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COST EVALUATION OF A NURSE COORDINATED OUTPATIENT PARENTERAL ANTIMICROBIAL THERAPY (OPAT) PROGRAM

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INTRODUCTION

- Outpatient parenteral antimicrobial therapy (OPAT) is a treatment model using intravenous antimicrobials for medically stable patients after hospital discharge
- OPAT has been widely adopted with more than 250,000 patients treated in the United States each year and has demonstrated effectiveness in patients of all ages, practice settings, and treatment regimens
- OPAT offers benefits such as allowing patients to be treated at home or in outpatient settings, and being more cost-effective than inpatient intravenous antimicrobial therapy
- OPAT requires a long-term intravenous catheter which carries a risk of complications which along with possible risk of treatment side effects and infection relapse can lead to unplanned hospital readmission
- To ensure high-quality care, a multidisciplinary team involving infectious disease physicians and dedicated nurses is recommended by the Infectious Disease Society of America (IDSA) guideline
- Prior to 2017, the University of Illinois Hospital and Health Sciences System (UI Health) OPAT program (pre-intervention program) was solely managed by ID physicians without administrative staff for care coordination
- In October 2017 the program was expanded to include an OPAT nurse who actively provides treatment coordination, patient monitoring and communication, laboratory administration, and documentation. This post-intervention OPAT program was shown to be associated with a reduction in the unplanned OPAT-related readmissions in a previous study
- However, the previous study did not evaluate OPAT-related readmissions at different time points after hospital discharge nor the associated financial impact; also, no prior studies have evaluated the cost-effectiveness of multi-disciplinary OPAT programs

OBJECTIVE

- The study aims to quantify the 30 and 60-day OPAT-related readmission rates and associated costs between the pre- and post-intervention programs at UI Health from a payer's perspective

METHODS

- The study is a retrospective observational cohort study of patients who received OPAT after hospital discharge at the UI Health
- Clinical data were collected from the UI Health electronic medical records and through chart review. Hospital billing records were provided by the UI, Center for Clinical and Translational Science department
- Cohort:** patients aged 18 years and older, who received OPAT through a peripherally inserted central catheter for at least two days and had an infectious diseases consultation during the index hospitalization were included; patients with cystic fibrosis were excluded
- Post-intervention vs. pre-intervention:** data were collected from January 2012 to August 2013 for the pre-intervention group and from October 2017 to January 2019 for the post-intervention group
- Outcomes:** unplanned OPAT-related hospital readmissions occurring within 30 and 60 days after hospital discharge were identified by a multidisciplinary research team and verified by an infectious disease clinician; and costs associated with unplanned readmissions were collected and inflated to 2019 United States dollars
- Statistical analyses:**
  - Readmission rate: multivariate logistic regression to estimate readmission odds ratios with 95% confidence intervals; 10% Change-in-Estimate to select model covariates; Hosmer-Lemeshow test to compute the fitness of the models
  - Costs: zero-inflated two-part model using a logit regression model and generalized linear model with log link and gamma distribution to estimate readmission cost difference; AIC and BIC to test the fitness of the model; margins estimation to predict the adjusted average OPAT-related readmission costs per person
- All analyses were conducted using Stata version 17 and the Institutional Review Board of the University of Illinois at Chicago approved this study

RESULTS

	Post-intervention OPAT Program (N=355)		Pre-intervention OPAT Program (N=73)		Standardized Differences
Characteristics	n	%	n	%	
<b>Age, years</b>					
Mean	55.5		51.1		0.30
<b>Insurance</b>					
Private insurance	70	19.8	23	31.5	0.25
State insurance	267	75.4	47	64.4	
No insurance	17	4.8	3	4.1	
<b>Charlson comorbidity score</b>					
Mean	3.5		2.3		0.53
<b>Previous hospitalizations for any cause within past year</b>					
No	173	48.7	37	50.7	0.04
Yes	182	51.3	36	49.3	
<b>Any intensive care unit visit during index hospitalization</b>					
No	257	72.4	42	57.5	-0.31
Yes	98	27.6	31	42.5	
<b>Lengths of stays of index hospitalization, days</b>					
Mean	12.7		13.8		-0.09
<b>Planned duration of OPAT treatment, days *</b>					
Mean	36.2		39.4		-0.13
<b>OPAT indications</b>					
Bone and joint infection	133	37.5	41	56.2	0.49
Central nerve system infection	34	9.6	13	17.8	
Skin soft tissue infection	29	8.2	6	8.2	
Intra-abdominal infection	34	9.6	2	2.7	
Genital/ urinary tract infection	36	10.1	2	2.7	
Others	89	25.1	11	15.1	
<b>Location of administration **</b>					
Ambulatory	191	53.8	44	60.3	0.13
Non-ambulatory	164	46.2	29	39.7	
<b>Use of vancomycin</b>					
No	245	69.0	34	46.6	-0.46
Yes	110	31.0	39	53.4	
<b>30-day hospital readmission</b>					
No	334	94.1	62	84.9	-0.28
Yes	21	5.9	11	15.1	
<b>60-day hospital readmission</b>					
No	333	93.8	60	82.2	-0.33
Yes	22	6.2	13	17.8	
<b>* Excluded 1 observation because of numeric error in the record</b>					
<b>** Ambulatory sites include home and infusion center; non-ambulatory sites include skilled nursing facility, subacute rehabilitation facility, and unknown sites</b>					

	Odds Ratio (post- vs pre-intervention program)	95% CI		P-value
30-day hospital readmission	0.48	0.22	1.05	0.067
60-day hospital readmission	0.42	0.19	0.91	0.028
* Adjusted for use of vancomycin				

	Odds Ratio (post- vs pre-intervention program)	95% CI		P-value
Any readmission costs	0.37	0.17	0.82	0.015
	Cost Ratio (post- vs pre-intervention program)	95% CI		P-value
Amount of readmission costs, conditional on any spending	0.93	0.49	1.74	0.810
* Adjusted for age and intensive care unit visit during index hospitalization				

Figure 1. Predicted per-person average total costs from OPAT hospitalization using marginal estimation\*

Intervention	Total costs per person
Pre-intervention	\$5,685
Post-intervention	\$2,201

61.3% reduction

\* Adjusted for age and intensive care unit visit during index hospitalization

DISCUSSION

- This is the first study to compare the costs of two OPAT programs with different care coordination structures and estimated potential cost savings from OPAT readmission due to care coordination
- Increased clinical involvement by OPAT nurse was associated with fewer readmissions and an estimated 61.3% reduction in total per-person readmission costs, which justified additional resources for OPAT programs to improve care while decreasing costs
- The post-intervention program led to decreased 30 and 60-day OPAT-related readmission rates compared to the previous program, and the reduction was statistically significant at 60 days
- Prior studies on the cost-effectiveness of nurse-facilitated disease management programs have shown mixed findings, with some evidence suggesting reduced readmission rates and costs, while others showed no improvement or increased costs
- The study's limitations include being a retrospective single-center design, potential confounding due to historical changes in care delivery other than changes to the OPAT program, assumptions about follow-up location, not assessing costs other than unplanned OPAT readmission, and focusing only on costs from a payer's perspective

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