Low Hospital Admission Rates Following Physician Office Infusion Center (POIC)-Based Outpatient Treatment with Intravenous Antibiotics

Infectious Disease Consultants

HEALIX

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ABSTRACT (revised)

Background: Current Centers for Medicare & Medicaid Services 30-day hospital (hosp) readmissions for all medical discharges are 16.1%, with many of these preventable. Outpatient antibiotic therapy (OPAT) has proven beneficial for patient (pt) safety and quality of care, however, little is known about hosp admissions following OPAT in a POIC. A recent study indicated a readmission rate of 26% for all OPAT settings. Our study investigates 30-day unplanned hosp admissions of pts treated with intravenous antibiotics only through an Infectious Disease (ID) POIC.

Methods: 600 pts were retrospectively evaluated from centralized databases; 60 random pts from each of 10 POICs from Jan 1 to Jun 30, 2013. Pt demographics, diagnosis, comorbidities, drug therapy, emergency department (ED) visits and hosp admissions within 30 days of OPAT initiation. Comparison of unplanned admissions was done by Fisher's exact test. Risk factors for hosp admissions were assessed using odds ratios (OR).

Results: Altogether, 41 of 600 pts (6.8%) had unplanned admissions to the hosp within 30 days of receiving OPAT. Readmissions for previously hospitalized occurred in 32/404 pts (8%) and 9/196 pts (5%) were admitted following POIC-initiated OPAT (p=0.39). For all admissions, 24 (59%) were for worsening infection, 3 (7%) for device-related issues, 5 (12%) for new or unrelated infections and 9 (22%) for reasons unrelated to infection. ED visits were reported for 38/600 pts (6.3%) with 40% resulting in hospitalization. Frequent diagnoses reported in pts admitted were bacteremia (27%), intra-abdominal (20%) and skin and skin structure infections (15%) with a mean length of treatment of 12, 14, and 11 days, respectively. Risk factors analyzed for hosp admissions were co-morbidities ≥ 3 (28/41pts; OR 1.4), prior 6 month hosp admissions (23/41 pts; OR 2.1), age ≥ 60 years (22/41 pts; OR 1.6), obesity (12/41 pts; OR 0.6), bacteremia (11/41 pts; OR 2.9), malignancy (10/41pts; OR 1.1) and diabetes (10/41pts; OR 0.8).

Conclusion: POIC-based OPAT following hosp discharge resulted in lower hosp readmission rates than indicated in current data. POIC-based OPAT without previous hospitalization resulted in even fewer hosp admissions. OPAT by an ID-physician in an office-based setting provides highly effective, high quality therapy, leading to a reduction in costly hosp admissions and readmissions.

INTRODUCTION

Readmissions following hospitalization are a costly and often preventable event [1]. OPAT has been shown to provide a safe, effective and cost-saving alternative to in-patient treatment [2]. However, little is known about hosp admission rate of pts receiving OPAT, either with or without prior hospitalization. Recently, Allison et al. reported a 26% readmission rate of previously hospitalized pts treated at a single outpatient infusion center over a 3-year time period [3]. The purpose of this study was to assess unplanned 30-day hosp admission rates for ID pts receiving OPAT exclusively at a POIC and to identify possible predictors.

METHODS

Charts from 600 random pts receiving OPAT at 10 POICs were reviewed. Hosp admissions were reported as any unplanned hospitalization within 30 days of OPAT initiation. Data were analyzed according to pts location prior to OPAT (hospitalized vs. non-hospitalized).

Statistical analysis: Descriptive characteristics (mean, SD) were used for demographic data and LOTs. OR, 95% confidence interval (CI), and p-values were assessed for admitted vs. non-admitted group including pts age, number of co-morbidities, prior 6 month hospitalization, insurance, vancomycin usage and the presence of diabetes mellitus, obesity, malignancy, and bacteremia according to the Altman method with a p-value ≤ 0.05 to be statistically significant [4]. Accordingly, OR=1: exposure does not affect odds of outcome, OR>1: exposure associated with higher odds of outcome, and OR<1: exposure associated with lower odds of outcome.

RESULTS

Table 1. Demographics

| Patient Characteristics (n=600, 10 POICs)	Value
Gender, No. of pts (%)	
Female	288 (48%)
Age at time of POIC admission	
Mean (range), Years	57 (13-95)
> 60 years, No. of pts (%)	258 (43%)
Primary diagnosis, No. of pts (%)	
Bone and joint infection (BJI)	128 (21%)
Skin and skin tissue infection (SSTI)	105 (18%)
Bacteremia	73 (12%)
Genitourinary infection (GUI)	59 (10%)
Intra-abdominal infection (IAI)	52 (8.7%)
Respiratory infection (RI)	50 (8.3%)
Surgical site infection	42 (7.0%)
Others*	91 (15%)
Co-morbidities, No. of pts (%)	
Hypertension	289 (48%)
Endocrine/metabolic disease (incl. 232 obese pts)	287 (48%)
Cardiovascular & vascular disease	171 (29%)
Diabetes mellitus	167 (28%)
Arthritis	135 (23%)
Neoplasm	133 (22%)
Pulmonary disorder	125 (21%)
Psychiatric disorder	117 (20%)
Gastrointestinal disorder	94 (16%)
Hepatic disorder	76 (13%)
Human immunodeficiency virus (HIV)	7 (1.2%)
Co-morbidities per pt (%)	
0	45 (8%)
1	95 (16%)
2	93 (15%)
≥ 3	367 (61%)
OPAT following hospital discharge, No. of pts (%)	404 (67%)
OPAT initiated in POIC, No. of pts (%)	196 (33%)

*; Others: prosthetic device infection (n=35), abscess (n=27), central-nervous system infection (n=12), endocarditis (n=9), and head-eyes-ears-nose-throat infections (n=8).

- Mean age was 57 years (range 13-95), 48% were female
- Primary diagnosis of all pts admitted to the POIC were BJI (21%), SSTI (18%), bacteremia (12%), GUI (10%), IAI (8.7%), RI (8.3%), surgical site infection (7%) and various other infections (15%).
- Multiple co-morbidities with 3 or more were common in 61% of pts
- 404 of 600 pts received OPAT following hospitalization and 196 of 600 pts initiated OPAT in a POIC.
- 31% of all study pts had federally-funded health insurance (Medicare, Medicaid, or Tricare).

30-Day Hospital Admissions

Figure 1. 30-Day Hosp Admission Rate
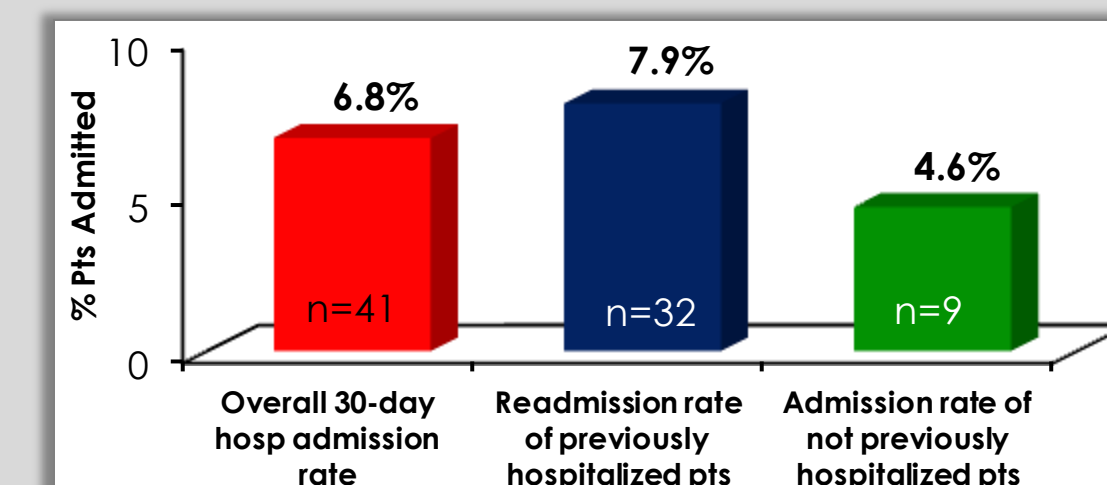
Altogether, 41 of 600 pts (6.8%) were admitted to the hosp within 30 days of initiating OPAT, including:
- 32 of 404 (7.9%) previously hospitalized pts and
- 9 of 196 (4.6%) non-hospitalized pts
- Admission rates varied across POICs (n=10) with an average of 4.1 ± 3.1 pts per site (data not shown).

Table 2. Reasons for 30-Day Hosp Admissions

Pt location prior to OPAT	No. of Pts (%)			
	Worsening infection	Non-infection related	New infection	Device complication
Hospitalized	21 (66%)	5 (15%)	4 (12%)	2 (6%)
Not hospitalized	3 (33%)	4 (44%)	1 (11%)	1 (11%)
Total	**24 (59%)**	**9 (22%)**	**5 (12%)**	**3 (7%)**

- The mean length of hospitalization post-OPAT was 7.5 ± 6 days.
- ED visits were reported for 38 of 600 (6.3%) pts with 15 (40%) of those resulting in hospitalization.

Figure 2. 30-Day Hosp Admission Rate by Condition
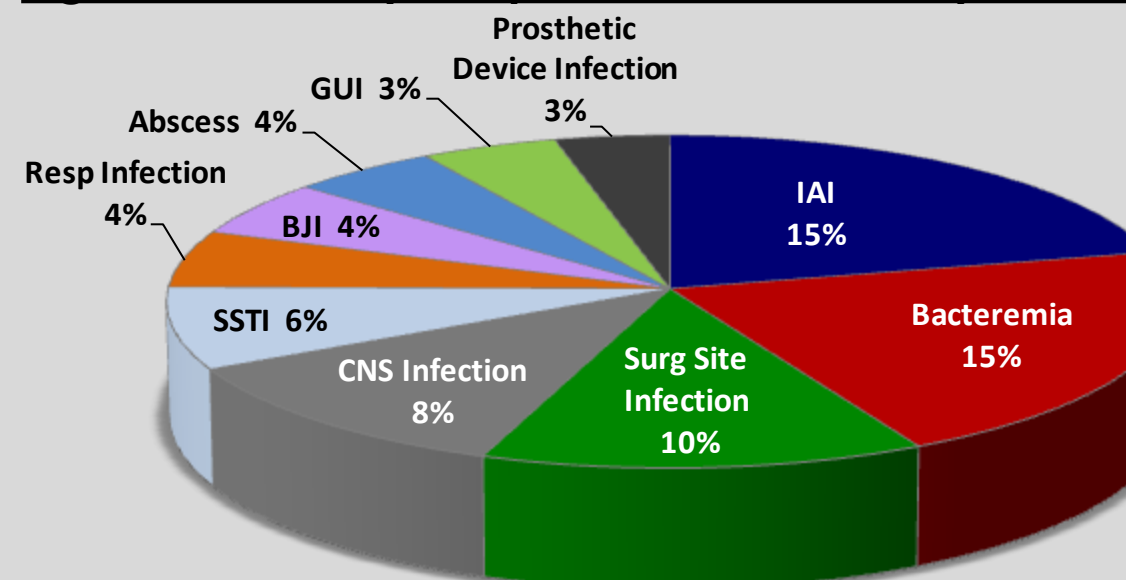
- The highest unplanned 30-day hosp admission rates were reported for IAI (15%), bacteremia (15%) and surgical site infections (10%).
- Admission rates below 4% were reported for BJI (4%), abscess (4%), GUI (3%), and prosthetic device infections (3%).

Table 3. Diagnosis, Mean LOT and Drug Usage

Diagnosis	No. of pts (%)	Mean LOT (days)	Drug Usage * (No. of pts)
Bacteremia	11 (27%)	12	ceftriaxone (n=3), ertapenem (n=2), cefazolin (n=1), dpt (n=1), dpt + cefepime (n=1), gent + pen G (n=1), imi/cil + dpt (n=1), vanco (n=1)
IAI	8 (20%)	14	pip/tazo (n=2), cefepime (n=1), ertapenem (n=1), ertapenem + imi/cil (n=1), imi/cil + pip/tazo (n=1), pip/tazo + micafungin (n=1), tob + gent (n=1)
SSTI	6 (15%)	11	vanco (n=3), ceftaroline (n=1), ceftriaxone (n=1), dpt (n=1)
BJI	5 (12%)	18	vanco (n=2), vanco + ceftriaxone (n=1), cefazolin (n=1), ceftriaxone (n=1)
Surgical Site Infection	4 (10%)	13	vanco (n=2), vanco + cefazolin (n=1), ceftriaxone (n=1)
GUI	2 (5%)	13	ceftazidime (n=1), dpt (n=1)
Respiratory Infection	2 (5%)	11	aztreonam (n=1), doripenem (n=1)
Abscess	1 (2%)	21	ertapenem (n=1)
CNS Infection	1 (2%)	20	ceftriaxone (n=1)
Prosthetic Device Infection	1 (2%)	26	vanco, dpt (n=1)

*; Abbreviations; dpt: daptomycin, gent: gentamicin, imi/cil: imipenem/cilastatin, pip/tazo: piperacillin/tazobactam, tob: tobramycin, vanco: vancomycin; +, concomitant therapy.

- Among all unplanned hosp admissions, bacteremia (27%), IAI (20%) and SSTI (15%) were the most frequent infections with a mean length of OPAT (LOT) of 12, 14, and 11 days, respectively.
- The 3 most frequently used intravenous drugs were vancomycin (n=11, 27%), ceftriaxone (n=8, 20%) and daptomycin (n=6, 15%).

Table 4. Potential Predictors for 30-Day Hosp Admission

Potential Risk Factor	OR	95% CI	P value
Age ≥ 60 years	1.58	0.838 to 2.995	0.156
Bacteremia	**2.93**	**1.403 to 6.158**	**0.004**
Co-morbidities ≥ 3	1.39	0.708 to 2.757	0.333
Diabetes	0.83	0.399 to 1.740	0.627
Federally-funded health insurance	1.28	0.665 to 2.491	0.453
Malignancy	1.12	0.534 to 2.347	0.764
Obesity	0.64	0.318 to 1.276	0.204
Prior 6-month hospitalization	**2.13**	**1.119 to 4.053**	**0.036**
Vancomycin	1.28	0.627 to 2.640	0.492

- Significantly increased odds for hosp admissions within 30 days of OPAT were found for pts with bacteremia (OR=2.93, 95% CI:1.403 to 6.158, p=0.004) and prior 6-month hospitalization (OR=2.13, 95% CI: 1.119 to 4.053, p=0.036).

DISCUSSION

It has become critically important to develop efforts in reducing hosp readmissions [1-3]. However, little is known about hosp admissions following OPAT. This retrospective multicenter study examined data from 600 pts (mean age: 57 years, 48% female) receiving OPAT in 10 nationwide ID-POICs over a 6-month time period:

- Overall hosp admission rate was 6.8%, as 41 of 600 pts were admitted to the hosp within 30 days of OPAT initiation. Of those, 32 pts (7.9%) were readmitted to the hosp within 30 days of discharge whereas 9 pts (4.9%) were admitted to the hosp without prior stay (POIC-initiated OPAT).
- Positive predictors with significantly increased odds of being admitted to the hosp within 30 days were bacteremia (OR=2.93, 95% CI: 1.4 to 6.1; p=0.004) and prior 6-month hospitalization (OR=2.13, 95% CI: 1.1 to 4.0; p=0.036).
- Nearly 60% of all unplanned hosp admissions were for worsening infections, 22% for reasons unrelated to primary infection, 12% for new infections and 7% for device-related issues.
- Among all hosp admissions, the most frequent diagnosis were bacteremia (27%), IAI (20%) and SSTI (15%). The 3 most prescribed antimicrobials were vancomycin (27%), ceftriaxone (20%), and daptomycin (15%).

The results indicate a substantially lower 30-day hosp admission rate for OPAT pts than previously reported (26%) [3]. In contrast, data for this study were compiled from 10 nationwide ID-POICs including both previously hospitalized and non-hospitalized pts over a 6-month time period. Furthermore, OPAT was solely provided through POICs excluding care from traditional home health care. Future studies incorporating more pts over an extended period of time are warranted to better identify risk factors and prevention efforts for hosp admissions following OPAT.

CONCLUSION

POIC-based OPAT resulted in a low unplanned hosp admission rate of 6.8%. Bacteremia and prior hospitalization were identified risk factors for admission following OPAT. Overall data suggests that provision of OPAT in a POIC provides optimal therapy with a high potential to prevent costly admissions and return hospital visits.

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