Outpatient Parenteral Antimicrobial Therapy at Large Veterans Administration Medical Center

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Objectives: To evaluate our outpatient parenteral antimicrobial therapy (OPAT) program to determine its impact on infection management in a facility notable for high patient comorbidity and a large catchment area that includes most of Southern California.

Study Design: Retrospective chart review.

Methods: We reviewed all episodes of patients receiving OPAT from our institution from 2006 through 2009 for patient utilization characteristics and assessment of complications.

Results: A total of 333 patients received 393 courses of OPAT for a mean of 21.1 days. Diabetes mellitus (53.5%), psychiatric disease (39%), and chronic kidney disease (31%) were common; more than half the patients lived more than 20 miles from our medical center. Osteomyelitis (39.7%) and bacteremia (19.3%) accounted for the majority of OPAT indications. *Staphylococcus aureus* (36.4%) was the most frequent infecting organism, and vancomycin (37.4%) was the most frequently prescribed medication. Complications including hospital readmission, adverse drug reactions, or line-related complications were noted in 96 of 393 (24.4%) episodes, but most were minor, reversible, or not directly related to the OPAT given. Serious line-related complications that required hospital readmission were noted in only 6 (1.5%) episodes. OPAT was completed as planned in 313 (79.6%) episodes; end-stage renal disease was associated with OPAT noncompletion in multivariable analysis (odds ratio = 2.20, P = .047). We estimated that OPAT saved our medical center $4 million per year.

Conclusions: Despite our patients' high level of comorbidity and our facility's large catchment area, we were able to deliver OPAT successfully and safely with significant cost savings.

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First described in 1974,[1] outpatient parenteral antimicrobial therapy (OPAT) has become integral in decreasing duration of hospitalization and reducing healthcare costs. Outpatient parenteral antimicrobial therapy facilitates hospital discharge for patients who would otherwise require ongoing hospitalization for the sole purpose of receiving intravenous antibiotics. Prolonged hospital stays have been associated with an increased risk of nosocomial infections,[2] including hospital-acquired pneumonia, catheter-related bloodstream infections (CR-BSIs), and *Clostridium difficile*–associated diarrhea. One study estimated that an average hospital stay is associated with a 17.6% chance of infection and that each additional day of stay increases this risk by 1.6%.[3] Another study estimates that, when it occurs, nosocomial infection further multiplies length of stay by a factor of 2.87.[4] Furthermore, increased lengths of hospitalization have been associated with deconditioning[5] and have been shown to predict poor functional outcomes in the elderly.[6] While few prospective studies evaluating outcomes of OPAT versus continued inpatient therapy have been performed, retrospective data have demonstrated comparable rates of treatment success.[7,8] The purpose of this study is to review our program's utilization data to determine rates of OPAT completion and related complications in a population with a substantial rate of background comorbidities.

METHODS

Study Design and Patient Selection

The Department of Veterans Affairs Greater Los Angeles Healthcare System (VAGLA) OPAT program was established in 2003. Our OPAT team consists of an infectious diseases faculty attending physician, an infectious diseases fellow, an infectious diseases pharmacist, and a home health coordinator. The majority of patients in our cohort were initially hospitalized at VAGLA for their illness and subsequently identified by their healthcare providers as potential candidates for OPAT. A small percentage of OPAT patients were referred from clinics or initially hospitalized at outside facilities. The final decision to administer OPAT, as well as antibiotic selection and duration, was made only after consultation with the OPAT team, who reviewed all OPAT requests for

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Take-Away Points

Outpatient parenteral antimicrobial therapy (OPAT) improves patient convenience and decreases hospital stay for patients requiring long-term parenteral antimicrobials.

- OPAT can be delivered safely in populations with significant comorbidity and in facilities that serve large catchment areas.
- Involvement of a pharmacist trained in infectious diseases was important for our program's success.

appropriate selection and duration of antimicrobial therapy, typically in consultation with the infectious diseases consulting service for OPAT candidate inpatients at VAGLA. The Department of Veterans Affairs Greater Los Angeles Healthcare System arranges fee-basis services with home infusion pharmacies and nursing agencies for the delivery of antimicrobials and nursing services over a broad catchment area extending as far north as Bakersfield, as far west as San Luis Obispo, as far south as Orange County, and as far east as the San Gabriel Valley. The decision about whether the antimicrobial is to be self-administered by the patient or administered by a healthcare professional is made after a collective evaluation by home healthcare professionals and the OPAT team; both types of patients were included in the analysis.

All patients who received OPAT through our program between January 1, 2006, and December 31, 2009, were identified. Patient data from this period were collected from the VA Computerized Patient Record System. Extracted data included patient diagnosis and demographics (including medication copay status, with "exempt" status serving as a surrogate marker for limited financial means, based on a yearly income of approximately $12,000-$25,000 according to the patient's number of dependents), medical comorbidities, zip code where patient received OPAT, antibiotics received, duration of treatment, microbiology, and information pertaining to complications and readmissions. We excluded patients who were discharged to community nursing homes, primarily because detailed records from these facilities were not available through the VA Computerized Patient Record System.

Complications during OPAT were recorded, including all-cause readmission, any line-related complaint, any adverse drug event consisting of a laboratory result or subjective complaint attributable to an administered antibiotic, or death. Acute kidney injury was defined as an increase in glomerular filtration rate of more than 50% above the recorded value at time of hospital discharge (if hospitalized) or at initiation of OPAT (if outpatient). Leukopenia was defined as an absolute white blood cell count of less than 4000/μL. The decision to continue, switch, or terminate therapy following an adverse drug event was made on an individualized basis by the infectious diseases and OPAT team. We defined a line-related complication as any adverse event pertaining to intravenous access, ranging from self-limited insertion site irritation to readmission for line-related sepsis. We further stratified these complications by assigning a severity grade ranging from 1 (least severe) to 3 (most severe). Complications that were self-limited and ultimately had no impact on duration and route of therapy were assigned a severity grade of 1. Complications that resulted in a truncated duration of intravenous therapy or change in route of administration were assigned a severity grade of 2. Complications that required hospitalization due to CR-BSI or exit site infections were assigned a severity grade of 3. We specifically chose to differentiate patients with a severity grade of 3 from patients readmitted due to a line-related complication, as several patients were briefly admitted solely for peripherally inserted central catheter (PICC) placement after a mechanical complication (eg, PICC line displaced). Using our grading system, these patients would receive a severity grade of 1 despite being readmitted due to a line-related complication.

We defined treatment completion as a patient who received a course of outpatient intravenous antibiotics for the duration prescribed at the onset of therapy. Patients who required a switch to an alternative intravenous agent (eg, due to an adverse drug event) but who still completed the prescribed course length were also counted as completions. Patients who required a switch to oral medications or had intravenous therapy stopped early due to OPAT complication, or who were admitted for any reason during their OPAT course, were counted as incomplete treatments. Logistic regression analysis of OPAT noncompletion was performed with Stata release 10 (StataCorp LP, College Station, Texas).

An informal cost analysis was conducted by subtracting outpatient costs related to OPAT from the projected costs of continued hospitalization. The cost of OPAT was determined by adding per diem nursing visit charges, cost of antibiotics (provided by contracted pharmacy), and per diem pharmacy charges. The projected inpatient cost was calculated by adding the total inpatient antimicrobial cost (VA price) and cost of continued hospitalization (average daily bed cost multiplied by total hospital days). The projected length of hospitalization was obtained by assuming that patients would have remained hospitalized for the duration of IV therapy.

RESULTS

Patient Enrollment and Demographics

From 2006 to 2009, 393 OPAT courses were received by 333 individual patients (Table 1). Average age was 62 years, and mean duration of outpatient treatment was 21.1 days (range, 0-88 days; interquartile ratio, 9-30 days). A total of 37 (9.4%) OPAT courses were referred from an outside facility and 41 (10.4%) OPAT courses were referred from an outpatient clinic within our system, 22 of which were from the infectious diseases clinic. Initial and/or ongoing infectious diseases consultation was obtained in 274 (69.7%) OPAT courses. Medical comorbidities were frequent in our population, particularly diabetes mellitus (53.5%), psychiatric disease (39.0%), congestive heart failure (38.7%), coronary artery disease (31.5%), and chronic kidney disease with estimated glomerular filtration rate of less than 60 mL/min (30.9%). A total of 27 (8.1%) patients had end-stage renal disease (ESRD), defined as an estimated glomerular filtration rate of less than 15 mL/min and/or receipt of hemodialysis at the time of OPAT initiation. Most (253/333, 76%) patients had limited financial means (as determined from exemption from VA copay), and 205 (62%) lived more than 20 miles away from our facility.

Table 1. Demographics and Comorbidities of 333 Patients Receiving OPAT, 2006 to 2009

Characteristics	Number (%)
Male	328 (98.5)
Female	5 (1.5)
Caucasian	179 (53.8)
African American	86 (25.8)
Hispanic	51 (15.3)
Asian/Pacific Islander	11 (3.3)
Other/unknown	6 (1.8)
VA copay exempt	253 (75.7)
VA copay nonexempt	81 (24.3)
Diabetes mellitus	178 (53.5)
Hypertension	253 (76.0)
Chronic kidney disease	
GFR 61-90 mL/min	120 (36.0)
GFR 31-60 mL/min	69 (20.7)
GFR ≤30 mL/min	34 (10.2)
ESRD (GFR <15 mL/min or hemodialysis)	27 (8.1)
Coronary artery disease	105 (31.5)
Congestive heart failure	129 (38.7)
Psychiatric diagnosis[a]	130 (39.0)
HIV positive	15 (4.5)
Distance from VAGLA, miles	
<5	22 (6.6)
5-10	16 (4.8)
10-20	90 (27.0)
20-40	84 (25.2)
40-80	52 (15.6)
>80	69 (24.0)

ESRD indicates end-stage renal disease; GFR, glomerular filtration rate; HIV, human immunodeficiency virus; OPAT, outpatient parenteral antimicrobial therapy; VA, Department of Veterans Affairs; VAGLA, VA Greater Los Angeles Healthcare System.
[a]Includes depression, anxiety disorder, posttraumatic stress disorder, schizophrenia, or any primary diagnosis made by psychiatry.

Diagnosis and Microbiology

Principal diagnoses were made by the physicians initiating the OPAT consult, with additional assistance from infectious diseases and the OPAT team. The most common indication for OPAT was osteomyelitis of the foot (113/393, 28.8%), which most commonly occurred in diabetic patients (Table 2). The second-leading diagnosis was bacteremia, which included both primary and secondary bacteremia (76/393, 19.3%) Other common indications included nonfoot osteomyelitis (43/393, 10.9%) and soft tissue infections (40/393, 10.2%).

The most commonly isolated pathogen was *Staphylococcus aureus* (143/393, 36.4%), of which 80 of 143 (56%) were methicillin-resistant *S aureus*. Other frequently isolated microorganisms included *Streptococcus* species (50/393, 12.7%) and *Pseudomonas aeruginosa* (38/393, 9.7%). In 92 of 393 courses (23.4%), treatment was given empirically in the absence of an isolated pathogen or relevant culture.

The most commonly prescribed antibiotics were vancomycin (147/393, 37.4%), ceftriaxone (109/393, 27.7%), and ertapenem (79/393, 20.1%). In 50 of 393 (12.7%) OPAT courses, patients were treated with 2 intravenous agents simultaneously.

Complications

Complications related to OPAT were noted in 96 of 393 (24.4%) episodes (Table 3). The major categories of complications were hospital readmission, adverse drug events, and PICC-related complications.

Readmissions. The most common complication was readmission, which occurred in 49 of 393 (12.5%) episodes. Of these 49 admissions, 13 (26.5%) were deemed to be unrelated to either OPAT or the underlying infectious process. Excluding these unrelated hospitalizations, our overall hospital readmission rate was 36 out of 393 (9.2%). Of the 36 potentially relevant readmissions, 9 were due to PICC-related complications and 8 were due to adverse drug events. Readmission due

Table 2. Clinical Characteristics of 393 Infections for Which OPAT Was Prescribed (2006-2009)

Clinical Characteristics	Number	%
Diagnosis		
Osteomyelitis (foot)	113	28.8
Bacteremia	76	19.3
Primary	56	14.2
Secondary	20	5.1
Osteomyelitis (nonfoot)	43	10.9
Soft tissue infection	40	10.1
Prosthetic joint infection	36	9.2
Urinary tract infection	22	5.6
Endocarditis	21	5.3
Foreign body infection not otherwise specified	14	3.6
Pneumonia	13	3.3
Intra-abdominal abscess	13	3.3
Other[a]	24	6.1
Infecting organism	**Number**	**% Courses**
Staphylococcus aureus	143	36.4
Methicillin resistant	80	20.4
Methicillin susceptible	63	16.0
Streptococcus species	50	12.7
Pseudomonas aeruginosa	38	9.7
Escherichia coli	29	7.4
Coagulase-negative staphylococci	19	4.8
Other	94	24.9
More than 1 organism	52	13.2
No organism identified (ie, empiric treatment)	92	23.4
Antibiotic prescribed	**Number**	**%**
Vancomycin	147	37.4
Ceftriaxone	109	27.7
Ertapenem	79	20.1
Cefepime	25	6.4
Cefazolin	17	4.3
Oxacillin	11	2.8
Gentamicin	9	2.3
Penicillin G	9	2.3
More than 1 antibiotic	50	12.7

[a]Other infections include foreign body infection not otherwise specified (n = 14), neurosyphilis (n = 7), cytomegalovirus retinitis and/or viremia (n = 5), urologic infection (n = 3), central nervous system infection (n = 3), fungemia (n = 3), pulmonary papillomatosis (n = 2), and cutaneous leishmaniasis (n = 1).

to "failure to improve" while receiving OPAT occurred in 15 cases. Four patients were rehospitalized at outside facilities; in these cases, records were not sufficiently detailed to reliably determine the cause for hospitalization. One of these 4 patients subsequently expired during this hospitalization; the cause of death was unclear due to paucity of records.

Adverse Drug Events. Overall, 40 of 393 (10.2%) courses were notable for an adverse drug event, resulting in shortening of OPAT (including switches to oral antimicrobial therapy) in 29 of those 40 (72.5%) courses. The most commonly encountered events were acute kidney injury (11/40, 27.5%), pruritus/rash (10/40, 25%), and leukopenia (7/40, 17.5%).

Table 3. Complications Associated With 393 OPAT Courses, 2006 to 2009

Complication	Overall Number	%
Readmission	**49**	**12.4**
Failure to improve on OPAT	15	3.8
Not related to OPAT	13	3.3
Related to PICC	9	2.3
Related to adverse drug event[a]	2.0	
Unknown reason	4	1.0
Adverse drug event	**40**	**10.2**
Acute kidney injury	11	2.8
Rash/pruritus	10	2.5
Leukopenia	7	1.8
GI/diarrhea (non-CDAD)	6	1.5
CDAD	2	0.51
Other	4	1.0
Line-related complications	**25**	**6.4**
Grade I	13	3.3
Grade II	6	1.5
Grade III	6	1.5
Noncompletion of OPAT	**80**	**20.4**
Readmission	49	12.5
Switch to oral antibiotics	20	5.1
Antibiotics discontinued altogether	8	2.0
Switch to different OPAT regimen	2	0.5
Death	1	0.25

CDAD indicates Clostridium difficile–associated diarrhea; GI, gastrointestinal; OPAT, outpatient parenteral antimicrobial therapy; PICC, peripherally inserted central catheter.

Vancomycin accounted for 40% of all adverse drug events recorded during the study period, followed by ertapenem (20%) and ceftriaxone (17.5%). However, when expressed as a percentage of total courses administered, an adverse drug event was recorded in 16 of 146 (11%) courses of vancomycin, 7 of 79 (8.9%) courses of ertapenem, and 8 of 109 (7.3%) courses of ceftriaxone. The most common adverse drug event due to vancomycin was acute kidney injury (8/16), followed by leukopenia (4/16). In 5 of the cases of acute kidney injury, a clinical decision was made to discontinue vancomycin. The overall rate of acute kidney injury in patients receiving vancomycin was 5.5% (8/146). In all cases, acute kidney injury in patients receiving vancomycin was reversible and did not result in any permanent sequelae.

Line-Related Complications. Our overall line-related complication rate was 6.4% (25/393) over the 4-year study period. The majority were related to PICC (22 of 25 cases), with the 3 remaining complications due to peripheral intravenous line placement. The most commonly reported line-related complications were mechanical in nature (occlusion/accidental displacement) and accounted for 9 of 25 events. Of these 25 events, 6 were self-limited local reactions (erythema, tenderness), and therapy was not interrupted in any of these cases. Six bloodstream infections attributed to line-related complications were diagnosed.

Of the 25 line-related complications, 13 were deemed grade 1, 6 were grade 2, and 6 were grade 3. Therefore, our rates of minor, moderate, and major line-related complications were, respectively, 3.3%, 1.5%, and 1.5%. In all 6 cases of moderate line-related complications, venous access was discontinued prior to the scheduled end date after evaluation by the infectious diseases or OPAT service, and transition to oral therapy was deemed to be appropriate.

Of our 6 major line-related complications, an organism was isolated from the bloodstream in 5 cases: vancomycin-resistant *Enterococcus facecium*, *Staphylococcus epidermidis*, *Candida albicans*, *Klebsiella* species, and *Enterococcus faecalis*. In the sixth case, CR-BSI was diagnosed based on high clinical suspicion despite no bloodstream isolate (possibly due to

prior administration of antibiotics). In 2 cases, it was not clear whether bacteremia stemmed from a PICC line or hemodialysis catheter. Because CR-BSI due to PICC line could not be ruled out in either instance, these episodes were designated as major line-related complications. All 6 patients had their PICC and/or hemodialysis catheters removed, and all but 1 had their intravenous antimicrobials discontinued.

All in all, rates of PICC complications decreased from 2006 to 2009 (8.4% to 4.5%), though the χ^2 test for trend was not significant.

Completion Rate

Of 393 courses of OPAT, 313 were completed, giving an overall completion rate of 79.6%. Of the 80 patients with incomplete treatments, 49 were readmitted, and 1 patient was admitted to an outside facility and died of unknown causes before completing OPAT treatment as described above. In all cases of incomplete treatment due to readmission, the patient received appropriate intravenous antibiotics while hospitalized and the need for further antimicrobial therapy was assessed by the OPAT team at time of discharge. Of the remaining 30 noncompletions of OPAT, 20 were changed early to oral antibiotics, 8 had antibiotics discontinued altogether, and 2 were changed to a different OPAT regimen (Table 3).

To determine whether any factors were associated with noncompletion of OPAT, we performed bivariate logistic regression using most of the demographic data from Table 1 and the clinical diagnosis and antibiotic data from Table 2. Those factors that approached or met statistical significance included bacteremia (odds ratio [OR] = 1.82; P = .040), concomitant congestive heart failure (OR = 1.64; P = .051), and concomitant ESRD (OR = 2.59; P = .015). When these 3 variables were combined in a multivariable model, only ESRD remained significantly associated with OPAT noncompletion (OR = 2.20; P = .047).

Informal Cost Analysis

The total cost of OPAT was $2,178,569 ($450,934 for antibiotics provided by contracted pharmacy plus $832,200 in per diem pharmacy charges plus $895,435 in per diem nursing charges). Projected inpatient cost savings were calculated by adding what our OPAT antibiotics would have cost if they had been given in an inpatient setting (we calculated this figure to be $234,637; VA prices are generally lower than contract pharmacy prices) to the estimated cost of continued hospitalization (average daily bed cost multiplied by total hospital days). Creating estimations regarding hospital days saved can be problematic, as patients who remain hospitalized (as opposed to receiving OPAT) may theoretically transition to oral therapy at some point and/or be discharged home. However, we can infer that patients are enrolled into OPAT specifically because an infectious diseases specialist has determined that the patient requires intravenous antibiotics for the duration of their treatment. We made the crude assumption that each day of outpatient therapy represented 1 saved day of hospitalization; using that metric, OPAT was responsible for a reduction of 8322 days in additional hospitalization over 4 years. Our hospital administrators estimate that a day of inpatient hospitalization costs $2198. Thus, a total of $18,526,393 (8322 days –$2198 per day + $234,637 in drug costs) in hospitalization costs were potentially averted. As such, overall estimated cost savings with OPAT were $16,347,824 ($4,086,956 per year, $41,598 per OPAT episode).

DISCUSSION

In this retrospective study, we demonstrate that OPAT can be delivered effectively and safely for a cohort of patients with a high acuity of illness, advanced age, and multiple baseline comorbidities. Our completion rate of ~80% is lower than that reported in other data sets, which is likely a result of the high number of all-cause hospital readmissions. All readmitted patients were evaluated by the OPAT service upon discharge, and there was significant heterogeneity in treatment course postdischarge (eg, continuation of OPAT, transition to oral therapy) depending on length of hospital stay or change in clinical status. Therefore, we considered *all* patients who were readmitted (regardless of cause) to have incomplete treatment. A significant number of patients were admitted because of "failure to improve" on OPAT; however, given the significant baseline comorbidities of our patient population, it is possible that many of these cases represent the natural progression of a disease state and not treatment failure per se.

Any analysis of an OPAT program must include the 2 most common complications of extended intravenous antimicrobial therapy: line-related complications and adverse drug events. In a cohort of 2059 OPAT episodes over a 13-year period, Matthews and colleagues[9] reported (for self-administered and healthcare professional–administered OPAT, respectively) overall complication rates of 24% and 23%, readmission rates of 10.5% and 12.6%, vascular device complication rates of 1% and 0.5%, and drug adverse-event rates of 12%. Our 4-year experience was similar to these findings, other than a higher frequency of line complications. However, our rates of line-related complications did decrease annually from 2006 to 2009. We believe that this decrease was partially due to several OPAT protocol changes implemented in 2007: (1) a telephone follow-up was performed on the day following discharge to ensure proper implementation of OPAT by pharmacy and nursing agencies; (2) weekly phone

calls were made to the patient with the express purpose of troubleshooting and to ensure compliance with lab monitoring; and (3) increased allowances were made for nursing visits for PICC dressing changes. Of note, only 1 episode of line-related venous thrombosis (brachial vein thrombus) was diagnosed in our study. The reported incidence of catheter-related thrombotic complications has varied, depending on the patient population studied, catheter location, and diagnostic modalities utilized. In a retrospective analysis of 2063 patients who received a PICC for intravenous antibiotics, the incidence of venous thrombosis was 2.5% with a mean time to diagnosis of 18.7 days. Deep venous thromboses slightly outnumbered superficial thromboses (55.8% vs 44.2%), and pulmonary embolism was diagnosed in 2 patients.[10] We have no explanation for our unusually low rates of venous thrombosis complications. The potentially subclinical nature of venous thrombosis is, of course, recognized. Nevertheless, a low rate of venous thromboses portends favorably for avoiding the potentially life-threatening complication of pulmonary embolism.

Our overall rate of adverse drug events was 10.2%, which is similar to what has been previously reported in the literature.[9] Although more patients had adverse events with vancomycin than with other commonly used agents in our study, vancomycin's overall ratio of adverse events to courses received was similar to that of the other agents. In a multicenter series from 1997 through 1999 following 1053 episodes of outpatient vancomycin administration, adverse events were reported in 11.3% of patients, with rash being the most common (3% of all episodes). A "renal toxic reaction" was encountered in 1.5% of all courses.[11] While the total number of adverse drug events due to vancomycin approximates that reported in previous studies, our *proportion* of vancomycin-associated acute kidney injury was higher (5.5%). We postulate that our higher rate of vancomycin-related acute kidney injury may be related to our protocol of aiming for high goal vancomycin troughs (15-20 mg/L) for the treatment of invasive *S aureus* infection, an approach advocated by recent guidelines issued by the Infectious Diseases Society of America, the American Society of Health-System Pharmacists, and the Society of Infectious Diseases Pharmacists.[12] The relationship between elevated vancomycin troughs and nephrotoxicity admittedly remains a subject of debate, as many studies are limited by concomitant nephrotoxic agents, varying definitions of nephrotoxicity, and an inability to determine whether an elevated trough leads to nephrotoxicity or vice versa.[12,13]

It is unclear why ESRD was associated with OPAT noncompletion in our study, but this association likely speaks to the complexity of illness of this particular patient population and potential issues related to hemodialysis access that should prompt further study. Also, a majority of our ESRD population receives hemodialysis outside of our system, so coordination of care may have been an issue as well.

Our OPAT experience may differ from others for a variety of reasons. Most notably, the advanced age and high background rate of comorbidites of the average VA patient may not reflect the general population encountered by other OPAT programs. In fact, it is conceivable that patients with similar profiles might routinely be transferred to a skilled nursing facility to complete their antibiotic therapy. Cox and colleagues[14] previously demonstrated in a series of 205 patients that OPAT could be self-administered to older adults with a rate of efficacy and safety similar to that of the comparator arm of younger patients. Our data support this option as a means to complete intravenous antibiotic therapy without institutionalization in a short-term healthcare facility. In addition, our data demonstrate the ability to deliver OPAT over a wide catchment area, as nearly 65% of our patients who received OPAT lived more than 20 miles from our facility. Our patients also benefit from an integrated healthcare system with longitudinal follow-up from initial point of care; this design increases adherence and may reduce rates of OPAT-related complications. Furthermore, our OPAT program enjoys the benefit of a full-time infectious diseases pharmacist who has primary responsibility for coordinating services between home health nursing, laboratory services, pharmacy, and multiple physicians (inpatient, prescribing, and outpatient primary care). The value of a centralized coordinator who can tie together the issues of infectious diseases and pharmacology cannot be overstated.

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