer-sponsored global interventional clinical studies conducted for medicines, vaccines, and medical devices (1) for indications that have been approved in the US and/or EU or (2) in programs that have been terminated (ie, development for all indications has been discontinued). Pfizer will also consider requests for the protocol, data dictionary, and statistical analysis plan. Data may be requested from Pfizer trials 24 months after study completion. The de-identified participant data will be made available to researchers whose proposals meet the research criteria and other conditions, and for which an exception does not apply, via a secure portal. To gain access, data requestors must enter into a data access agreement with Pfizer.

Ethics Approval and Informed Consent

Independent ethics committees and/or institutional review boards (IRBs) approved the final study protocol. The study was undertaken in accordance with good clinical practice guidelines and the Declaration of Helsinki. As this was a non-interventional study that abstracted data from existing hospital medical records only, patient informed consent form waivers were requested by the IRBs of each study site.

Acknowledgments

The authors would like to thank the patients, their families, and all investigators involved in this study. Medical writing support was provided by Melanie More, BSc, CMPP, of Onyx (a division of Prime, London, UK), and was funded by Pfizer Inc. The design and conduct of the study, as well as analysis of the study data and opinions, conclusions, and interpretation of the data, are the responsibility of the authors.

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Study concept and design: Wajeeha Ansari, Michal Kantecki, Tristan Ferry, Alex Soriano, Charalambos Gogos, Francesco Blasi, and Matteo Bassetti. Acquisition of data: Tristan Ferry, Alex Soriano, Charalambos Gogos, Francesco Blasi, and Matteo Bassetti. Data analysis and interpretation: Wajeeha Ansari, Michal Kantecki, Tristan Ferry, Alex Soriano, Charalambos Gogos, Francesco Blasi, Matteo Bassetti, Bernd Schweikert and Gustavo Luna. All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Funding

This study was sponsored by Pfizer Inc.

Disclosure

Wajeeha Ansari and Michal Kantecki are employees of and shareholders in Pfizer. Bernd Schweikert is an employee of ICON and Gustavo Luna is a former employee of ICON, who were paid consultants to Pfizer in connection with the development of the manuscript. Gustavo Luna also reports former employment with Evidera and is paid for consultancy

from Evidera and is currently employed by H. Lundbeck A/S. Tristan Ferry, Alex Soriano, Charalambos Gogos, Francesco Blasi, and Matteo Bassetti received institutional research grant funding from Pfizer for the conduct of the study. Alex Soriano also reports grants and/or personal fees from MSD, Shionogi, Angelini, Menarini, and Gilead, outside of the submitted work. Francesco Blasi also reports grants and/or personal fees from AstraZeneca, Bayer, Chiesi, GSK, Grifols, Guidotti, Insmed, Menarini, Novartis, Ompharma, Pfizer, Zambon, Viatris and Vertex outside of the submitted work.

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