Open Forum Infectious Diseases

MAJOR ARTICLE

OPTIONS-DC: Treatment Course Outcomes Following Outpatient Parenteral Antimicrobial Therapy RN–Led Multidisciplinary Care Conferences for People Who Use Drugs Hospitalized With Complex Infections

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Background. Care of people who use drugs with infections and recommendations for long-term intravenous (IV) antimicrobials can be challenging. OPTIONS-DC is a multidisciplinary care conference developed in 2018 that utilizes a standardized conference tool led by outpatient parenteral antimicrobial therapy (OPAT) registered nurses (RNs) to guide treatment and discharge planning while focusing on harm reduction, ethical principles, and patient preferences. We describe treatment outcomes associated with OPTIONS-DC over the first 4 years of implementation.

Methods. Eligibility for OPTIONS-DC included history of substance use and recommendation for ≥10 days of IV antimicrobials. Conference data were collected prospectively; treatment course outcomes were collected retrospectively via a REDCap database.

Results. A total of 229 conferences were conducted for 202 unique patients between February 2018 and April 2022. Median conference length was 28 (interquartile range [IQR], 23.8–33.0) minutes. Median age was 38 years, 214 (93.5%) had active substance use, and 77 (33.6%) were houseless. The median recommended antimicrobial duration was 6 (IQR, 4–6) weeks. A total of 172 (75.1%) patients completed their antimicrobial course (80 [46.5%] inpatient and 92 [53.5%] outpatient). Average out-of-hospital antimicrobial days was 28.7 (standard deviation, 19.6). On multivariate analysis, having a primary care provider at the time of conference was associated with treatment completion (odds ratio, 4.50 [95% confidence interval, 1.55–13.07]; $P < .01$).

Conclusions. The OPAT RN–led OPTIONS-DC discharge planning conference is associated with high antimicrobial course completion rates, out-of-hospital completion, and out-of-hospital antimicrobial days.

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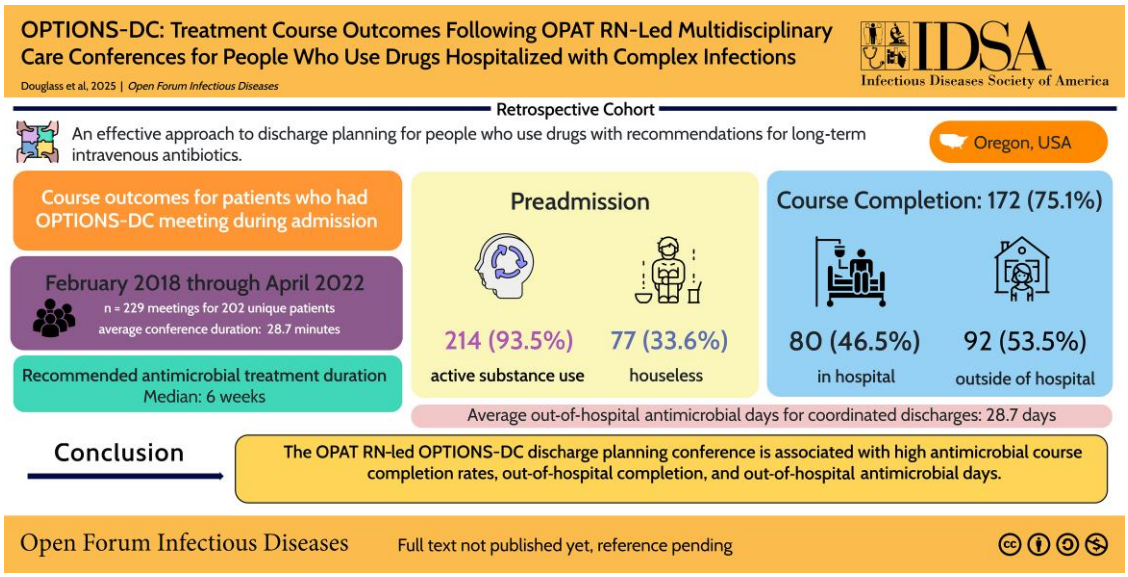
Graphical Abstract



This graphical abstract is also available at Tidbit: https://tidbitapp.io/tidbits/options-dc-treatment-course-outcomes-following-opat-rn-led-multi-disciplinary-care-conferences-options-dc-for-people-who-use-drugs-hospitalized-with-complex-infections

Keywords. before medically advised discharge; infection; OPAT; people who use drugs; substance use disorder.

Hospitalizations among patients with substance use disorders (SUDs) who have serious infections, including osteomyelitis, bloodstream infections, and endocarditis, are rising in the United States and in Oregon [1]. Recommended treatments for these infections often include a long course of intravenous (IV) antimicrobials, which can create medical, logistical, and ethical challenges in discharge planning.

COMPLEXITY OF DISCHARGE PLANNING

Patients with SUD often encounter stigma when engaging with the healthcare system. Perceived or actual stigma creates mistrust and has led persons who use drugs (PWUD) to delay seeking medical care and downplay pain, resulting in decreased medical treatment completion and poorer outcomes [2, 3]. Stigma also contributes to the inflexibility of potential discharge settings, such as home infusion, given concerns of ongoing substance use during treatment or misuse of IV access [4, 5]. Stigma and discrimination toward people with SUD may affect acceptance to skilled nursing facilities (SNFs) solely based on an opioid use disorder diagnosis, even though this is a violation of the Americans with Disabilities Act [4]. Consequently, PWUD are often required to stay in the hospital for prolonged treatment courses, which, combined with the stigma experienced in this setting, places them at increased risk for discharging before medically advised (BMA) and avoiding necessary care [6, 7]. One promising approach to address stigma around substance use is the incorporation of harm reduction. In the hospital setting, harm reduction includes navigating therapeutic (and in some cases, non–standard of care) options with PWUD by allowing patient autonomy in treatment approaches when they best align with the patient's goals around their medical care.

Challenges and ethical considerations of discharging PWUD with peripherally inserted central catheters (PICCs) include concern for central line–associated bloodstream infections in those who continue to inject nonsterile substances [8]. When considering outpatient parenteral antimicrobial therapy (OPAT) for PWUD, providers and staff express concern about treatment nonadherence, challenging social circumstances, and safety [8]. However, data continue to emerge demonstrating that OPAT/IV antimicrobial completion and complication rates are similar for people who inject drugs (PWID) in outpatient versus inpatient settings [4], which questions if the constraints on the treatment options for PWUD are necessary in all cases. After meeting program-specific criteria for OPAT enrollment, Ho et al [9] reported a 96.5% completion rate for 29 PWID. Similar results came from research by D'Couto et al [10] with 81.0% completion in OPAT for 17 PWID who were discharged to a home setting.

The focus of concern is typically substance use, but safe OPAT also relies on socioeconomic factors such as stable housing, access to transportation, and a working phone [11], which can be barriers for PWUD entering into these programs [12]. In particular, housing status prior to admission plays a substantial role in coordinating safe discharges. Unhoused PWID in OPAT are at increased risk for line complications and

readmissions when compared to housed PWID and people who do not inject drugs, both housed and unhoused [13]. Logistical and ethical considerations for OPAT should also be examined for those who do not inject drugs [7], as poor care and management of the central line or limited access to necessary OPAT components, such as transportation, can occur with any patient being considered for OPAT. The risks of OPAT for PWUD should focus on broader socioeconomic complexities and barriers, of which substance use is a single risk in a myriad of safety considerations.

OPTIONS-DC AND HOW IT WORKS

Oregon Health & Science University (OHSU)'s infectious diseases (ID) consult sevice, addiction consult service (ACS), and OPAT program developed the OPTIONS-DC conference (hereafter OPTIONS-DC), a structured multidisciplinary discharge planning conference, to address complex discharge planning for patients with SUD being treated for serious infections [14]. OPTIONS-DC incorporates harm reduction to allow for inclusion of patient preferences in treatment planning with a goal to improve clinical outcomes. The meeting was initially held in hospital conference rooms, but since the start of the coronavirus disease 2019 (COVID-19) pandemic, has transitioned to a virtual setting. The core meeting participants include OPAT, ID consult service, ACS (if consulted), primary team, care management, and social work (SW); all members of these services at our institution participate in the conferences. During OPTIONS-DC introduction, participants are encouraged to utilize harm reduction language, focus on safe patient care, and hold ethical principles of beneficence, nonmaleficence, paternalism, and autonomy [14] central to the discussion.

Requirements for OPTIONS-DC are (1) formal ID consult; (2) diagnosis of serious infection with recommendation for long-term IV antimicrobials (≥10 days); and (3) active drug use (within 90 days) or substance use history with high-risk factors for return to use. Examples of high-risk factors may be a new complex pain regimen, having a partner with active drug use, and houselessness, etc. Any member of the care team can request or join an OPTIONS-DC. A premeeting standardized community PICC safety assessment is performed by an ACS or unit SW before the OPTIONS-DC [15]. This assessment reviews patient desires for their treatment setting and weighs protective and risk factors including substance use history, connection with medical community, discharge BMA history, home environment, and other factors that may contribute to unsafe conditions if the patient were to discharge with a PICC line. From these instrumental assessments, the SW recommends home/community, SNF, or hospital; however, OPTIONS-DC meeting participants use shared decision making to propose final setting options.

OHSU's ACS is a robust interprofessional service including addiction medicine physicians, advanced practice providers, SWs, and peer mentors with lived experience in recovery as described in earlier work [16–18]. The OHSU OPAT program is comprised of registered nurses (RNs) whose primary role is ambulatory OPAT patient care, an ID-trained pharmacist, a medical assistant, and ID physicians. Each OPTIONS-DC discusses 1 unique patient and is scheduled ad hoc by the ACS admin or OPAT RN within days of request. Each conference is facilitated by an OPAT RN who performs premeeting chart review; moderates the conference using a standardized conference template; provides OPAT input, guidance, and education; summarizes the meeting in the electronic medical record (EMR); and manages any outstanding tasks from the meeting. The ID consult service physician co-signing the conference note verifies the accurate representation of the complex medical recommendations. We report outcomes for the first 4 years of conducting OPTIONS-DC at our institution.

METHODS

Data Collection

We retrospectively reviewed the EMR of patients at 2 academic hospitals in Portland, Oregon, who had OPTIONS-DC between February 2018 and April 2022. OPTIONS-DC were documented prospectively using the standardized conference template (Supplementary Table 1) that melds complex medical and coordination/logistical recommendations into a cohesive plan, typically with several treatment/setting options listed in order of medical and/or patient preference. Data were collected via a REDCap database. R version 3.3.2 (R Core Team, 2016) was used for statistical analysis.

At the time of the OPTIONS-DC and via the conference template we prospectively collected patient demographics, ID diagnosis and treatment recommendations, active or nonactive substance use history, SUD treatment history, medical/discharge decisions made during the meeting, and other conference details. Details on nicotine and marijuana use were not collected in this study. For patients seen by the ACS, details regarding substance use, route of use, and risk/protective factors around use were collected in structured ACS notes and recorded in the meeting template. We considered any medication prescribed by the ACS for treatment of SUD as medication for addiction treatment (MAT) even if not US Food and Drug Administration approved for the condition. Data collection for infection type included all sites of infection listed by the ID consult team as being treated with the prolonged antimicrobial course without priority for primary or secondary sites of the infection.

We retrospectively collected discharge setting; discharge antimicrobial modality (IV, oral, long-acting injectable [LAI]); changes to the antimicrobial plan after discharge; completion

of planned follow-up visits; emergency department visits and hospital readmissions for patients on IV or LAI; and antimicrobial course outcomes, classified as completed course, did not complete course, or oral antimicrobials with unconfirmed course completion. Course completion was defined as confirmed completion of >95% of the recommended duration, irrelevant of changes of antimicrobials during course. For oral antimicrobials, completion was confirmed based on explicit documentation in the EMR, otherwise it was documented as unconfirmed course completion. Discharge setting was defined as the location where the patient resided immediately after discharge.

Data Analysis

The dataset underwent preprocessing to recode and categorize variables, including conference details, discharge settings, and antimicrobial regimens. Housing status and discharge location were reclassified into hierarchical categories. Descriptive statistics summarized patient demographics, infection types, substance use patterns, discharge locations, and course outcomes.

A multivariate logistic regression model was developed to identify significant predictors of successful antimicrobial treatment completion, which in this model also included oral antimicrobials with unconfirmed completion. Predictors included age, home environment prior to admission, presence of a personal working phone, duration of the antimicrobial course, presence of active substance use, types of substances used (heroin, amphetamines, alcohol), MAT initiation during hospitalization, and mental health diagnosis. The modality of antimicrobial administration post–care conference and the initial discharge location were also evaluated as predictors.

To manage multicollinearity, a stepwise backward elimination approach was applied. The initial model included all candidate variables, followed by iterative removal of nonsignificant predictors based on changes in the Akaike information criterion. The process continued until the most parsimonious model with the lowest Akaike information criterion was achieved. The final simplified model retained the following variables: age, primary care provider (PCP) at the time of OPTIONS-DC, modality of antimicrobial administration, and discharge location.

RESULTS

Two hundred twenty-nine OPTIONS-DC were conducted during individual hospitalizations for 202 unique patients during the study period. Patients' median age was 38 years and 133 (58.1%) were male (Table 1). Seventy-seven (33.6%) patients were houseless prior to admission and 127 (55.5%) had a confirmed working phone at the time of the OPTIONS-DC. One hundred twenty-nine (56.3%) patients had a PCP assignment in the EMR at the time of the OPTIONS-DC, and this increased to 200 (87.3%) by hospital discharge.

Table 1. Characteristics of 229 Conferences for 202 Individual Patients, February 2018 and April 2022

Characteristic	No. (%)
Demographics	
Age, y, median (IQR)	38 (32–49)
Male sex	133 (58.1)
Mental health diagnosis	167 (72.9)
Houseless prior to admission	77 (33.6)
Personal working phone at time of OPTIONS-DC	127 (55.5)
Primary care provider at time of OPTIONS-DC	129 (56.3)
Substance use disorders	
Active substance use	214 (93.5)
Active intravenous substance use	172 (75.1)
On MAT prior to hospitalization	28 (12.2)
MAT initiated during hospitalization	135 (59.0)
Active substances used	
Methamphetamine	183 (79.9)
Heroin	167 (72.9)
Alcohol	30 (13.1)
Other (eg, psychedelics, benzos)	14 (6.1)
Fentanyl	8 (3.5)
Cocaine	8 (3.5)
Primary and metastatic sites of infection present (>1 possible per patient)[a]	
Bloodstream infection	150 (65.5)
Osteomyelitis	113 (49.3)
Vertebral, including epidural abscess	71 (31.0)
Nonvertebral	42 (18.3)
Infective endocarditis	87 (38.0)
Pulmonary infection	35 (15.3)
Septic arthritis	34 (14.9)
Deep muscle abscess or myositis	31 (13.5)
Skin and soft tissue infection	22 (9.6)
Central nervous system infection	21 (9.2)
Device-related infection	10 (4.4)
Other site of infection	19 (8.3)

Data are reported as No. (%) unless otherwise indicated.

Abbreviations: IQR, interquartile range; MAT, medication for addiction treatment.

[a]Inclusive of bloodstream infections, 45 (19.7%) patients had 1 site of infection, 102 (44.5%) patients had 2 sites of infection, 59 (25.8%) patients had 3 sites of infection, 17 (7.4%) patients had 4 sites of infection, and 6 (2.6%) patients had 5 sites of infection.

Most patients, 214 (93.5%), had active substance use and 172 (75.1%) endorsed active IV substance use. Polysubstance use was common with 167 (72.9%) endorsing heroin use, 183 (79.9%) methamphetamine use, and 30 (13.1%) alcohol use. One hundred thirty-five (59.0%) patients initiated MAT for SUD during their hospitalization while another 28 (12.2%) were already on MAT and continued throughout their hospitalization.

A majority of cases had a bloodstream infection (65.5%) and multiple sites of infection (80.3%) (Table 1). Almost all had at least 1 deep-seated focus of infection necessitating prolonged antimicrobial treatment with median treatment duration recommendations at time of the OPTIONS-DC of 6 weeks (Table 2). When organized by a hierarchy of deep-seated foci of infection based on intensity of antimicrobial therapy generally recommended for curative treatment, >80% of patients had

Table 2. Infections Impacting Antimicrobial Duration

Characteristic		No. (%)
Treatment duration		
Recommended treatment duration by ID consult service prior to OPTIONS-DC, wk, median (IQR)		6 (4–6)
Primary OPAT infection diagnosis (single diagnosis per patient)		
Endocarditis		87 (38.0)
Osteomyelitis without endocarditis		99 (43.2)
BSI without endocarditis or osteomyelitis		23 (10.0)
Other site of infection without endocarditis, osteomyelitis, or BSI		20 (8.7)
Organisms in blood cultures in cases with a BSI	Endocarditis[a] (n = 87)	BSI without endocarditis[b] (n = 72)
Methicillin-susceptible *S aureus*	28 (32.2)	31 (43.1)
Methicillin-resistant *S aureus*	39 (44.8)	32 (44.4)
Streptococci	13 (14.9)	7 (9.7)
Enterococci	6 (6.9)	1 (1.4)
Gram-negative rods	3 (3.5)	2 (2.8)
Candida spp	0 (0.0)	2 (2.8)
Other	4 (4.6)	4 (5.6)

Data are reported as No. (%) unless otherwise indicated.

Abbreviations: BSI, bloodstream infection; IQR, interquartile range; OPAT, outpatient parenteral antimicrobial therapy.

[a]Seventy-seven cases had 1 organism in the blood cultures; in 5 cases there were 2 organisms; in 2 cases there were 3 organisms; and in 3 cases there were 0 organisms (culture-negative endocarditis).

[b]Sixty-eight cases had 1 organism in the blood cultures; in 1 case there were 2 organisms; and in 3 cases there were 3 organisms.

either endocarditis with or without osteomyelitis (38.0%) or osteomyelitis without endocarditis (43.2%), with 62.8% of the osteomyelitis cases involving the vertebrae. A vast majority of the bloodstream infections, with or without endocarditis, were caused by *Staphylococcus aureus* (Table 2). There was a small number of polymicrobial bloodstream infections, although it could not be determined from the information available to the investigators if all cultured organisms in these cases were clinically relevant pathogens.

OPTIONS-DCs averaged 28.7 minutes (ranged from 10–56 minutes) in duration, with 134 (58.5%) completed as virtual meetings (Table 3). Attendance was >90% for OPAT RNs, ID consult service, and ACS providers and >75% for ACS SWs, care management, and primary service providers. SW Community PICC Safety Assessments were completed for 198 (86.5%) patients prior to the conference. Outcomes of OPTIONS-DC led to a change in the original recommended antimicrobial management plan for 165 (72.1%) patients. In many cases multiple changes were made, the most common being a change in treatment setting in 145 (63.3%) or antimicrobial choice/route in 121 (52.8%). Only 5 (2.2%) had a change in treatment duration. In a small minority of cases, 14 (6.1%), a multidisciplinary group had to formally reconvene at a subsequent date to discuss outstanding discharge planning items that could not be addressed due to information not available at the time of the OPTIONS-DC.

Overall, 172 (75.1%) patients had confirmed successful completion of their antimicrobial course (Table 4). Of these, 80 (46.5%) received their last dose of antimicrobials while in the hospital, and in 21 (26.3%) this was given as single dose of an LAI to complete their course, although these patients continued to be followed by our OPAT team until the antimicrobial was presumed to be out of their system. Another 92 (53.5%) completed the antimicrobial course outside of the hospital. Of these, 52 (56.5%) received daily IV antimicrobial courses, 28 (30.4%) had course completion after receiving LAI doses in the outpatient setting, and 12 (13.0%) had a confirmed oral antimicrobial course completion (Table 5). An additional 31 patients (representing 13.5% of the entire cohort, 33.7% of the outpatient courses, and 54.4% of the 57 courses without successful confirmed completion) discharged on an oral antimicrobial regimen without explicit documented completion. These cases were not counted as successful treatment completions although many may have taken the entire oral course. If all unconfirmed outpatient oral antimicrobial courses were successfully taken, the overall antimicrobial course completion rate would be 88.6% (n = 203). Of those who discharged to an out-of-hospital setting to complete the antimicrobial course, completion of therapy occurred in 50 (76.9%) of those who discharged to their home or a family/friend's home, 17 (77.3%) of those who discharged to an SNF, 16 (61.5%) of those who discharged to temporary housing (hotel, shelter, residential SUD treatment, transitional housing), and 4 (16.0%) of those who left the hospital BMA or were administratively discharged (Table 5).

Average out-of-hospital antimicrobial days for courses completed in the outpatient setting was 28.7 (standard deviation, 19.6). Out of 141 recommended, 81 (57.5%) completed ID outpatient follow-up. Median emergency department/readmission rates at 6 months and 1 year post–hospital discharge were 2 and 3, respectively.

Table 3. OPTIONS-DC Data and Influence on Plan (N = 229 Conferences for 202 Individual Patients)

Characteristic	No. (%)
Days into admission of OPTIONS-DC, average ± SD	12.9 ± 9.2
Length of OPTIONS-DC, min	
Median (IQR)	28 (23.8–33.0)
Mean ± SD	28.7 ± 7.8
Virtual meeting	134 (58.5)
Present at conference	
OPAT registered nurse	227 (99.1)
ID consult team provider	222 (96.9)
ACS consult team member	210 (91.7)
ACS social worker	203 (88.7)
ACS consult team provider	196 (85.6)
ACS peer	106 (46.3)
Case manager	187 (81.7)
Primary team provider	175 (76.4)
OPAT pharmacist	150 (65.5)
Floor registered nurse	3 (1.3)
Other (unit/psych social worker, student, ethics committee, etc)	87 (38.0)
PICC assessment completed at time of OPTIONS-DC	198 (86.5)
PICC assessment discharge setting recommendations (multiselect)	
Hospital/acute care	103 (52.0)
Skilled nursing facility/care facility	67 (33.8)
Community/home	65 (32.8)
No PICC line	2 (1.0)
Management plan changed during OPTIONS-DC (multiselect)	165 (72.1)
Change in antimicrobial choice/route	121 (52.8)
Change in antimicrobial duration	5 (2.2)
Change in antimicrobial treatment setting	145 (63.3)
Second formal multidisciplinary meeting to finalize planning not completed at OPTIONS-DC	14 (6.1)

Data are reported as No. (%) unless otherwise indicated.

Abbreviations: ACS, Addiction Consult Service; ID, infectious diseases; IQR, interquartile range; multiselect, >1 result possible for each case; OPAT, outpatient parenteral antimicrobial therapy; PICC, peripherally inserted central catheter; SD, standard deviation.

On multivariate analysis, having a PCP at the time of the care conference was significantly associated with a higher likelihood of successful treatment completion, with an odds ratio (OR) of 4.50 (95% confidence interval [CI], 1.55–13.07]; $P < .01$). In contrast, patients discharged BMA had significantly lower odds of treatment success, with an OR of 0.14 (95% CI, .04–.52; $P < .01$).

DISCUSSION

Despite significant disease complexity and structural determinant of health vulnerabilities, along with stigma and additional coordination efforts for PWUD, OPTIONS-DC data suggest that a structured, harm reduction–based, and OPAT RN–led multidisciplinary care model can support successful completion of prolonged antimicrobial courses. The 75% antimicrobial treatment completion rate is likely an underestimate and completion rates could have been as high as 88% if all courses of oral antimicrobials were completed. Additionally, more than half of OPTIONS-DC patients successfully completed their course in the outpatient setting, saving an average of >4 weeks of hospitalization per patient compared to completing therapy during hospitalization. Finally, just over 10% of patients had a BMA discharge. Although the retrospective and nonrandomized nature of the study means causality between OPTIONS-DC and these outcomes is unknown, all of these are notable associations given that published literature frequently reports lower antimicrobial course completion rates, higher rates of BMA discharge, and prolonged hospitalizations in this complex patient population.

Many antimicrobial treatment plans were changed during OPTIONS-DC. Some changes were likely driven by the default treatment setting prior to OPTIONS-DC being inpatient for antimicrobial course completion, so any change to an outpatient plan for part of the course led to a setting change. However, this also highlights what we hypothesize to be one of the greatest strengths of this multidisciplinary conference in that it places the burden of medical decision making on no one provider, freeing all providers to be less risk averse in recommendations and more supported to incorporate patient goals into treatment planning according to harm reduction principles. In the case of antimicrobial choice/route, we hypothesize that ID providers were given support both to choose non–standard of care options and to avoid the "easiest" option and instead to choose the best option in the context of a patient's overall care needs, weighing of all the potential risks, protective factors, and benefits as determined in the multidisciplinary discussion.

Regarding treatment completion rates, there are nuances of the program and data reporting that should contextualize interpretation. First, we categorized the use of LAI given inpatient to complete the treatment course as inpatient completion, even if that dose stayed in the patient's system as active therapy for 1–2 weeks after discharge. Almost half of our LAI completed courses (42.9%) were given in this way with the patient discharging shortly thereafter. In some settings, values-based decisions by the healthcare system create barriers to use of LAI in the inpatient environment, which may create challenges to implementation. Second, we only reported a course of oral antimicrobial as successfully completed if that completion was confirmed in medical records, and we defined course completion as >95% of doses completed. This is a stringent definition; many studies use a lower number of planned doses or less explicit documentation that oral doses were taken to define completion. Additionally, because patients are frequently given oral antimicrobial courses that are taken to completion without formal documentation in the EMR, our overall treatment completion rate is likely an underestimate and more likely that number is between 75% and 88%. In the multivariate model developed,

Table 4. Treatment Plan Outcomes

Outcome	No. (%)
Completion of antimicrobial course	
Yes	172 (75.1)
Completed course outpatient	92 (53.5)
Completed course inpatient	80 (46.5)
LAI dosed before discharge to complete	21 (26.3)
No	26 (11.4)
Died during course	3 (1.3)
Orals with unconfirmed completion	31 (13.5)

Initial discharge location to complete antimicrobial outside of the hospital	Discharged to setting prior to completion of antimicrobials (n = 147)	Completed LAI inpatient then discharged to setting (n = 21)
Own home	33 (22.5)	7 (33.3)
Family/friend's home	32 (21.8)	1 (4.8)
Skilled facility	22 (15.0)	1 (4.8)
Temporary/respite housing	26 (17.7)	7 (33.3)
BMA/administrative discharge	25 (17.0)	3 (14.3)
BMA	21 (14.3)	3 (14.3)
Administrative discharge	4 (2.7)	0 (0.0)
Houseless	6 (4.1)	1 (4.8)
Incarceration/unknown	3 (2.0)	1 (4.8)
Discharged prior to completion of antimicrobials	147 (64.2)	
Outpatient changes in treatment plan subsequently coordinated by OPAT RNs	43 (29.3)	
Change in setting	16 (10.9)	
Change in antimicrobial	27 (18.3)	
From non-IV to IV	3 (11.1)	
To oral	10 (37.0)	
To LAI	7 (25.9)	
IV to another IV	7 (25.9)	
PCP assigned at time of discharge	200 (87.3)	
ID follow-up visit completion	81 (57.5)	
Total out-of-hospital antimicrobial days for coordinated discharges, average ± SD	28.7 ± 19.6	
ED visits during OPAT course per record	26 (21.7)	
Related to OPAT	17 (65.4)	
Readmissions during OPAT course per record	21 (17.5)	
Related to OPAT	13 (61.9)	
ED visits for any reason 6 mo after discharge, median (min, max)	2.00 (0, 40.0)	
Readmissions and/or ED visits for any reason 1 y after discharge, median (min, max)	3.00 (0, 69.0)	

Data are reported as No. (%) unless otherwise indicated.

Abbreviations: BMA, before medically advised; ED, emergency department; ID, infectious diseases; IV, intravenous; LAI, long-acting injectable; OPAT, outpatient parenteral antimicrobial therapy; PCP, primary care provider; RN, registered nurse; SD, standard deviation.

because 3 different outcomes for course completion were not feasible, we chose to count the oral courses with unconfirmed completion (13.5% of the courses) as being successfully completed, which likely impacted the modeling results.

Regarding the multivariate model output, the statistically significant association with PCP and treatment completion is promising as this adds to other literature findings in OPAT populations that having a PCP was associated with fewer hospital readmissions [19]. There is a possible causal connection between an established PCP and the ability to successfully navigate complex inpatient to outpatient transitions, although it is possible that a listed PCP was also a marker of less overall structural vulnerability. We suspect that many hypothesized predictors of treatment completion, such as houselessness or lack of phone, were not significant in the model due to multiple predictors with collinearity, which limited the ability of the model to detect an association in a cohort of this size.

By inserting OPAT RNs as central leaders in OPTIONS-DC, plans are guided by intricate OPAT knowledge and followed with nuanced understanding of the overall situation by OPAT RNs as the patient transitions out of the hospital. The alternate plans made in OPTIONS-DC remain a roadmap for course treatment as the OPAT RN remains involved with patient care and course management until course completion. Table 4 illustrates that post–hospital discharge, 16 (10.9%) patients who did not complete their course in the hospital had a setting change

Table 5. Treatment Completion by Antimicrobial Therapy and Discharge Location

Treatment Completion	Completed Therapy	Did Not Complete Therapy	Oral Antimicroials With Unconfirmed Completion	Total
Type of antimicrobial therapy[a]				
At least daily IV antimicrobials	52 (88.1)	5 (8.5)	2 (3.4)	59
LAI (inpatient)	21 (95.5)	1 (4.5)	0 (0.0)	22
LAI (outpatient)	28 (71.8)	7 (17.9)	4 (10.3)	39
Hospital setting for course	59 (79.7)	12 (16.2)	3 (4.1)	74
Oral antimicrobials	12 (34.3)	1 (2.9)	22 (62.9)	35
Total	172	26	31	229
Discharge location[b]				
Own home	24 (72.7)	4 (12.1)	5 (15.2)	33
Family/friend home	26 (81.3)	2 (6.3)	4 (12.5)	32
Skilled facility	17 (77.3)	2 (9.1)	3 (13.6)	22
Temporary/respite housing	16 (61.5)	4 (15.4)	6 (23.1)	26
BMA/administrative discharge	4 (16.0)	10 (40.0)	11 (44.0)	25
Other/unknown	8 (88.9)	0 (0.0)	1 (11.1)	9
Total	95	22	30	147

Data are presented as No. (%).

Abbreviations: BMA, before medically advised; IV, intravenous; LAI, long-acting injectable.

[a]Three deceased are accounted for in the "did not complete therapy" column.

[b]One patient in BMA/administrative discharge died during course and was therefore placed in the "did not complete" category.

during their outpatient course, while 27 (18.3%) had changes to their antimicrobial regimens during their course. Of the 25 patients who left the hospital BMA or by way of administrative discharge, 4 (16.0%) had successful course completion and 11 (44.0%) had an oral antimicrobial regimen with unconfirmed completion, some of whom likely completed. These successes are likely attributed to the care coordination and expertise of the OPAT RNs and the contingency plans made during the OPTIONS-DC. These midcourse interventions also illustrate why lack of access to a working phone is the only universal hard stop for admittance to our OPAT program.

Our study has several limitations. This study involved 2 academic institutions, 1 urban medical center and 1 smaller partner hospital, that have robust OPAT programs and ACS and may not be generalizable to other institutions. OHSU also has access to several transitions of care programs not illustrated in OPTIONS-DC data, which may additionally support at-risk patients at our institution by following patients after discharge and/or providing them with a phone [20]. OHSU also has a unique SNF Reserved Bed Program that holds a certain number of beds for patients with SUD or houselessness who might otherwise be denied SNF placement, though their insurance benefits fund most of their stay. Many OPTIONS-DC patients who discharge to SNF do so within the Reserved Bed Program. Future research includes completion of data analysis of records from 2022 to present, assessing outcomes pre/post-COVID-19, including evaluation of fentanyl use and outcomes, understanding how other components of the OHSU health system impact treatment success in addition to OPTIONS-DC, and implementing the OPTIONS-DC model at other institutions with less robust ACS and OPAT programs.

CONCLUSIONS

OPTIONS-DC, an OPAT RN–led multidisciplinary discharge planning conference for PWUD with recommendations for long-term antimicrobials structured around harm reduction principles, is associated with high antimicrobial treatment completion rates, low BMA discharge rates, and high out-of-hospital antimicrobial days. Although the data published here are from a 4-year period, implementation of this care model at an academic healthcare system has been feasible and sustainable over a 6-year period.

As infections and hospitalizations in PWUD increase, OPTIONS-DC is an example that specialized disciplines can be utilized in a collaborative approach to advance holistic patient care and support positive patient outcomes. By having OPAT RNs central to OPTIONS-DC, medical and nonmedical needs can be melded to create comprehensive and patient-centered discharge plans that can be followed and honored throughout the entire treatment course in a significant majority of patients.

Supplementary Data

Supplementary materials are available at *Open Forum Infectious Diseases* online. Consisting of data provided by the authors to benefit the reader, the posted materials are not copyedited and are the sole responsibility of the authors, so questions or comments should be addressed to the corresponding author.

Notes

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Ethics approval. All methods were carried out in accordance with relevant guidelines and regulations/Declaration of Helsinki. A waiver of informed consent was granted by the Oregon Health & Science Institutional Review Board due to minimal risk of the retrospective review. This study was approved by the Oregon Health & Science University Institutional Review Board.

Potential conflicts of interest. All authors: No reported conflicts.

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