1332

Cost-Effectiveness of an Outpatient Parenteral Antimicrobial Therapy (OPAT) Care Coordination Service

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Introduction

Outpatient parenteral antimicrobial therapy (OPAT), by allowing patients to receive long-term parenteral antimicrobial therapy outside of acute care hospitals, saves costs. However, it requires extensive outpatient case management. These case management services are often not reimbursed, or reimbursed at a rate less than the cost of filing the reimbursement paperwork. Therefore, many individual infectious diseases providers may manage OPAT at a loss. We have shown that intensive case management (the Infectious Diseases Transitions Service, IDTS) led by an infectious diseases pharmacist results in improved laboratory test result receipt, decreased medication errors, improved patient follow-up, and decreased catheter complications and adverse drug events.[1] We wanted to see if intensive case management was cost-effective compared with infectious diseases follow-up without case management.

Purpose

To determine whether an infectious disease pharmacist-led intensive OPAT case management service (the IDTS) is cost-effective when compared with usual care.

Methods

Analysis: A Markov model for cost-effectiveness analysis was performed over a 12-month horizon. Univariate sensitivity analyses were performed, varying individual parameters by +/- 15%. We used a societal perspective, including costs to the health system and the patient. We used 10,000 Monte-Carlo simulations to carry out a multivariate probabilistic sensitivity analysis comparing the cost of the intervention with the cost of treating patients before and after the intervention.[1] In the original study, 237 patients were treated prior to the intervention, and 393 patients were treated after the intervention.[1]

Assumptions: Costs of medications were based on vancomycin, and costs of switching medications based on daptomycin. We used the most common antibiotic side effect (rash) and the most frequent serious antibiotic side effect (renal insufficiency) in our analysis. We assumed that each patient was on OPAT for 8 weeks. We did not account for additional costs (need for repeat surgery, etc.) in infection relapse. The intervention cost a 0.8 full time equivalent (FTE) of a hospital pharmacist.[2]

Results

- With standard of care, the cost per OPAT patient was $56.257.65, with 0.952 life-years gained.
- With the IDTS, the cost per OPAT patient was $47,139.27, with 0.955 life-years gained.
- IDTS was associated with an incremental cost-effectiveness ratio (ICER) of negative $2,911,302.39/life-year.
- The intervention is dominant and cost-effective, improving survival with lower costs.
- These results were cost-effective in 98% of simulations based on a willingness to pay of $50,000 per life-year.

Table 1. Examples of costs associated with OPAT complications.

Payor	Description of Cost	Cost per Item	Note	Minor ADE	CLABSI	Major ADE (hemodialysis)	Minor adverse event (line out)
System	Additional Antibiotics: daptomycin	$200/day[3]	Switch vancomycin to daptomycin	1 week, $1400	No	1 week, $1400	No
System	Additional Antibiotics: vancomycin	$25.64/day[3]	Vancomycin added	No	2 weeks, $358.96	No	No
System	Weekly home nursing visit	$149.32/visit[4]		1 week, $149.32	2 weeks, $298.64	1 week, $149.32	$149.32
System	Vancomycin laboratory test	$37/test[5]		1 week, $37	2 weeks, $74	1 week, $37	No
System	Complete blood count	$21/test[5]		1 week, $21	2 weeks, $42	1 week, $21	No
System	Basic metabolic panel	$28/test[5]		1 week, $28	2 weeks, $56	1 week, $28	No
System	Blood cultures	$15.91/test[6]	2 sets	No	5 days, $318.20	No	No
System	Infusion support	$100/day[4]		1 week, $700	2 weeks, $1400	1 weeks, $700	No
System	Readmission	$2289/day[7]		5 days, $11445	7 days, $16023	7 days, $16023	2 days, $4578
System	Emergency Department	$1233/visit[7]		1 visit, $1233	1 visit, $1233	1 visit, $1233	1 visit, $1233
System	New PICC	$973.97/PICC[7]	In radiology suite	No	1 PICC, $973.97	No	1 PICC, $973.97
System	Infectious diseases clinic visit	$108.13[7]	CPT code 99214	2, $216.26	2, $216.26	1, $108.13	1, $108.13
System	Hemodialysis	$73.4/session[7]		No	No	1 month, $954.20	No
Patient	Missed work	$25.25/hour[8]	U.S. earnings/hour	5 days, $1010	2 weeks, $2020	1 week, $1414	2 days, $404
Patient	Caregiver time	$25.25/hour[8]		1 week, $530.25	2 weeks, $1060.50	2 weeks, $1060.50	2 days, $151.25
Patient	Transportation	$0.54/mile[9]	40 miles/round trip	2, $43.20	4, $86.40	1, $21.60	2, $43.20
Total				$13860	$24797	$24556.21	$7469.95

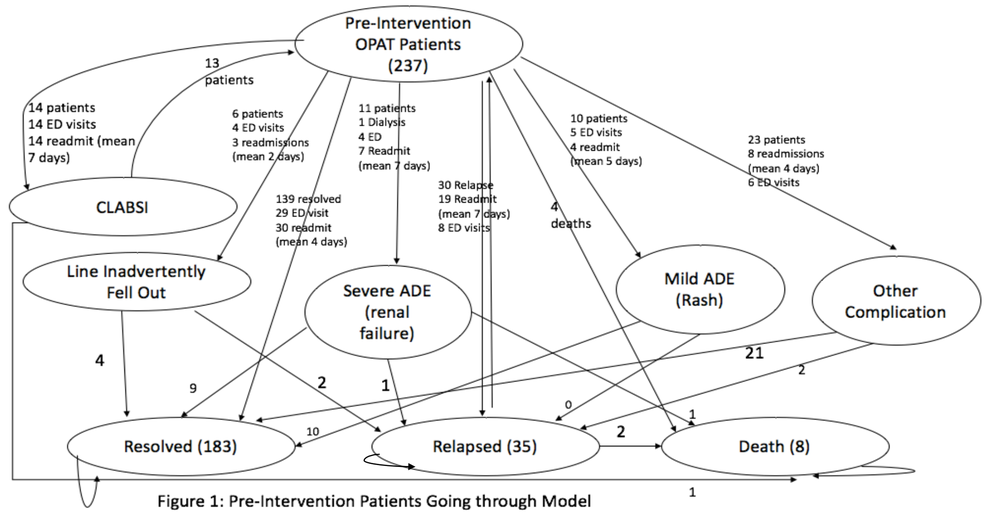

Figure 1: Pre-Intervention Patients Going through Model

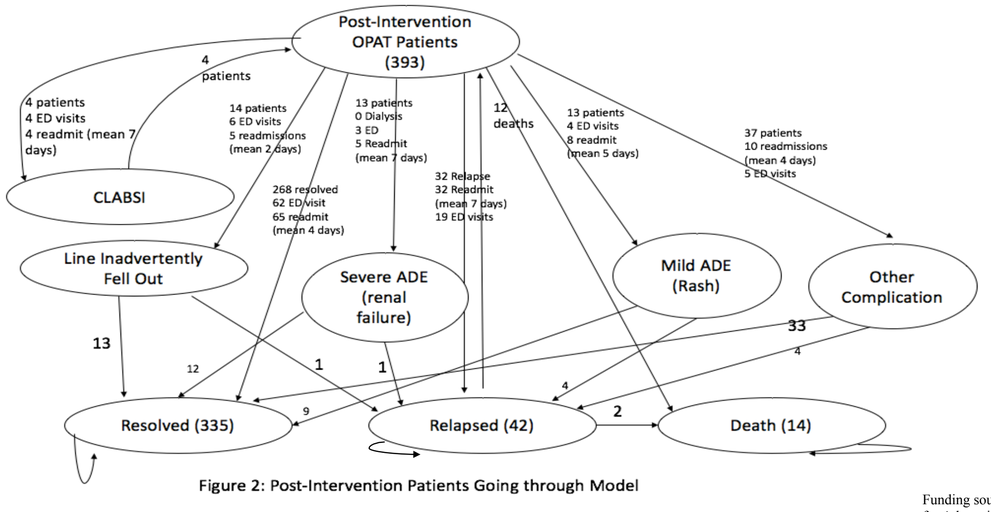

Figure 2: Post-Intervention Patients Going through Model

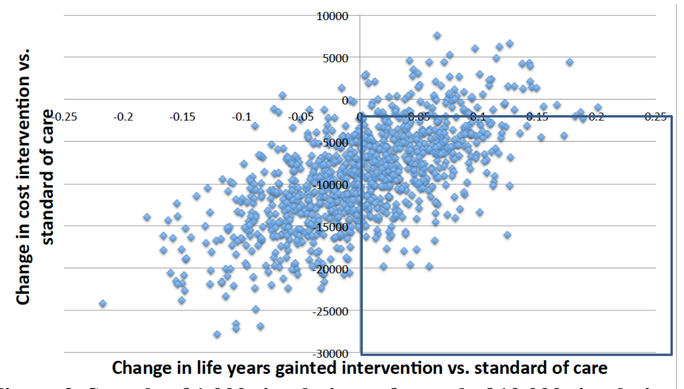

Figure 3. Sample of 1,000 simulations of a total of 10,000 simulations. Predominant outcome: lower costs, life-years gained.

Table 2: Effect of increasing outcomes by 15% on ICER.

Parameter	Pre-IDTS Life-years	Pre-IDTS Cost	Post-IDTS Life-Years	Post-IDTS Cost	ICER
Baseline	0.952	$56,257.65	0.955	$47,139.27	-$2,911,302.39
More CLABSI	0.952	$56,560.85	0.955	$47,415.11	-$2,576,641.06
More Lines Removed	0.952	$56,375.15	0.955	$47,167.84	-$2,805,070.75
More Renal Failure	0.952	$56,421.84	0.955	$47,294.35	-$2,553,626.15
More Rash	0.952	$56,220.78	0.955	$47,299.61	-$2,951,441.64
More "Other" Complications	0.952	$56,351.92	0.955	$47,404.04	-$2,933,086.29
More Cured	0.956	$53,588.77	0.960	$44,936.02	-$2,537,122.28
More Relapsed	0.950	$58,533.61	0.954	$48,766.26	-$2,516,838.87
More Death	0.950	$56,174.30	0.951	$47,031.02	-$7,743,757.39

Conclusion

- A pharmacist-led care coordination service for OPAT patients is cost-effective and improves survival.
- Healthcare systems should consider funding OPAT care coordination services.

Limitations: Our analysis was based on one case management intervention in one academic medical center, and may not be applicable to all settings.

References

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CLABSI: Central line-associated bloodstream infection; ADE: adverse drug event; PICC: peripherally-inserted central catheter; OPAT: outpatient parenteral antimicrobial therapy. ICER: incremental cost-effectiveness ratio.

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