Oritavancin is Associated with Improved Economic Outcomes vs. Dalbavancin in Patients with Acute Bacterial Skin and Skin Structure Infections Treated in a Hospital OPAT Setting: Results from an Observational Database

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Abstract

Background: Traditionally, acute bacterial skin and skin structure infection (ABSSSI) patients have been admitted to the hospital in order to receive 7-10 days of IV antibiotic therapy at a cost to hospitals of $7000-$10,000. Newer antibiotics such as once-only oritavancin and once-weekly dalbavancin facilitate treatment of many patients in the Outpatient Parenteral Antimicrobial Therapy (OPAT) setting. The objective of this analysis was to assess the costs, from a hospital perspective, of treating ABSSSI at the OPAT setting with either oritavancin or dalbavancin.

Methods: The Premier Research Database was used to identify all patients treated for ABSSSI who received at least one dose of oritavancin or dalbavancin in the outpatient setting between July 1, 2014 and June 30, 2015. ABSSSI was identified through ICD-9 codes; patients who had infections other than ABSSSI were excluded. Due to the lag in new drug data entry, drug costs for oritavancin and dalbavancin were not available for all hospitals; a standard WAC of $2,900 was applied for oritavancin patients, $4960 for two doses of dalbavancin and $2,980 for one dose. All other costs were from ABSSSI Premier cost data. Charlson comorbidity score (CCI) was calculated from ICD-9 data.

Results: A total of 95 oritavancin and 89 dalbavancin outpatients were identified. Oritavancin patients had a mean CCI score of 1.85 compared to 1.55 for dalbavancin but were younger (51.1 vs 55.4 years old). 68.5% of dalbavancin patients received two doses. Total costs for oritavancin patients were 34% lower, $3,283 vs. $4,983. Excluding drug costs, costs of drug administration and other services were also lower for oritavancin, $383 vs. $914.

Conclusions: This analysis suggests that cost of outpatient ABSSSI treatment is lower than previously published costs for inpatient treatment. Further, treatment with oritavancin is less expensive than dalbavancin.

Background

Acute bacterial skin and skin structure infections (ABSSSI) represent an unrecognized burden to the healthcare system in the United States (US). There were 3.4 million emergency department visits for ABSSSI in 2011.[1] Twenty percent of those patients were treated as inpatients[2,3], making ABSSSI the cause of 2% of all hospital admissions at a cost to hospitals of $7000-$10,000.[4,5] Outpatient parenteral antibiotic therapy (OPAT) has the potential to reduce costs and improve patient satisfaction through avoidance of hospital admission for appropriate patients. However, IV antibiotics to treat ABSSSI, including vancomycin, daptomycin, and linezolid, require 7 to 14 days of therapy. Thus treatment completion has involved multiple visits and extensive patient and physician time commitment. Newer antibiotics such as once-only oritavancin and once-weekly dalbavancin facilitate treatment of many patients in the OPAT setting by providing a full course of therapy in one or two doses. Both oritavancin and dalbavancin have been shown to be non-inferior to daily regimens in clinical trials.[6-8] However, little is known about the costs and outcomes of these treatments in the real world outpatient setting. The objective of this analysis was to assess the costs, from a hospital perspective, of treating ABSSSI in the OPAT setting with either oritavancin or dalbavancin.

Methods

Data Sources:

Data was extracted from the Premier hospital database, one of the largest US hospital clinical and economic databases. It contains data from more than 500 hospitals, representing all geographical areas, a broad range of bed sizes, and teaching, nonteaching, urban, and rural facilities. In addition, the Premier hospital database also contains all patient-level, day-of-service billed items, including procedures, medications, laboratory, and diagnostic and therapeutic services delivered within the hospital.

Study Population:

Study population consisted of all adult patients who were treated for ABSSSI and received at least one dose of oritavancin or dalbavancin between July 2014 and June 2015. ABSSSI was defined as either one of primary diagnosis or secondary diagnosis of cellulitis/abscess (ICD-9 codes of 035 [erysipelas], 681.00 [cellulitis/abscess of finger], 681.10 [cellulitis/abscess of toe], 681.9 [cellulitis/abscess of unspecified digit], 682.XX [other cellulitis/abscess]), wound infection (958.3X [post-traumatic wound infection], 998.5X [post-operative wound infection]), or other unspecified skin infection (686.8 [Other specified local infections of skin and subcutaneous tissue], 686.9 [Other unspecified local infections of skin and subcutaneous tissue]). Patients who received oritavancin or dalbavancin for infections other than ABSSSI (e.g., chronic ulcer, or osteomyelitis) were excluded from study cohort.

Statistical Analysis:

Patient demographic characteristics, comorbidities, dosage and length of treatment of oritavancin and dalbavancin, surgical procedures, and total costs of treatment were analyzed. Hospital costs were calculated according to 1 of 2 methods:

1. Ratio of cost-to-charge (32% of hospitals): The Medicare cost-to-charge ratios were applied to every charge item at departmental level and summed over departments.
2. Procedural (68% of hospitals): Standard costs were developed by hospital for each charge code. The patient's total costs were the sum of standard costs over all charge codes.

Due to the lag of hospital billing system transfer to Premier, oritavancin and dalbavancin drug costs were not always available for some hospitals. A standard WAC of $2,900 was applied to all oritavancin patients and $2,980 to the first dose of dalbavancin and $1,980 for the second dose. All other costs were actual costs reported from hospitals.

All data was summarized by treatment group (oritavancin and dalbavancin). Descriptive statistics for continuous variables included means and standard deviations (SD). Categorical variables were summarized by frequencies and percentages. Chi-square tests (or fisher's exact tests if <5 patients in one cell) for categorical variable and non-parametric, distribution-free Wilcoxon rank-sum tests for continuous variables were used to compare oritavancin to dalbavancin.

For outcomes, particularly costs, a mixed linear model with hospital as random effect was applied in order to adjust for potential risk factors and minimize the patients' correlation within same hospital (cluster impact). Potential risk factors included demographics, comorbidities, hospital characteristics, severity of infection and admission type.

Data processing, summarization and analyses were performed using SAS Version 9.2 (SAS Institute Inc., Cary, NC).

Results

A total of 95 oritavancin and 89 dalbavancin outpatients met all inclusion and exclusion criteria and were included in the study.

- Oritavancin-treated patients and dalbavancin-treated patients had a mean age of 51.5 years and 55.4 years respectively (P=NS) (**Table 1**).
- Oritavancin-treated patients and dalbavancin-treated patients were similar in terms of comorbidities, with the exception of renal disease which was more frequent in oritavancin-treated patients (18.9% vs. 6.7%, P=0.014) (**Table 1**). Overall, half of patients had diabetes, with or without complications. The second most frequent comorbidities observed were chronic pulmonary disease, renal disease, congestive heart failure and peripheral vascular disease.
- 61 (68.5%) dalbavancin-treated patients received 2 doses of dalbavancin and 28 (31.5%) received only the first dose.
- Without risk factor adjustment, oritavancin demonstrated cost savings of $1,699 relative to dalbavancin (**Table 3**). The cost difference was mainly driven by the drug price of dalbavancin. Even though there are few baseline differences between oritavancin- and dalbavancin-treated patients, a linear mixed model with hospital as random effect demonstrated a cost saving of $1,624 of oritavancin compared to dalbavancin. If study drug costs were excluded, there was no statistical difference between two treatment groups.
- 60-day all-cause admission rates and ABSSSI-related admission rates were similar between two groups (**Table 3**).

Table 1: Patient Demographic and Baseline Characteristics

	Oritavancin (N=95)	Dalbavancin (N=89)	P-value
Age (years), mean±SD	51.5±16.9	55.4±15.9	0.096
>=65 years old	27.4%	28.1%	0.913
Gender – Male, %	54.7%	50.6%	0.571
Race - White, %	92.6%	96.6%	0.232
Admission Type, %			0.005
Elective	81.1%	69.7%	
Emergency	14.7%	18.0%	
Urgent	3.2%	0.0%	
Other/Unknown	1.1%	12.4%	
Payer Mix, %			0.077
Medicare	46.3%	46.1%	
Medicaid	25.3%	21.3%	
Managed care/Commercial	16.9%	30.3%	
Self-pay	4.2%	1.1%	
Other	7.4%	1.1%	
The most frequent comorbidities, %			
Diabetes w/o complications	38.9%	37.1%	0.794
Diabetes w complications	21.1%	12.4%	0.115
Chronic Pulmonary Disease	24.2%	20.2%	0.516
Renal disease	18.9%	6.7%	0.014
Peripheral vascular disease	9.5%	13.5%	0.393
Congestive heart failure	9.5%	11.2%	0.695
CCI Score, mean±SD	1.85±2.34	1.55±2.05	0.607
CCI=0, %	38.9%	39.3%	
CCI=1	24.2%	25.8%	
CCI=2	8.4%	13.5%	
CCI=3	8.4%	7.9%	
CCI=4	3.2%	4.5%	
CCI≥5	16.9%	9.0%	

Table 2: ABSSSI Infection Characteristics

	Oritavancin (N=95)	Dalbavancin (N=89)	P-value
ABSSSI infection type, %			0.491
Cellulitis/Abscess	92.6%	92.1%	
Traumatic wound	1.1%	0.0%	
Post-procedural infection	4.2%	4.5%	
Unspecified	2.1%	3.4%	
MRSA, %	20.0%	21.3%	0.821
MSSA, %	6.3%	2.2%	0.280
Bacteremia, %	1.1%	1.1%	1.000
Infected body part*, %			
Toe	5.3%	3.2%	0.689
Foot	18.7%	21.0%	0.736
Leg/ankle	50.7%	50.0%	0.938
Buttock	1.3%	1.6%	1.000
Trunk	8.0%	12.9%	0.346
Neck	2.7%	0.0%	0.501
Head	1.3%	8.1%	0.091
Arm	10.7%	9.7%	0.849
Hand	4.0%	4.8%	1.000
Finger	2.7%	1.6%	1.000

*based on 75 oritavancin-treated patients and 62 dalbavancin-treated patients with infected body part information. A patient might have multiple infected body parts.

Table 3 Resource Utilization and Total Costs

	Oritavancin (N=95)	Dalbavancin (N=89)	P-value
Emergent room (ER) visit, % (n)	14.7% (14)	19.1% (17)	0.429
Cost of ER visit ($), mean±SD	$244±70	$219±126	0.078
Observational Unit (OBS) use, % (n)	2.1% (2)	0.0% (0)	0.498
Cost of OBS use ($), mean±SD	$740±264		
Total costs ($), mean±SD	$3,283±324	$4,982±4,211	<0.001
Costs excluding study drug ($), mean±SD	$383±324	$914±4,053	0.185
60-day admission, % (n)	7.4% (7)	9.0% (8)	0.688
60-day ABSSSI-related admission, % (n)	2.1% (2)	1.1% (1)	1.000

Limitations

- Inherent in most secondary database analyses, we have assumed that hospitals have coded ICD-9 accurately and consistently and there was no source verification across with the original medical charts.
- The available data were derived from administrative records rather than a prospectively defined and standardized data collection.
- Full clinical detail, such as outcomes data including clinical and microbiological cure, are not available in the Premier database
- Oral antibiotics use outside of hospital was not available for Premier database

Despite those limitations, the data were derived from a broad sample of both hospitals and patients and are representative of most current real world use of oritavancin and dalbavancin.

Conclusions

This analysis suggests that cost of outpatient ABSSSI treatment is lower than previously published costs for inpatient treatment which has been shown to range from $7,000 to $10,000 for patients with similar level of infection severity and comorbidities.[9] Very few patients were subsequently hospitalized within 60 days, indicating that hospitalization can be avoided entirely for many ABSSSI patients with few comorbidities. Further, treatment with oritavancin was significantly less expensive than dalbavancin treatment. As patients increasingly bear a substantial portion of the costs of their care, ensuring that optimal care can be delivered at the lowest cost is an important determinant of patient satisfaction with treatment.

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