

# Economic and Hospital Resource Impact of Outpatient Antibiotic Treatment for ABSSSI with Oritavancin Compared to Daptomycin

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## Background

Acute bacterial skin and skin structure infections (ABSSSI) represent an unrecognized burden to the US healthcare system.

4.96% of US adults experience a skin and soft tissue infection each year<sup>1</sup>

Leading to:

- 3.4 million Emergency Department (ED) visits in 2011<sup>2</sup>
- 750,000 hospital admissions<sup>3</sup>

Average hospital costs varied between \$5,800 and \$12,500 in patients without life threatening infections<sup>4</sup>

Analyses of hospital admission patterns suggest that up to 67% of admitted patients may not have a clinical reason for admission<sup>4</sup>

A survey of ED physicians found that need for intravenous (IV) antibiotics was the primary reason for admission in 85% of patients and the sole reason for admission in 41%<sup>5</sup>

Avoiding an admission with treatment entirely in the outpatient setting has been estimated to save \$1,752 to \$6,476 per patient, depending on patient severity and comorbidities.<sup>6</sup>

However, outpatient parenteral antibiotic therapy (OPAT) has required multiple visits to the outpatient setting to receive daily IV antibiotic therapy, requiring extensive patient and physician time commitment to complete treatment.

Oritavancin is an IV antibiotic indicated for ABSSSI caused, or suspected to be caused by gram-positive pathogens including methicillin-resistant *Staphylococcus aureus* (MRSA), that is delivered in a single dose, compared to multiple doses for standard of care treatments.

While oritavancin has been demonstrated to be safe and effective in the outpatient setting, little is known about the costs and resource use associated with real world use of this drug.

Thus the objective of this study was to assess the costs and resource use associated with outpatient treatment of ABSSSI with single-dose oritavancin compared to daily-dose daptomycin from a real world database.

## Disclosures

Shannon Armstrong, Weihong Fan, and Stephanie Plent are employees of The Medicines Company.

## Methods

### Data Source:

The data was extracted from the Premier Hospital Database, one of the largest US hospital clinical and economic databases, with data from more than 500 hospitals, representing all geographical areas, a broad range of bed sizes, and teaching, nonteaching, urban, and rural facilities.

### Study Population:

Patients receiving oritavancin for ABSSSI in the outpatient setting from 23 hospitals between September 1, 2014 and June 30, 2015 were included for study.

Patients with a hospital admission for ABSSSI immediately preceding outpatient treatment were excluded from the analysis as they were likely patients completing a course of therapy that had begun in the inpatient setting.

In order to control for inter-hospital differences in practice, protocols and cost structure, those same 23 hospitals were queried for patients receiving full course of daptomycin for ABSSSI in the outpatient setting between January 1, 2014 and August 31, 2014; daptomycin patients were excluded from the analysis if:

- Hospital admission for ABSSSI immediately before outpatient treatment with daptomycin
- More than 15 days of IV daptomycin, as this may indicate an infection other than ABSSSI
- Only 1 dose of daptomycin, as this may indicate an infection not severe enough to qualify as ABSSSI
- With secondary diagnosis of other infections such as pneumonia, chronic ulcer, urine tract infection, osteomyelitis, pyogenic arthritis or other complication of prosthetic joint implant, due to the broader indications of daptomycin.
- Received daptomycin on Day 1 or Day 2 then switched to non-MRSA active IV antibiotics

### Statistical Analysis:

Continuous variables were summarized as means and standard deviations (SD). Categorical variables were summarized as frequencies and percentages.

Chi-squared tests (or Fisher exact test if <5 patients) were used for categorical and distribution-free Wilcoxon rank-sum tests were used for continuous variables for treatment comparison between oritavancin and daptomycin.

A generalized linear model (GLM) was utilized to estimate the adjusted costs difference between treatment groups. Log-link with gamma distribution was assumed. The covariate variables for costs included age, gender, hospital

ABSSSI patients were identified using the following ICD-9 diagnostic codes: (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]).

Patient demographic, background clinical information, medication use, surgical procedures and hospital costs were extracted.

Hospital costs were estimated using one of two methods.

- Ratio of cost to charge (36% of hospitals) obtained at the department level and applied to every charge item within that department and summed over departments.
- Procedural (64% of hospitals) in which standard costs were developed for each charge code by hospital and a patient's total costs were the sum of standard costs over all charge codes.

Due to the lag of hospital billing systems to Premier data, oritavancin drug costs were not available for all hospitals; a standard wholesale acquisition cost of \$2,900 was applied for oritavancin

characteristics, patient's comorbid conditions and CCI score, severity of infection (MRSA, SIRS), ER visit, and procedures. The inference from adjusted models was converted to dollar values (\$) using method of recycled predictions: predict costs for all patients as if they were both treated with oritavancin and daptomycin and average the within-person differences. The average value was referred as the adjusted treatment effect.

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

## Results

65 oritavancin and 68 matched daptomycin patients were identified and qualified for all inclusion and exclusion criteria.

Patient characteristics were similar between groups (Table 1), though oritavancin patients were slightly older and had higher rate of Medicare.

Charlson Comorbidity Index was slightly higher for oritavancin compared to daptomycin (1.91±2.53 vs. 1.10±1.49).

Rates of MRSA were higher in oritavancin than in daptomycin patients (20% vs. 2.9%).

No patients in either group had bacteremia or symptoms of systemic inflammatory response syndrome (SIRS).

Infection location was similar across groups; Majority of patients in both groups had infections on the leg/ankle (48.9% oritavancin, 36.1% daptomycin), followed by foot (23.4% and 13.1%).

Prior IV drug abuse was rare in both groups; 1.5% of oritavancin patients and 4.4% of daptomycin patients.

Two (3.1%) oritavancin patients had a history of MRSA; none in the daptomycin group.

One (1.5%) oritavancin patient had a history of non-compliance with medical treatment; none in the daptomycin group.

Incision and drainage was more frequent in the daptomycin group: 3.1% of oritavancin patients vs. 13.2% of daptomycin patients.

No patients died in either group.

Considering adjusted total costs of outpatient treatment, oritavancin cost \$457 (P=NS) more than daptomycin.

Considering adjusted costs of services to deliver outpatient treatment, oritavancin cost \$1,226 (P<0.001) less than daptomycin.

4 (6.2%) oritavancin patients and 7 (10.3%) daptomycin patients (p=NS) were subsequently admitted to the hospital within same month or next month after initial treatment

- 1 of 4 (25%) admission for oritavancin patients was ABSSSI-related
- 4 of 7 (57%) admissions for daptomycin patients were ABSSSI-related

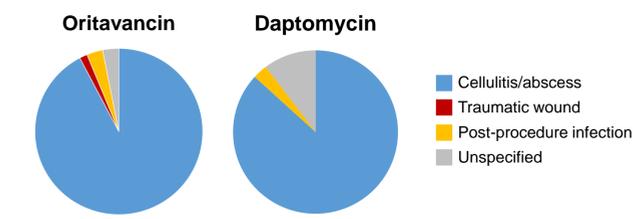
### Table 1. Patient Baseline Characteristics

	Oritavancin (N=65)	Daptomycin (N=68)	P-value
Age (years), mean±SD	51.7±17.8	48.0±17.8	0.295
≥65 years old	29.2%	23.5%	0.455
Female, %	47.7%	33.8%	0.104
Insurance Payers, %			<0.001
Medicare	49.2%	22.1%	
Commercial	4.6%	5.9%	
Managed Care	15.4%	27.9%	
Medicaid	20.0%	11.8%	
Self-pay	3.1%	23.5%	

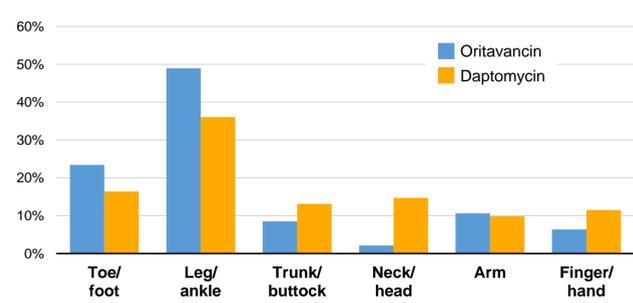
### Table 2. Patient Comorbidities

	Oritavancin (N=65)	Daptomycin (N=68)	P-value
<b>Charlson comorbidities, %</b>			
Myocardial Infarction	4.6%	2.9%	0.612
Congestive Heart Failure	9.2%	11.8%	0.634
Peripheral Vascular Disease	12.3%	4.4%	0.098
Cerebrovascular Disease	4.6%	0.0%	0.114
Chronic Pulmonary Disease	23.1%	23.5%	0.951
Connective Tissue Disease-Rheumatic Disease	4.6%	7.4%	0.719
Peptic Ulcer Disease	3.1%	0.0%	0.237
Mild Liver Disease	1.5%	4.4%	0.620
Diabetes without Complications	38.5%	23.5%	0.062
Diabetes with Complications	18.5%	5.9%	0.033
Renal Disease	21.5%	4.4%	0.003
Cancer	4.6%	4.4%	1.000
<b>Charlson Comorbidity Index score, mean±SD</b>			
= 0	44.6%	45.6%	
= 1	18.5%	26.5%	
= 2	7.7%	16.2%	
≥ 3	29.2%	11.8%	

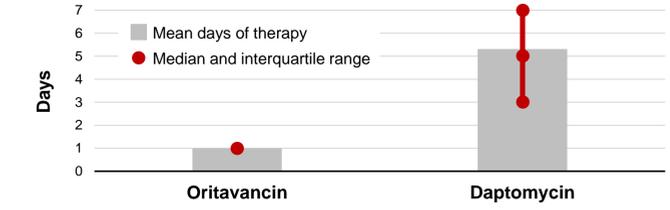
### Figure 1. Infections types with oritavancin and daptomycin outpatients



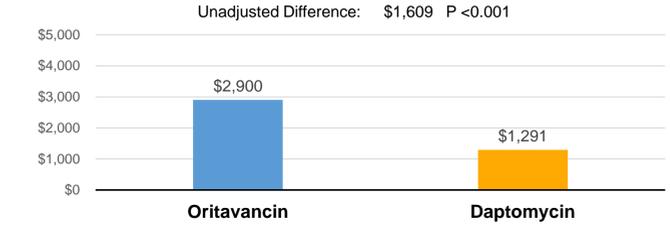
### Figure 2. Location of infection by treatment



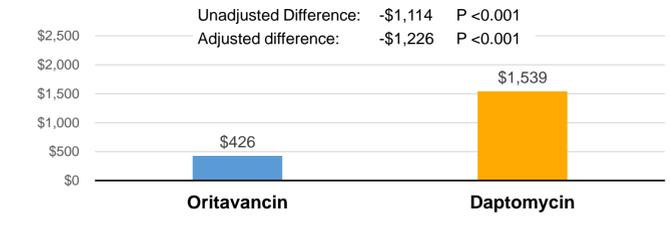
### Figure 3. Days of therapy



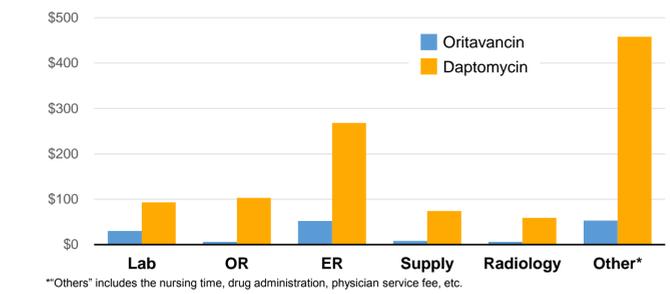
### Figure 4. Unadjusted mean drug costs of oritavancin and daptomycin



### Figure 5. Unadjusted mean cost of services to deliver outpatient treatment with oritavancin and daptomycin



### Figure 6. Components of service costs for outpatient treatment of ABSSSI with oritavancin compared to daptomycin



## Limitations

As these data were taken from the Premier Hospital Database, oral antibiotic use outside of outpatient setting was not available; given that recommended course of daptomycin is 7-14 days, and the mean days of therapy in our cohort was 5.3, it is likely that some of these patients were switched to oral antibiotics following initial IV therapy.

Total costs of care represent only initial outpatient treatment and do not consider costs of subsequent hospital admission.

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.

## Conclusions

This analysis suggests that outpatient treatment for appropriate ABSSSI patients is an opportunity for substantial hospital savings on a per patient basis. The total treatment costs for oritavancin and daptomycin in the outpatient setting are substantially lower than previously reported for ABSSSI patients of similar severity treated in the inpatient setting; \$2,2525 to \$9,717 lower than reported by Lodise and colleagues in their analysis of ABSSSI inpatient costs for patients without life threatening infections.<sup>4</sup>

Total cost difference was driven by difference in cost of drug, \$2,900 for oritavancin vs. \$1,291 for daptomycin; when considering only the cost of hospital services needed to administer treatment, costs for oritavancin were significantly lower than daptomycin, representing an opportunity to save \$1,226 in cost of services per patient.

Total treatment days were lower for oritavancin (1.0 vs. 5.1) and subsequent admission was numerically lower (6.3% vs. 10.3%), indicating a lesser burden on patients to complete treatment successfully.

With fewer treatment days, similar hospital admission rate and lower costs for treatment administration, ABSSSI treatment with oritavancin in the outpatient setting is easier for patients and providers than treatment with daptomycin in the outpatient setting.

## References

1. Ray GT, Suaya JA, Baxter R. Incidence, microbiology and patient characteristics of skin and soft-tissue infections in a US population: a retrospective population-based study. *BMC Infectious Diseases* 2013;13:252.
2. Agency for Healthcare Research and Quality, 2011 national statistics: All ED visits. 2011. Accessed Nov, 2014, at <http://hcupnet.ahrq.gov/HCUFnet.jsp?Params=H4sIAAAIAAAIAAEUqTPNsd0k2NEZnyZMSosMTkpNynGJCAIK4A4PUzLTEQIexSkTmPcGlgGJQAPOGj9MwAAAF9F36C42E3DB7294FD516624AA628A24D0ABF881&JS=Y>
3. LaPensee K, Fan W. Economic burden of hospitalization with antibiotic treatment for ABSSSI in the US: An analysis of the Premier hospital database. 17th Annual International Meeting of The International Society for Pharmacoeconomics and Outcomes Research (ISPOR) 2012:Poster
4. Lodise TP et al. Hospital admission patterns in adults with skin and soft tissue infections: Identification of potentially avoidable hospital admissions through a retrospective database analysis. *Hospital Practice* 2015;43(4):137-143.
5. Talan DA et al. Factors associated with decision to hospitalize emergency department patients with skin and soft tissue infection. *West J Emerg Med* 2015;16(1):89-97.
6. Lodise TP et al. Economic impact of oritavancin for the treatment of acute bacterial skin and skin structure infections in the emergency department or observation setting: cost savings associated with avoidable hospitalizations. *Clin Ther* 2015.