

# Successful Early Discharge and Avoided Hospitalization for Methicillin-Resistant *Staphylococcus aureus* (MRSA) Infections Treated with Outpatient Parenteral Antimicrobial Therapy (OPAT) Result in Healthcare Cost Savings

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## ABSTRACT, revised

**Background:** MRSA infections cause over \$3 billion in annual hospital costs. They were responsible for 48% of hospital-acquired infections in 2014, for which the federal government will penalize hospitals beginning in 2017. Therefore, careful management of MRSA infections by Infectious Disease (ID) physicians will become crucial in all settings. For those requiring intravenous antibiotics, a physician office infusion center (POIC) may allow for early discharge or avoidance of hospitalization for MRSA patients (pts) with the potential for positive clinical and financial impact.

**Methods:** The study population included all pts from 10 POICs treated with OPAT in 2015 with MRSA recorded as the infecting organism. Demographics, diagnoses, inpatient length of stay (iLOS) prior to OPAT and clinical outcomes were compared. National mean iLOS by diagnosis was used to compare mean iLOS and avoided hospital days derived from pts in this study. Costs were calculated from iLOS saved and daily hospitalization cost by diagnosis, all obtained from the Healthcare Cost and Utilization Project. Statistical analyses were performed using Student's *t*-test.

**Results:** A total of 186 pts (mean age 55 years) were identified including 91 skin/soft tissue (SSTI), 58 bone and joint (BJI), 15 infective endocarditis/bacteremia (IE/Bact), 14 respiratory (Resp), and 8 central nervous system (CNS) infections. 127/186 pts (68%) were hospitalized prior to OPAT with 59 pts (32%) avoiding inpatient stay entirely. Of those hospitalized, 66% achieved earlier discharge compared to national averages. In addition to cost savings, 95% of all pts successfully completed OPAT without further intervention other than continued oral antimicrobials.

Diagnosis	Incidence n (%)	National Mean iLOS (days)	Study Mean iLOS (days)	iLOS Saved (days)	Cost Savings (USD)
SSTI	91 (49)	4.7	3.2	136	236,776
BJI	58 (31)	7.5	3.9	206	432,971
IE/Bact	15 (8)	12.5	5.9	91	250,887
Resp	14 (8)	7.0	3.9	44	106,216
CNS	8 (4)	11.6	6.4	42	103,782
Summary	186 (100%)	8.1	4.6	519	\$1,130,632

**Conclusion:** Pts with various MRSA infections requiring OPAT experienced earlier hospital discharge or avoidance altogether when managed by ID physicians through a POIC resulting in significant reduction of healthcare costs.

## INTRODUCTION

Hospital costs in the U.S. are reported to be between \$3.2 and 4.2 billion USD annually for the treatment of MRSA pts [1]. Beginning in 2017, the Centers for Medicare and Medicaid Services will add financial penalties for hospital-acquired MRSA infections [2]. Strategies to aggressively manage these pts to avoid and minimize hospitalization is urgently needed. ID physicians are qualified to facilitate both avoidance of a hospital admission for MRSA-infected pts and early discharge of infected pts. An ID physician with a POIC can rapidly initiate OPAT when required with potentially significant cost savings in the management of MRSA pts [3]. This study evaluates treatment of MRSA pts receiving OPAT through a POIC with analysis of the treatment, setting and duration, potential iLOS saved and resultant cost benefits compared to national data.

## METHODS

A multicenter, retrospective study was conducted of 186 pts with culture-confirmed MRSA receiving OPAT in 2015 at 10 ID POICs nationwide.

**Data Collection:** Demographics, site of MRSA diagnosis, antimicrobial use, clinical outcome, site of care prior to initiation of OPAT including iLOS (mean days) and cost savings

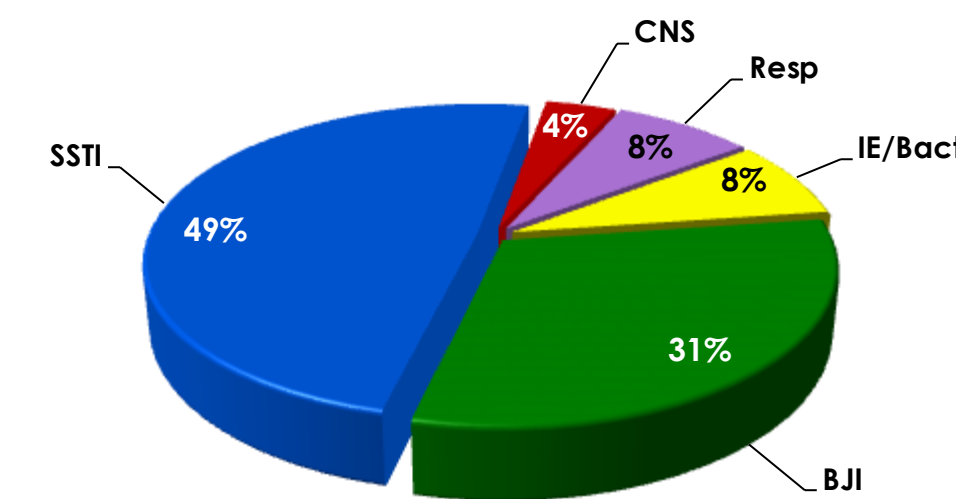
- Data Analysis:**
- Clinical success at end of OPAT was defined as: cured (resolution of infection, no further therapy), improved (partial resolution and/or additional oral antibiotics), non-evaluable and unsuccessful (worsening and/or new signs and symptoms of infection)
  - Calculation of inpatient costs derived from Healthcare Cost and Utilization Project (HCUP) using specific diagnoses (ICD-9-CM) of study pts [4]
  - Savings were calculated by comparing study iLOS (mean, days) with national average iLOS and inpatient costs (mean, \$/USD)
  - Statistical analysis was conducted using Student's *t*-test (MedCalc®, Ostend, Belgium) with *p*-values <0.05 being statistically significant

## RESULTS

### 1. DEMOGRAPHICS

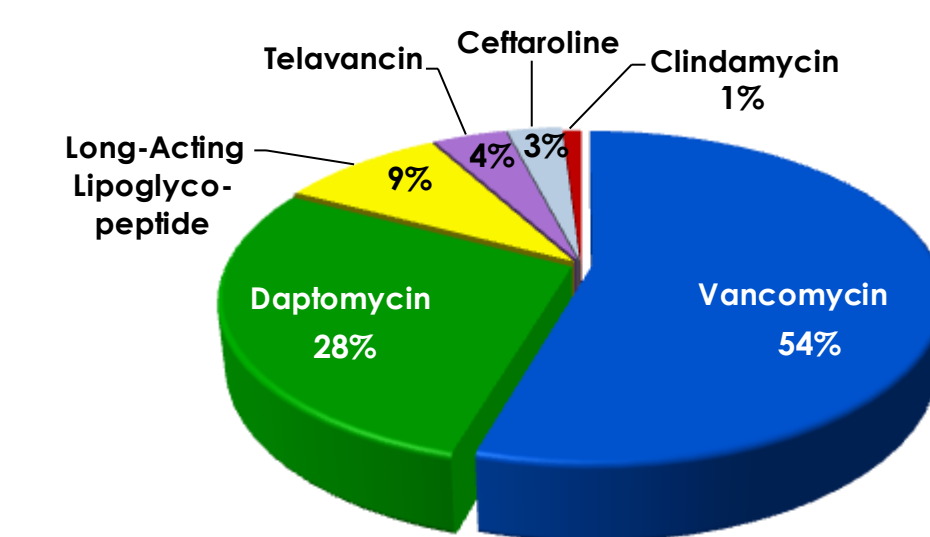
Characteristics (n=186)	Results
<b>Gender</b>	
female (no. of pts, %)	96 (52)
<b>Age</b>	
mean (years ± SD)	55 ± 15
<b>Comorbidities (no. of pts, %)</b>	
hypertension	97 (52)
obesity (body mass index ≥ 30 kg/m <sup>2</sup> )	88 (47)
diabetes mellitus (type 1 & 2)	46 (25)
arthritis	42 (23)
cardiovascular & vascular disease	40 (22)
psychiatric disorder	37 (20)
gastrointestinal disease	36 (19)
pulmonary disorder	31 (17)
dyslipidemia	30 (16)
thyroid disease	25 (13)
liver disease	21 (11)
cancer (past/current)	18 (10)

### 2. SITE OF MRSA INFECTION



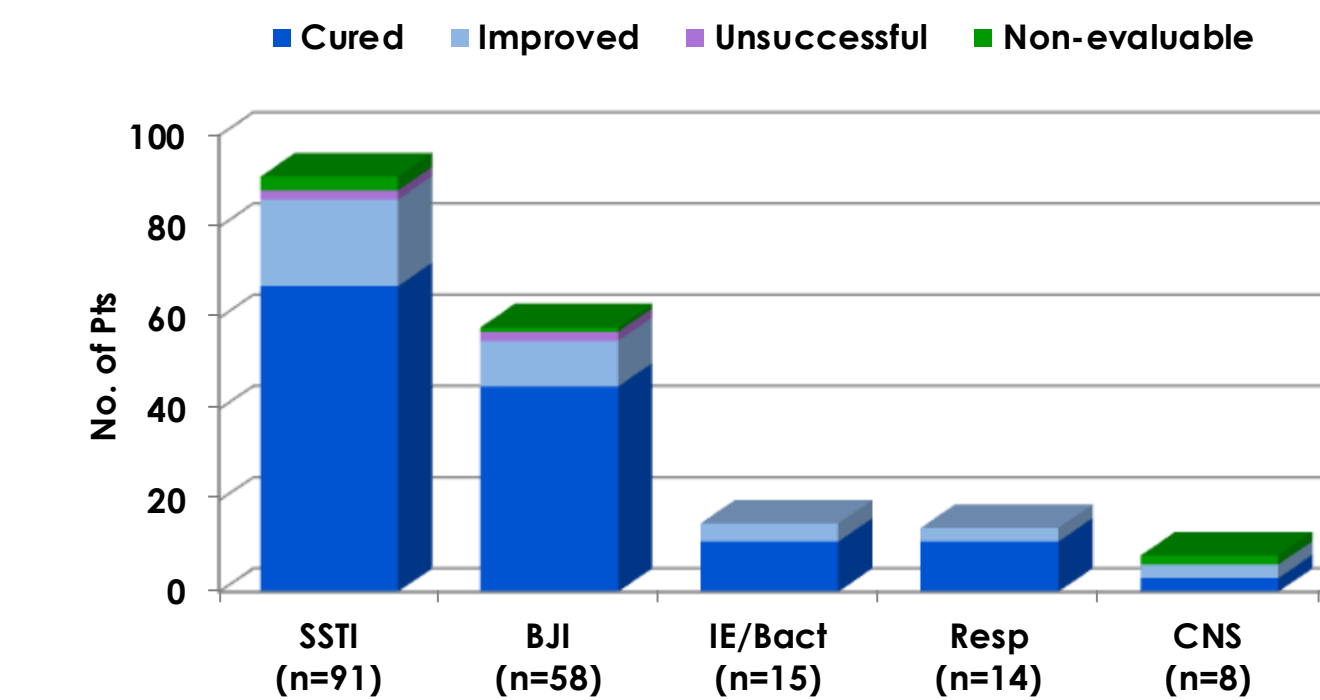
**Abbreviations:** BJI: bone and joint infection, CNS: central nervous system infection, IE/Bact: infective endocarditis/bacteremia, Resp: respiratory tract infection, SSTI: skin and soft tissue infection

### 3. ANTIMICROBIAL USE



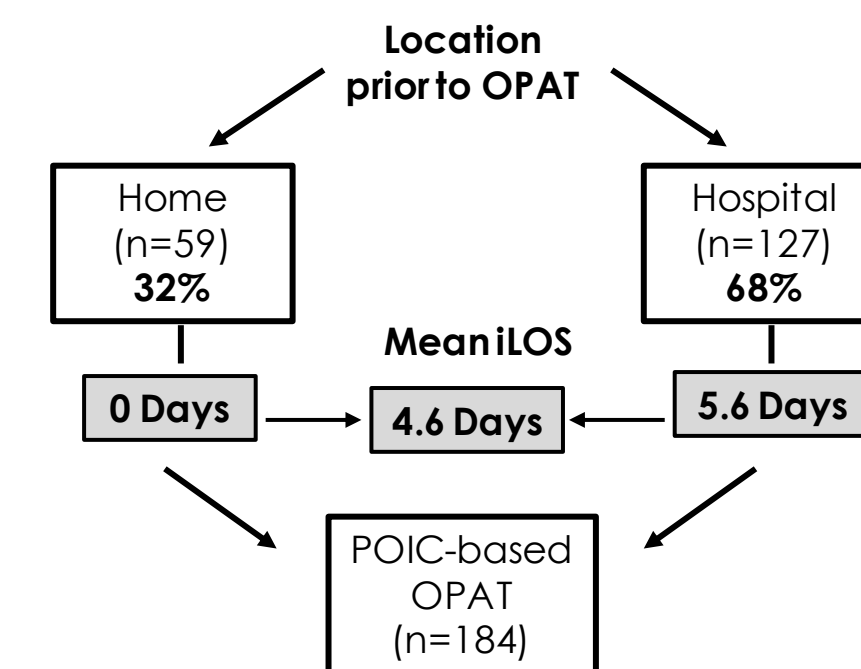
- Long-acting lipoglycopeptides included dalbavancin (n=18) and oritavancin (n=1)
- 4 pts (2%) received concomitant antimicrobials

### 4. CLINICAL OUTCOME



- 176 pts (95%) had successful clinical outcomes, including 137 pts (74%) cured and 39 pts (21%) improved
- 4 pts (2%) had unsuccessful outcomes due to disease exacerbation
- 6 pts (3%) were non-evaluable for outcomes

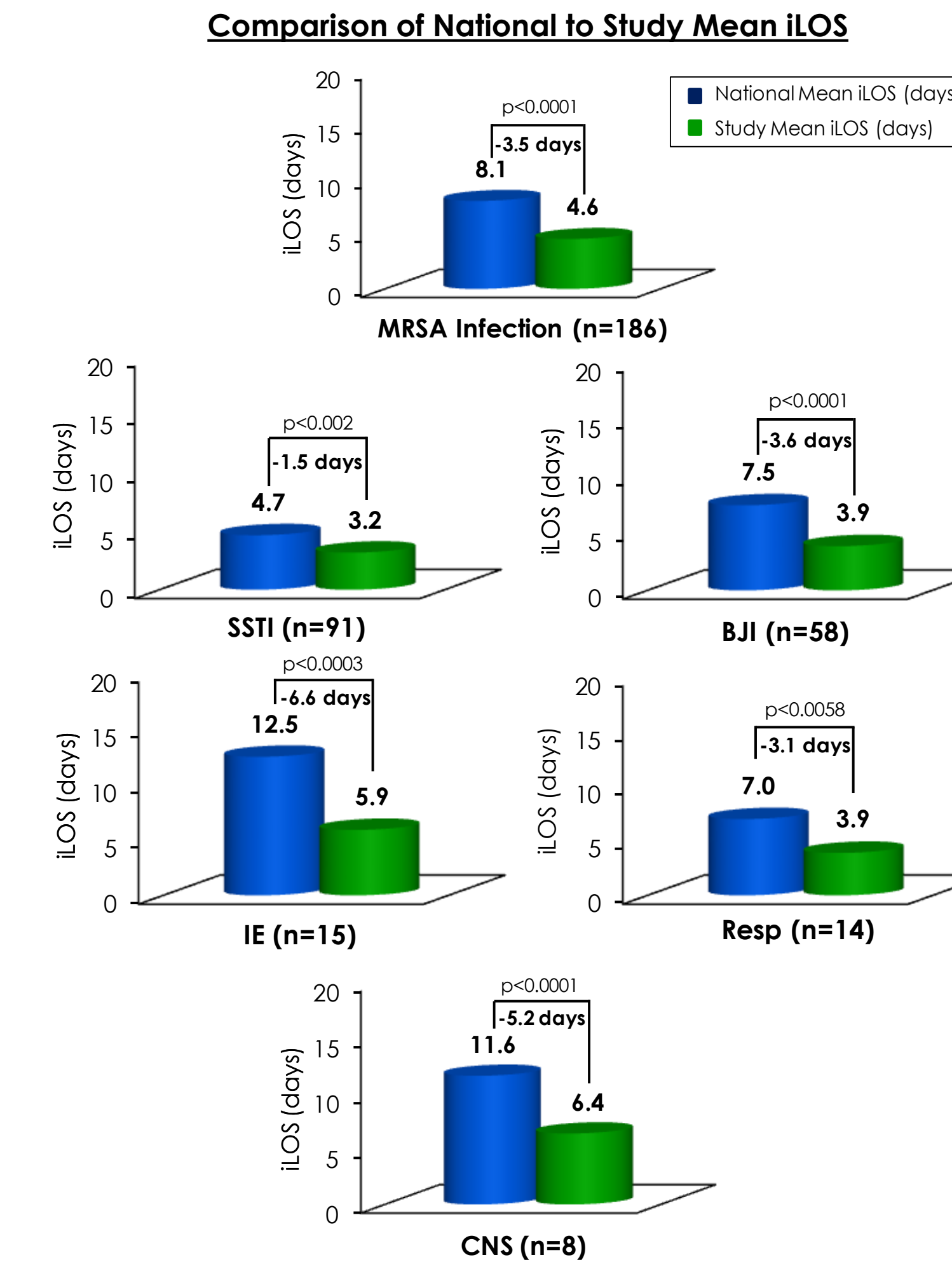
### 5. SITE OF CARE & iLOS



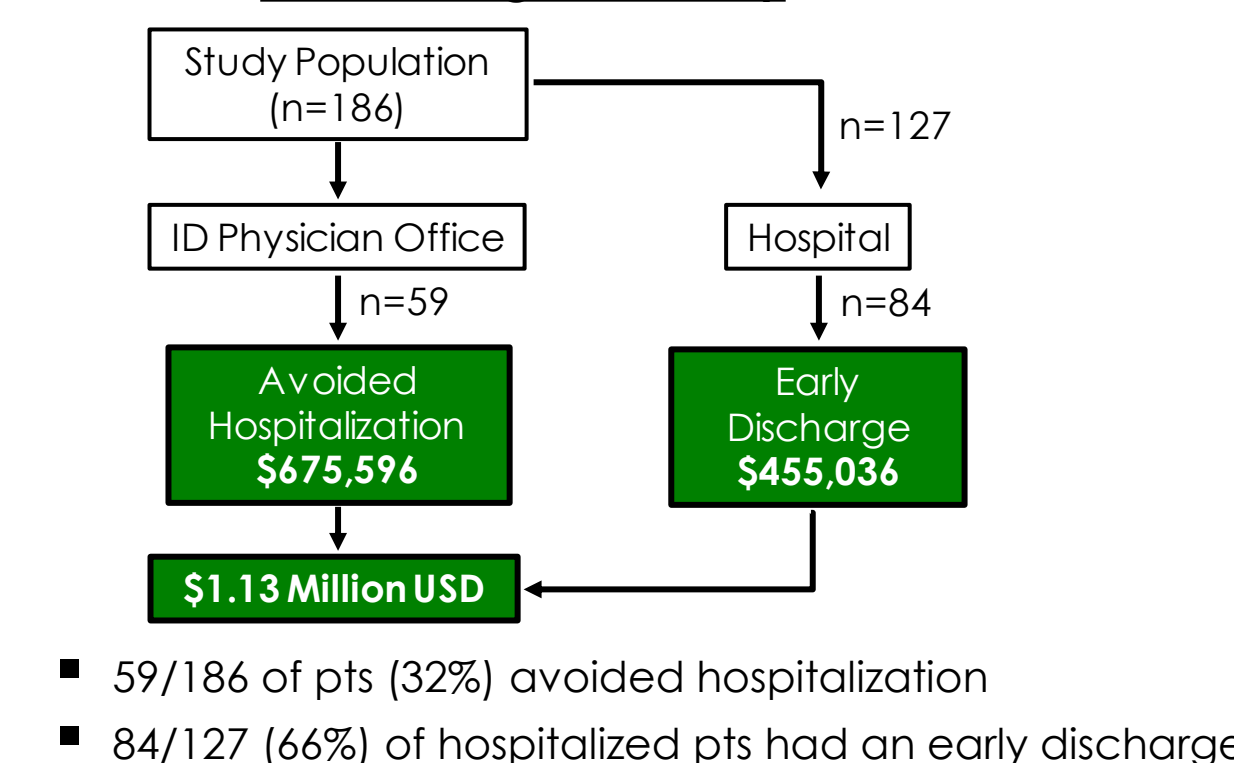
### 7. COST SAVINGS

Diagnosis	Incidence n (%)	National Mean iLOS (days) [4]	Study Mean iLOS (days)	SAVINGS		
				Saved iLOS (days)	Inpatient Cost/Day [4]	Total Inpatient Cost (USD)
SSTI	91 (49)	4.7	3.2	136	\$ 1,741	\$ 236,776
BJI	58 (31)	7.5	3.9	206	\$ 2,102	\$ 432,971
IE/Bact	15 (8)	12.5	5.9	91	\$ 2,757	\$ 250,887
Resp	14 (8)	7.0	3.9	44	\$ 2,414	\$ 106,216
CNS	8 (4)	11.6	6.4	42	\$ 2,471	\$ 103,782
<b>Overall</b>	<b>186 (100)</b>	<b>8.1 days</b>	<b>4.6 days</b>	<b>519 days</b>	<b>\$ 2,297</b>	<b>\$ 1,130,632</b>

### 6. EARLY DISCHARGE & AVOIDED HOSPITALIZATION



### Cost Savings Summary



## DISCUSSION

This retrospective study determined cost benefits of MRSA pts managed by ID physicians through a POIC based hospital avoidance or shortened length of stay.

- 186 pts with confirmed MRSA infections received OPAT at 10 POICs
- Diagnoses associated with MRSA were 49% SSTI, 31% BJI, 5% IE/Bact, 8% Resp, and 4% CNS infections
- Most commonly used antimicrobials were vancomycin (54%) and daptomycin (28%)
- Clinical success at completion of therapy through the POIC was 95%. Unsuccessful outcome was 2% (n=4) due to disease exacerbation
- 127 of 186 pts were discharged from a hospital, of which 66% had an earlier than national average discharge and 32% initiated therapy in a POIC avoiding hospitalization altogether
- Overall mean iLOS for OPAT pts was significantly shorter than the national mean iLOS (4.6 vs. 8.1 days, *p*<0.0001). Individual diagnoses also indicated a significant reduction of iLOS compared to national data [4]
- In total, 519 inpatient days were saved through outpatient management of MRSA in an ID POIC through shorter iLOS or hospital avoidance
- An early discharge for 66% previously hospitalized pts as well as hospital avoidance for 32% MRSA pts resulted in significant reduction of healthcare costs of \$1.13 million USD
- In the absence of actual cost data, a limitation of the study is the comparison of data to national averages along with the assumption that all who avoided hospitalization would normally be admitted to the hospital

## CONCLUSION

This study of 186 MRSA infected pts demonstrated substantial healthcare savings of \$1.13 million by allowing earlier discharge or avoidance of hospitalization with an overall reduction of 3.5 inpatient days per patient. In addition to significant costs savings, a high overall success rate of 95% suggest that POIC-based OPAT managed through an ID physician should be considered over other settings of care when treating pts with MRSA infections.

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