



# Successful, Cost-Saving Outpatient Parenteral Antimicrobial Therapy (OPAT) Following Hospital Discharge: Early Pilot Study of an Indigent Healthcare Program between a Physician Office Infusion Center (POIC) and Two Tucson Hospitals

Richard M. Mandel, MD<sup>1</sup>; Clifford P. Martin, MD<sup>1</sup>; Thuy N. Sixt, PharmD<sup>2</sup>; Lucinda J. Van Anglen, PharmD<sup>2</sup>; E. Jolene Patterson, PharmD<sup>3</sup>

<sup>1</sup>Southern Arizona Infectious Disease Specialists, PLC, Tucson, AZ; <sup>2</sup>Healix Infusion Therapy, Inc., Sugar Land, TX; <sup>3</sup>Healix Infusion Therapy, Inc, Tucson, AZ

Lucinda J. Van Anglen, PharmD  
Healix Infusion Therapy, Inc.  
14140 SW Fwy, 4<sup>th</sup> Floor  
Sugar Land, TX 77478  
281-295-4000  
Lvananglen@healix.net



## Abstract

**Background:** OPAT is a safe and effective option for patients (pts) requiring continuation of intravenous antibiotics (IVAB) upon hospital discharge. For hospitals that provide care to the indigent population, lack of health insurance and the patient's inability to meet the costs of OPAT create a financial burden to the hospitals who are obligated to care for these pts. IVAB are often completed during inpatient hospitalization at a higher level of care than is required. Our practice developed a hospital-funded indigent healthcare program (IHP) with 2 Tucson hospitals to provide IVAB in our POIC to qualified pts, in order to provide the means for these pts to receive their IVAB at an appropriate level of care. An early pilot study was conducted on all pts under the IHP.

**Methods:** A retrospective chart review was conducted of all pts receiving OPAT under the IHP from January 2011 - April 2012. Data evaluated were demographics, diagnosis, drug regimen, adverse events (AEs), outcome and costs. Cost benefit was calculated based upon comparison of total OPAT costs incurred under the IHP to hospital costs derived from the Healthcare Cost and Utilization Project (HCUP) National Inpatient Sample, 2009.

**Results:** 10 pts received OPAT through the POIC following discharge from the hospital. Diagnoses treated were: cellulitis (4, mean length of therapy (mLOT) 16 days), osteomyelitis (4, mLOT 33 days) and other (2, mLOT 30 days). Vancomycin was the most utilized IVAB (3, 25%). Seven (70%) pts self-administered IVAB at home while the other 3 were treated in the POIC. Five pts reported drug-related AEs, with 2 requiring a change in the IVAB. None of the pts were readmitted to the hospital. Reported clinical success rate was 90% (cured 7, improved 2) with 1 (10%) pt lost to follow-up. Pts with osteomyelitis have had no recurrences as of April 2012. The cost of treatment for all 10 POIC pts was \$75,800 whereby attributable hospital costs would have been \$442,000 had patients been required to remain hospitalized.

**Conclusion:** Data indicate that management and treatment of serious infections through a POIC under an IHP results in treatment at an appropriate level of care that is safe and effective. There were significant healthcare savings of \$366,200 under the IHP program. Additional study is warranted to confirm these early findings.

## Introduction

Early hospital discharge of acutely infected patients to receive OPAT has been shown to be safe and effective [1]. In addition, potential benefits of OPAT include significant cost savings and faster convalescence because patients may feel more comfortable and actively involved in their treatment than patients in the hospital [2, 3]. This study aimed to assess clinical outcomes and cost savings in qualified infectious disease patients who were discharged from the hospital earlier to continue IVAB treatment at our physician office infusion center (POIC).

## Methods

A retrospective analysis was conducted of 10 pts receiving OPAT under the IHP from January 2011 through April 2012 (15 months). Data was collected for demographics, diagnosis, drug regimen, hospital stay, AEs, outcomes and costs.

> Descriptive statistics (mean, min/max) were used for demographic data and length of therapy.

> Percentages were applied to therapy outcome.

> Clinical outcomes were evaluated for all patients who completed therapy as "cured" or "improving," both indicating no remaining evidence of infection, or as "failed" for worsening of signs/symptoms of infection at time of POIC discharge.

> Success rate was defined as (Cured + Improving)/(total # of patients).

> Inpatient hospital costs were calculated as an estimated mean reimbursement rate per day using the HCUP State Inpatient Database 2009 for Arizona and bacterial infection as principal diagnosis [4]. OPAT costs were calculated as the sum of total patient charges billed to hospital under the IHP. Results are presented as a comparison of the difference in total costs over the sum treatment period between OPAT and inpatient therapies.

## Results

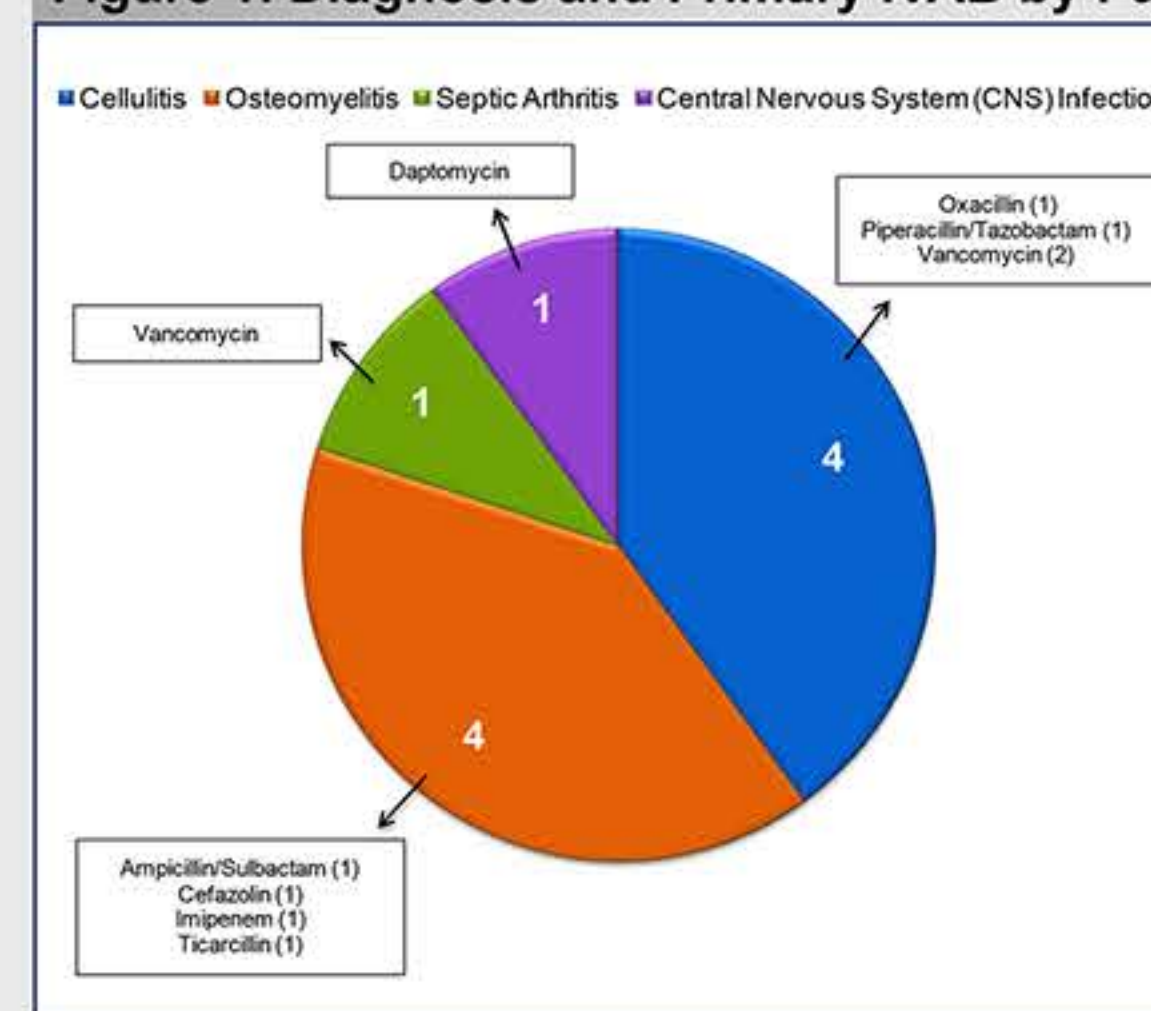
### Demographics

Table 1. Demographics

Characteristics (n=10)	No.
<b>Gender</b>	
Female	8
<b>Age in years</b>	
Mean (range)	48 (29-62)
< 65	10
<b>Comorbidities</b>	
Coronary Artery Disease	2
Cancer History	1
Chronic Kidney Disease	1
Diabetes Mellitus	3
Hypercoagulable State	2
Obesity, defined as BMI ≥ 30 (range)	6 (31 - 62)
<b>Comorbidities per patient</b>	
None	2
One	2
Two	4
Three or more	2
<b>Length of prior hospitalization in days</b>	
Mean (range)	12 (3-26)

### Diagnosis and Treatment

Figure 1. Diagnosis and Primary IVAB by Patients



- The most utilized primary IVAB was vancomycin (3 pts).
- The most common organisms treated were MSSA (4 pts) and MRSA (3 pts). 1 pt had a polymicrobial infection (osteomyelitis).
- 7 pts were able to self-administer IVAB (ampicillin/sulbactam, daptomycin, imipenem, piperacillin/tazobactam and vancomycin) at home via elastomeric devices (ED).
- 3 pts received IVAB (cefazolin, oxacillin and ticarcillin) via ambulatory pump with medication changes in the POIC either due to drug or inability to self-administer medication.

Table 2. Mean and Total Treatment Length

Pt #	Diagnosis	Length of Therapy (LOT) in days	mLOT per Diagnosis in days
1	Cellulitis	15	
2	Cellulitis with abscess	5	
3	Cellulitis	12	
4	Cellulitis	31	15.8
5	Osteomyelitis	40	
6	Osteomyelitis	23	
7	Osteomyelitis	28	
8	Osteomyelitis	42	33.3
9	Other (septic arthritis)	25	
10	Other (CNS infection)	34	29.5
<b>Total TX days</b>		<b>255</b>	

### Safety

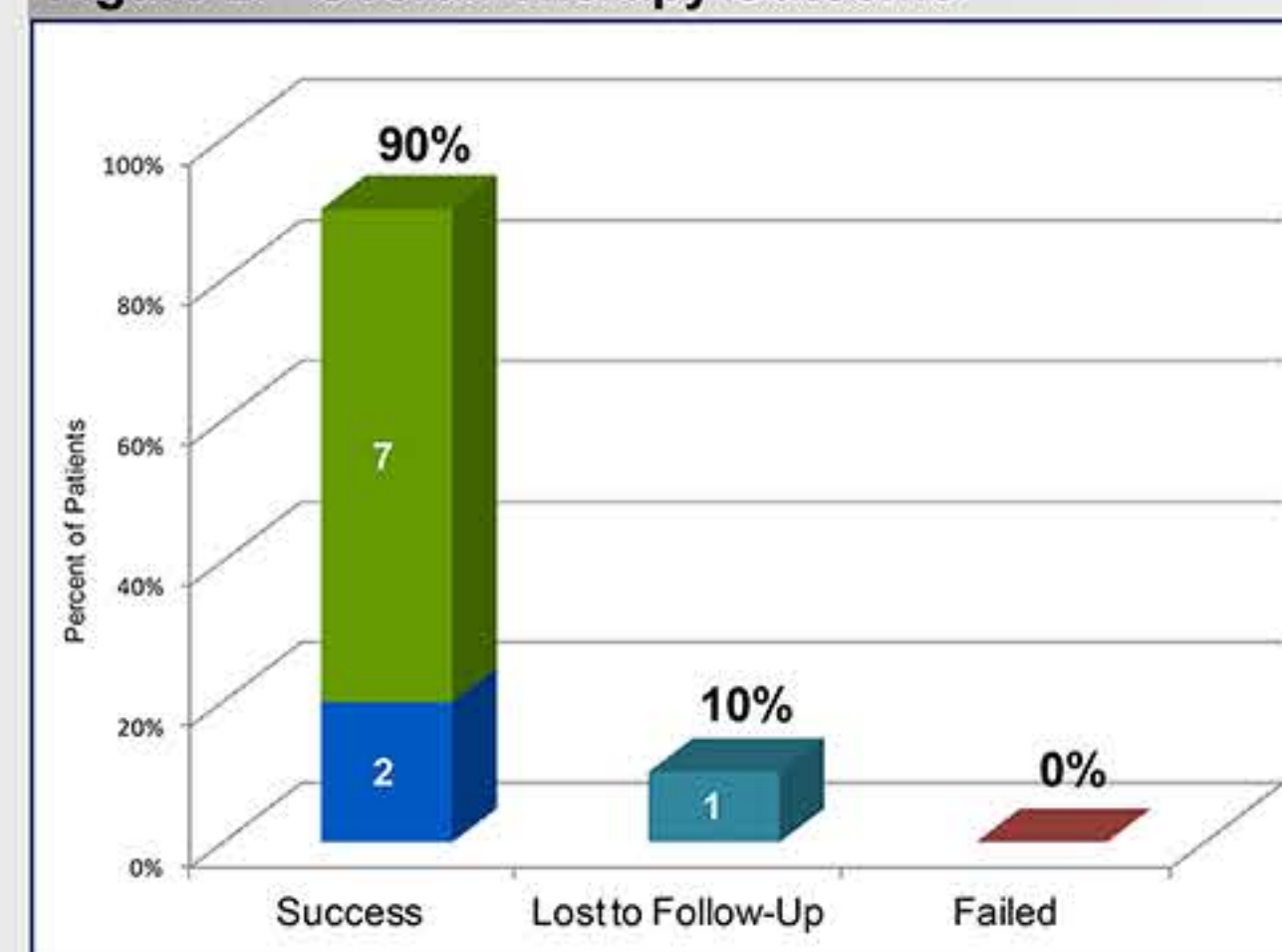
Table 3. Drug-Related Adverse Events

Adverse Event	No. of Pts	Agent(s)	Drug Changed	Outcome
Diarrhea	2	Ampicillin/Sulbactam	No	Resolved
		Vancomycin	No	Resolved
Nausea	1	Oxacillin	No	Resolved
Rash	2	Ticarcillin	Yes	Resolved
		Vancomycin	Yes	Resolved

- Mild AEs were reported by 5 pts: 2 diarrhea, 1 nausea and 2 rash.
- Both pts who experienced allergic-type rash reactions were changed from ticarcillin to aztreonam and vancomycin to clindamycin.
- All AEs resolved regardless of drug change.
- None of the pts were readmitted to the hospital during OPAT.

### Outcomes

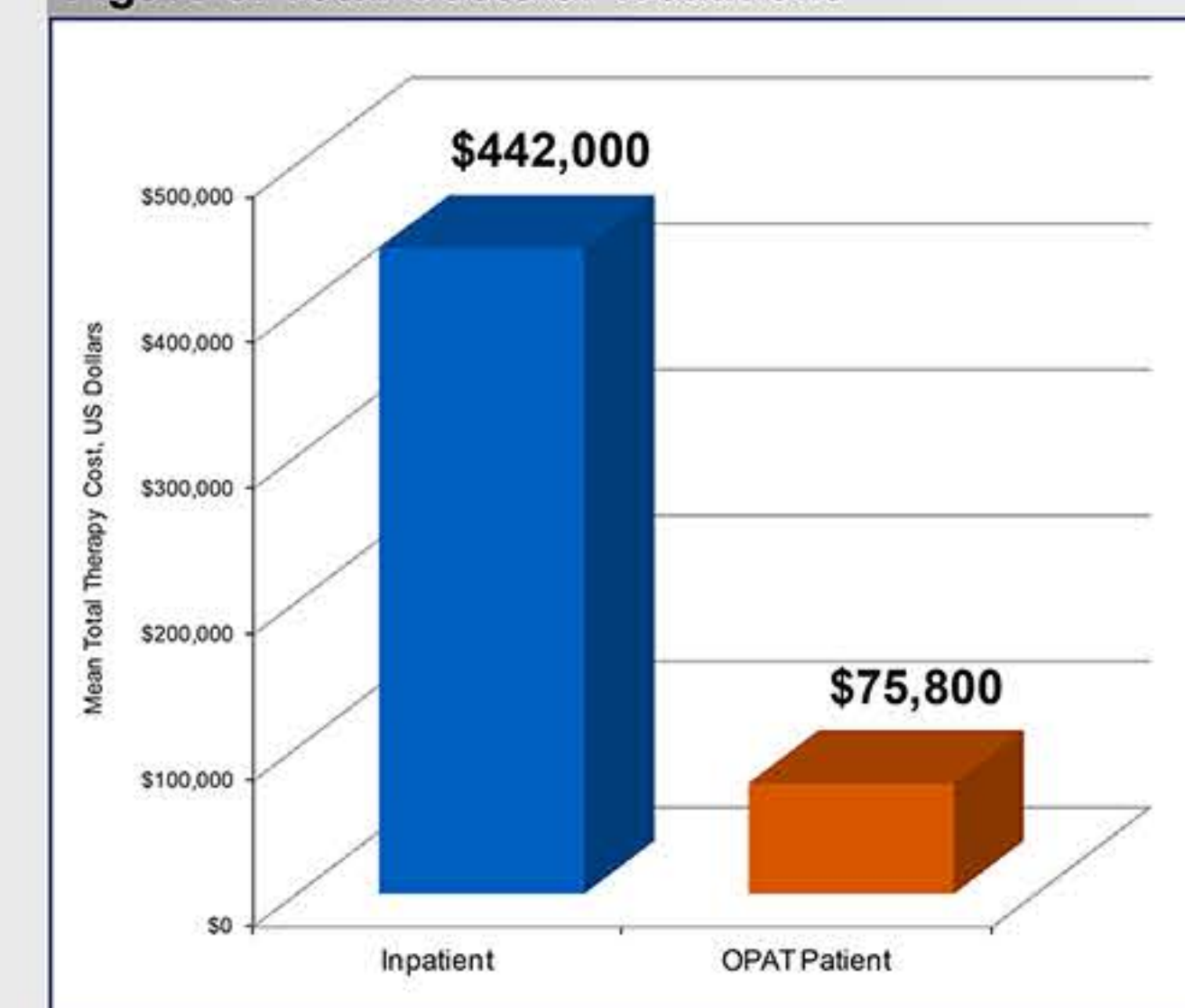
Figure 2. Overall Therapy Outcome



- Overall clinical success rate was 90% (7 cured + 2 improved) at completion of IVAB.
- One pt treated for cellulitis with piperacillin/tazobactam via ED was lost to follow-up at time of scheduled IVAB completion.

### Cost Savings

Figure 3. Total Costs of Treatment



- The cost savings for OPAT vs. inpatient treatment represents a reduction in healthcare costs of 83% for the two hospitals.

## Discussion

> Data for this early pilot study demonstrates an overall clinical success rate of 90% for the treatment of infections in a relatively small set of indigent patients.

> The overall mean treatment days for the OPAT patients was 25 days, which primarily included skin and skin structure or bone infections. None of the patients were readmitted to the hospital for recurrent infections as of April 2012.

> Mild drug-related AEs were reported in half of pts, 2 requiring a change in IVAB. Notably, all AEs resolved regardless of drug change.

> IVAB were self-administered at home via elastomeric devices where drug stability and patient compliance permitted.

> The estimated average cost for inpatient treatment of bacterial infections based on 255 hospital days is \$442,000 or \$1,733 per hospital day [4]. In contrast, the total charges for patients who received OPAT in this study were \$75,800 or \$297 per OPAT day. The costs for antibiotic treatments were potentially reduced by 83% for total healthcare dollar savings of approximately \$366,200.

> Limitation to this study is the small patient population and estimates only of the inpatient hospital costs based on 2009 HCUP data.

> Future larger and comparative studies are warranted to confirm the program's results.

## Conclusions

> This pilot study supports the supposition that an Infectious Disease POIC can provide safe and effective OPAT for patients who would otherwise require continued hospitalization in order to receive appropriate IVAB therapy.

> OPAT under an IHP can lead to significant healthcare cost savings for hospitals that serve an indigent population.

## References

1. Eron LJ, Passos S. Early discharge of infected patients through appropriate antibiotic use. *Arch Intern Med* 161: 61-65, 2001.
2. Gray A, Dryden M, Charos A. Antibiotic management and early discharge from hospital: an economic analysis. *Antimicrob Chemother* 67(9): 2297-2302, 2012.
3. Balinsky W and Nesbitt S. Cost-effectiveness of outpatient parenteral antibiotics: a review of the literature. *Am J Med* 87(3): 301-5, 1989.
4. [www.hcupnet.ahrq.gov](http://www.hcupnet.ahrq.gov). Agency for Healthcare Research and Quality, Rockville, MD, 2009.