Improving Outcomes in Persons Who Inject Drugs: A Multidisciplinary Healthcare Initiative

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Improving Outcomes in Persons Who Inject Drugs:

A Multidisciplinary Healthcare Initiative

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The University of San Francisco, School of Nursing and Health Professions

N789/Qualifying Project

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In closing, this DNP project is lovingly dedicated to the memory of my late nephew, who, in early 2021, at the age of 28, lost a hard-fought battle with opioids. His passing underscored the urgent need for advocacy and societal changes in the wake of the current opioid epidemic. Healthcare providers play a critical role in addressing this crisis. I hope this DNP project inspires others to explore novel models of care that can improve the health and well-being of those with substance use disorders and injection drug use.
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Abstract

**Background:** Outpatient parenteral antimicrobial therapy is the standard of care for patients who require long-term antimicrobial therapy but is not considered a safe discharge option for persons who inject drugs (PWID). Many PWID leave against medical advice before completing therapy, resulting in high emergency department utilization and frequent readmissions.

**Local Problem:** A 646-bed academic and Level I trauma center where opioid overdoses are 6.5 times higher than the state average experiences disproportionately high PWID admissions. Prolonged hospitalization for the duration of antimicrobial therapy increases costs and reduces access for other acute care patients.

**Methods:** A prospective cohort of PWID discharged to a hospital-based clinic for supervised OPAT was compared to a similar cohort of patients admitted during the intervention period. The primary outcome was the completion of antimicrobial therapy. A two-way t-test, chi-square, and Fisher’s exact test were used to determine statistical significance (p < 0.05) between the two groups.

**Interventions:** A multidisciplinary team developed tools and processes to aid in the early identification and referral of PWID for treatment supported by infectious disease, addiction medicine, and other wrap-around services. Eleven patients received supervised OPAT in a hospital-based clinic.

**Results:** Twenty-seven non-intervention and 11 intervention patients were evaluated. Nine of 11 (82%) intervention patients completed therapy. PICC lines were present in four (40%) of the intervention group. A total of 233 inpatient days were saved, with an estimated cost savings of nearly $1M.
**Conclusions:** Supervised OPAT, supported by wrap-around services, is a safe, cost-effective alternative to prolonged hospitalizations in PWID.

**Keywords:** addiction medicine, against medical advice (AMA), infectious disease, intravenous antimicrobial and addiction team (IVAT), outpatient parenteral antimicrobial therapy (OPAT), patient-directed discharge (PDD), peripherally inserted central catheter (PICC), persons who inject drugs (PWID), serious injection-related infection (SIRI), supervised outpatient parenteral antimicrobial therapy (SuPAT).
Promoting Health Equity in Persons Who Inject Drugs:
A Multidisciplinary Health Initiative

Background

The COVID-19 pandemic of 2020 illuminated social and economic inequities, structural biases, and systematic racism pervasive in the United States and brought forth an urgent call—if not a demand—to view healthcare delivery through a new and much sharper lens of “equity.” Equity in healthcare acknowledges the unique circumstance of each individual. Within that construct, healthcare organizations allocate resources to ensure the opportunity for all patients to attain their full health potential (Centers for Disease Control and Prevention, 2020). Given the new realities of a post-pandemic world, a 646-bed academic tertiary hospital in Northern California sought ways to improve care delivery to vulnerable populations, including a complex and fragile population of individuals who inject drugs. This population disproportionality encounters many upstream structural factors and social determinants of health due to substance use disorder, including homelessness, food insecurity, economic disenfranchisement, and estrangement from a supportive community and resources available therein (Alfandre & Geppert, 2019; Bearnot et al., 2019; Velez et al., 2017).

Persons who inject drugs (PWID) have a higher viral and bacterial infection rate than those who do not inject drugs. Serious bacterial infections common in this population include cellulitis, endocarditis, and osteomyelitis (Beiler et al., 2019; D’Couto et al., 2018; Suzuki et al., 2018). Medical treatment of these conditions requires long-term intravenous antibiotics for a clinical cure. Outpatient parenteral antimicrobial therapy (OPAT) is the standard for treating patients with these severe infections (Ho et al., 2010). The benefits of outpatient parenteral antimicrobial therapy include safety and cost-effectiveness; however, PWID are often excluded
(Vazirian et al., 2018). The disinclination to discharge PWID to OPAT ranges from concerns for loss to follow-up, legal liability, fear of line tampering, and overdose (Vazirian et al., 2018). Approximately 25-30% of hospitalized PWID are unwilling or unable to conform to the restrictions of an inpatient setting, leave against medical advice (AMA), and fail to complete therapy (Ti & Ti, 2015). Failure to complete therapy results in high emergency department (ED) utilization, increased readmissions, and increased morbidity and mortality (Choi et al., 2011; Suzuki et al., 2018).

This Doctor of Nursing Practice (DNP) project focused on creating a system-wide multidisciplinary approach to improve health outcomes and health equity in PWID, a vulnerable population with complex health needs. Key hallmarks of this project were the utilization of evidence-based tools and organizational resources (e.g., project management and clinical experts) to aid in the early identification and delivery of a structurally competent person-centered model of care grounded in equity and compassion (Metzl & Hansen, 2014).

**Problem Description**

In the United States, injection drug use (IDU) has increased during the past decade, with surveillance and public health data showing a shift in substance use from primarily the misuse of prescription opioids to the use of heroin and, most recently, to use of stimulants and synthetic opioids (Centers for Disease Control and Prevention, 2022). Bradley et al. (2023) estimated the number of PWID at 3,694,500 in 2018 using datasets on fatal and non-fatal injection drug overdoses from the Centers for Disease Control and Prevention, Federal Substance Abuse & Mental Health Services Administration, and National Center for Health Statistics. Persons who inject drugs (PWID) have a higher incidence of viral and bacterial infections, including cellulitis, endocarditis, and osteomyelitis, than the general population. Prolonged parenteral antibiotic
therapy is often required to achieve a clinical cure (D’Couto et al., 2018; Marks et al., 2019; O’Callaghan et al., 2019; Price et al., 2020; Suzuki, 2018). Infective endocarditis alone poses a significant economic burden to the healthcare system, with treatment cost for PWID with infective endocarditis in the state of North Carolina estimated at more than $50,000 per patient, for a total annual cost to the state healthcare system of $22.2 million in 2015 (Fleischauer et al., 2017).

Outpatient parenteral antimicrobial therapy (OPAT) is the standard for treating individuals requiring long-term antimicrobial therapy (Ho et al., 2010; O’Callaghan et al., 2019; Price et al., 2020; Tice, 1995). Most patients receive OPAT at home or in a community setting, such as a skilled nursing facility or infusion center (Gordon et al., 2011). The safety and efficacy of OPAT are well established; however, continued durable venous access, such as a peripherally inserted central catheter line, is required (Gordon et al., 2011; Ho et al., 2010; Tice, 1995). The continued need for durable vascular access is a significant reason PWID are excluded from consideration for OPAT. The objective rationale for exclusion is the concern for legal liability due to anticipated line tampering or recreational use of the line, with consequences of line complications, overdose, or death (Vazirian et al., 2018). The disinclination to discharge PWID to OPAT can be complicated by provider bias in consideration of economic and social barriers, from unstable housing to poor health literacy or lack of empathy for the precarity of unhoused persons (Alfandre & Geppert, 2019; Beieler et al., 2019; Ho et al., 2010; Norris et al., 2019; Price et al., 2020; Suzuki et al., 2018; Vazirian et al., 2018). Discharge to a skilled nursing facility is challenging as few facilities are willing to accept PWID. Refusals to treat PWID, coupled with widespread facility closures or inadequate staffing from COVID-19 outbreaks,
have further compromised the ability to discharge PWID to a safe setting (D’Couto et al., 2018). As a result, PWID are often restricted to inpatient care for the duration of their therapy.

Prolonged hospitalization increases costs and reduces timely access to the fewer beds available for other acute care patients. The average duration of antimicrobial therapy for patients with infective endocarditis is between two and six weeks, with an average of 21 days (S. Cohen, personal communication, October 24, 2021). Other than their need for daily antimicrobial therapy, PWID are usually clinically stable for discharge (Alfandre & Geppert, 2019; Jafari et al., 2015), which makes extended inpatient hospitalization for PWID with infective endocarditis particularly challenging. These patients are typically younger and more mobile than patients discharged to receive home OPAT and more likely to be resentful of restrictive practices imposed during hospitalization, which can lead to conflict between the patients and the care teams.

Consequently, approximately 25–30% of PWID leave AMA and fail to complete therapy (Ti & Ti, 2015). Failure to complete treatment creates a cycle of high ED utilization, increased readmissions, and increased morbidity and mortality (Suzuki et al., 2018). According to Choi et al. (2011), patients who leave AMA tend to be homeless, have other comorbid conditions, including intravenous drug use, and are at 12 times greater risk for readmission within 14 days of the index admission with the same related illness. Moreover, individuals who left AMA had nearly double the frequency of readmissions and mortality from any cause over 12 months (Choi et al., 2011). Current evidence supports just and ethical treatment of PWID, including medications to help alleviate cravings and the stress and extreme discomfort associated with withdrawal to prevent AMA discharges and failure to complete therapy (Park et al., 2015).

Stigma-related care inequities imposed on persons with opioid use disorder admitted for an illness resulting from injection drug use may contribute to poor clinical outcomes observed
for these patients (Bearnot et al., 2019). Documented attitudes and beliefs by healthcare professionals when caring for persons with opioid use disorders include ascribing the associated diseases to an individual’s moral failure (Bearnot et al., 2019; Englander et al., 2018). To improve outcomes, health professionals’ negative attitudes toward PWID must be addressed (Alfandre & Geppert, 2019; Bearnot et al., 2019).

**Setting**

The setting for this DNP project was a 646-bed Level I trauma and academic teaching hospital with Magnet designation in Northern California. The medical center is the only Level I adult and pediatric trauma center for inland California and has a regional burn center. Within the medical center, there is a 112-bed Children’s Hospital. The Emergency Department (ED) totals 63,194 patient visits annually, with 29,841 inpatient admissions from the ED. The hospital has a Comprehensive Cancer Center and an extensive primary care network totaling 808,242 clinic visits annually (UC Davis Health [UCDH], 2022). As an academic teaching hospital, the organization has a School of Nursing and a School of Medicine. The workforce comprised of 1,789 faculty, 957 residents and fellows, 1,054 students, 2,964 nurses, 1,252 physicians, and another 11,799 full-time and part-time ancillary staff support the medical and academic mission of the organization. The hospital serves a 33-county catchment area that extends north to the Oregon border and east into Nevada.

**Specific Aim (Purpose)**

The project aim was to improve the completion of antimicrobial therapy in PWID from a facility baseline of 50 to 67% by implementing a hospital-wide clinical pathway promoting early screening, recognition, intervention, and discharge for continued parenteral antimicrobial therapy in a monitored outpatient setting by December 2022. The project engaged a multidisciplinary
team of infectious disease, addiction medicine, and other wraparound services to promote equitable, safe, cost-effective, compassionate, and patient-centered care.

Available Knowledge

PICO(T) Question

An intervention “formula” template (Melnyk & Fineout-Overholt, 2019, p. 44) was used to develop a population, intervention, comparison, outcome, and time (PICOT) question to guide the literature search for the DNP project. The PICOT question was: In persons who inject drugs (P), how does discharge to outpatient parenteral antimicrobial therapy (OPAT) supported with wraparound services, including addiction medicine, substance abuse navigators/counselors, and infectious disease specialists (I), compared to PWID who remain hospitalized (C) affect the successful completion of parenteral antimicrobial therapy (O) within three months of project implementation (T)?

Search Methodology

A literature search was conducted using PubMed, the Cochrane Database of Systematic Reviews, and the Cumulative Index of Nursing and Allied Health (CINAHL). The search terms included persons who inject drugs, outpatient parenteral antibiotic therapy, outpatient parenteral antimicrobial therapy, outpatient parenteral antibiotic therapy + intravenous drug, outpatient parenteral antimicrobial therapy + intravenous drug use, and peripherally inserted central catheter + intravenous drug use. These key terms yielded 15 articles that were obtained for review. A second search used the combinations of substance abuse, intravenous (MeSH) AND (bacterial infection OR antimicrobial OR antibiotic) AND harm reduction (injection drug users OR intravenous drug users OR IV drug users OR heroin) AND (antimicrobial OR antibiotic OR central line) AND (discharge) OR (left against medical advice), resulting in 23 additional
articles, for 38 total. Further studies relevant to this project were identified using a reverse search strategy. The inclusion criteria were full-text articles published in English from 2015 through 2020. Exclusion criteria were book chapters and articles outside the project scope, including Hepatitis C virus or HIV infections secondary to illicit drug use. All 38 studies were reviewed, for which 25 were rejected based on exclusion criteria or lack of direct relevance to the PICOT question. The 13 remaining studies were appraised using the Johns Hopkins Nursing Evidence-Based Practice Appraisal Tools (Dang & Dearholt, 2018) and presented in an Evidence Table (see Appendix A).

**Integrated Review of the Literature**

Three themes emerged from the review of evidence. First, the discharge of PWID to OPAT can provide a safe and effective alternative to care, even for homeless people (Price et al., 2020). However, patient selection requires thoughtful consideration to minimize the risk of harm (Marks et al., 2019; O’Callaghan et al., 2019). Incorporating a multidisciplinary team approach that includes infectious and addiction medicine experts improves the likelihood that a person will complete antimicrobial therapy in OPAT, remain engaged in addiction treatment, mitigate patient-directed discharges and elopements, and reduce healthcare utilization (Eaton et al., 2020; Fanucchi et al., 2019; Price et al., 2020; Serota et al., 2023).

Second, PWID are more likely to leave AMA (Ti & Ti 2015). The myriad contributing factors include acute withdrawal, suboptimal pain management, soft paternalism reflected in the hospital policies that prevent PWID from leaving the floor, and a general feeling of mistrust towards the healthcare system (Alfandre, 2009; Alfandre & Geppert, 2019; Eaton et al., 2020; Ti & Ti, 2015). Conversely, in-hospital methadone administration helps prevent AMA discharge (Ti & Ti, 2015).
Third, and perhaps most controversial, is the discharge of PWID to an outpatient setting with durable venous access, such as a peripherally inserted central catheter line. The evidence from the literature counters the long-held belief that PWID will use the line recreationally. The incidence of line tampering was rare; however, some sites elected to use tamper-evident tape or a locking device as an additional measure to discourage tampering behavior (Beieler et al., 2019; Ho et al., 2010; Price et al., 2020).

**Outpatient Parenteral Antimicrobial Therapy in PWID is Safe and Cost-Effective**

In a Level III-B retrospective cohort study, Vazirian et al. (2018) evaluated the safety of OPAT in PWID. The researchers reviewed the charts of all patients treated with OPAT from the Cleveland Clinic OPAT registry from 2013 to 2014. A total of 5779 charts were reviewed. The study aimed to test the hypothesis that patients with intravenous drug use on OPAT would have less favorable treatment outcomes than those without current intravenous drug use (Vazirian et al., 2018). Patients were screened for inclusion using ICD-9 billing codes and problem lists to identify patients with intravenous drug use via the intravenous route less than 30 days before hospital admission. Thirty-nine patients met the criteria for inclusion and were matched 1:3 with a control group based on age, sex, OPAT year, and diagnosis. Outcomes evaluated between the two groups included treatment failure, infection relapse, line infection, hospital readmission, number of ED visits, and 90-day mortality. The study findings concluded that patients with current intravenous drug use on OPAT did not have less favorable treatment outcomes than those who did not inject drugs, thus disproving the hypothesis (Vazirian et al., 2018).

Price et al. (2020) conducted a Level III-B retrospective study to evaluate a pilot program incorporating addiction treatment for 68 PWID in OPAT between April 1, 2018, and March 31, 2019. All patients admitted with complications from intravenous drug use that required long-
term antimicrobial therapy were reviewed for inclusion. Inclusion in the pilot required that patients had safe housing without others in the home who abused substances, must not have exhibited any violence while hospitalized, and agreed to keep all clinic appointments with an infectious disease physician and engage in active treatment for addiction. Only 20 patients met the criteria for inclusion. The pilot results demonstrated that 100% of the patients completed antimicrobial therapy at home. Six patients (30%) were readmitted within 30 days, and three (15%) relapsed. There were no overdoses, deaths, or central catheter line complications reported. The researchers concluded that with careful selection, OPAT is a safe treatment setting for PWID with serious infections when supported by addiction treatment (Price et al., 2020).

In 2016, the Intravenous Antibiotic and Addition Team (IVAT) at the University of Alabama at Birmingham, an 1157-bed tertiary care center, was created. The IVAT team provides a multidisciplinary approach to reduce inpatient length of stay (LOS) for intravenous antibiotic therapy and the cost of care for PWID (Eaton et al., 2019). In 2018, the IVAT team published a clinical report describing the implementation of an IVAT intervention, comprised of a 9-point risk-scoring tool, to help risk-stratify PWID for discharge to OPAT (Eaton et al., 2019). As described in this level V-B clinical report, the IVAT intervention tool scores PWID on (a) cravings, (b) home environment, (c) dual psychiatric diagnosis, (d) history of overdose, (e) relapse, (f) trauma, (g) use of multiple drugs, (h) family history of addiction, and (i) willingness to change. Patients scored as low risk (1-3 points) were discharged for the duration of antibiotic treatment and participation in outpatient addiction care. Medium and high-risk patients (4-6 and 7-9 points, respectively) remained as inpatients, offered group therapy and treatment with a partial opioid agonist if applicable, and assessed for discharge readiness. Analysis of the data comparing LOS and cost outcomes for PWID pre-and post-implementation
of the scoring tool (demonstrated a 33% lower direct cost per admission for the post-IVAT group and a decrease in LOS from 42 days to 22 days. Additionally, it was identified that patients with osteomyelitis had the most significant reduction in LOS, which declined by a median of 38.5 days (Eaton et al., 2019).

Studies by Marks et al. (2019) and Price et al. (2020) also reported improved patient outcomes for PWID in OPAT when inpatient addiction medicine consults are integrated with standard medical care in the inpatient setting. Fanucchi et al. (2019) conducted a pilot study featuring a novel pathway of care in persons with serious injection-related infections (SIRI) and opioid use disorder. Inclusion for participation in the pilot required greater than two weeks of IVAT and willingness to receive buprenorphine, a partial opioid agonist. During hospitalization, participants also received education on safe injection practices, the risk of peripherally inserted central catheter (PICC) line misuse, recognition and prevention of overdose, and proper use of naloxone. Once a patient was medically stable, a PICC line was placed. Patients were discharged to the outpatient setting for OPAT with continued office-based administration of buprenorphine supported by addiction counseling. Houseless patients were excluded. All patients (n=3) completed the required course of antimicrobial therapy. However, one patient became houseless after discharge, requiring readmission to the hospital to complete intravenous antimicrobial treatment. The three vignettes presented in this level V-A study provide additional insight into the complexity and challenges of treating PWID and help inform appropriate care models for this vulnerable population (Fanucchi et al., 2019).

Similar published studies also demonstrated improved outcomes in PWID when routine inpatient care was integrated with infectious disease and addiction medicine expertise for injection-related severe infections. In a level, III/B retrospective cohort study, Marks et al. (2018)
identified 125 patients admitted to Barnes-Jewish Hospital between January 2016 and January 2018 with drug or opioid use disorder and serious infections requiring prolonged antimicrobial therapy. Participants were identified using the *International Classification of Diseases, Tenth Revision* (ICD-10). Of the 125 patients in the study, 38 received an inpatient addiction medicine consult. The researchers found that addiction medicine consultations are associated with a significantly greater completion rate of antimicrobial therapy and fewer patient-directed discharges, elopements, and readmissions within 90 days of discharge (Marks et al., 2019).

Researchers at the University of Miami, Jackson Memorial Hospital, conducted a level III-A prospective cohort study evaluating the outcomes of PWID who received inpatient care utilizing an integrated care model with an infectious disease and addiction medicine team. The intervention featured a severe injection-related infection (SIRI) team that provided infectious disease and substance use disorder care during hospitalization and 90 days after discharge (Serota et al., 2018). Analysis showed that the SIRI team intervention group (n=59) had a 45% risk reduction for readmission within 90 days or death compared to the pre-SIRI intervention compared to historical controls (n=70). Additionally, the SIRI intervention patients were more likely to begin medication for opioid use disorder, complete antimicrobial therapy, and less likely to leave AMA (Serota et al., 2023).

The evidence from these studies reinforces the need for innovative and comprehensive care models that incorporate infectious disease and addiction medicine consultations early in treating admitted patients. Integrated interdisciplinary care teams can promote effective and timely transitions of PWID from the hospital to the outpatient setting for ongoing care, improving healthcare utilization in a challenging and complex patient population (Fanucchi et al., 2019; Marks et al., 2019; Serota et al., 2023).
To assess the safety and efficacy of OPAT for PWID, Suzuki et al. (2018) conducted a literature review that included ten studies and more than 800 patients with a recent history of intravenous drug use and referral to OPAT. The review identified the following: (a) home was the most common discharge location; (b) durable venous access in all studies was a central catheter line (except for one with a subclavian line); and (c) ports for access and treatment for substance use varied across the studies. Only one study required patients to be drug-free. Mortality was zero in seven of the ten studies; however, readmissions were greater than 20% in most studies. Suzuki et al. (2018) found that completion of antimicrobial therapy in PWID referred to OPAT was high, ranging from 72% to 100%, with an average duration of treatment between 18 and 42 days. The cost savings ranged between $11,700 and $25,000 per OPAT episode. The researchers concluded that OPAT outcomes for PWID were similar to those who did not inject drugs. Thus, OPAT for PWID can be an effective cost-reduction strategy without sacrificing patient safety (Suzuki et al., 2018).

**Effects of Discharge Location on Completion of Therapy**

Discharge disposition is an essential post-acute care consideration to support PWID completion of therapy and clinical outcomes. Beieler et al. (2018) and D’Couto et al. (2018) evaluated outcomes related explicitly to discharge disposition in PWID receiving OPAT. Beieler et al. (2018) examined the added complexity of care for PWID who are homeless. In a large Level III-B retrospective cohort study, the authors reviewed electronic medical record (EMR) data of hospitalized adults discharged from an urban facility OPAT program between January 1, 2015, and April 30, 2016 (n = 596). Data collection was performed using REDcap, a data-capturing software program linked to the EMR. The purpose of the study was to evaluate two primary exposures: patient-reported intravenous drug use and homelessness. The outcome of
clinical cure was defined as the completion of antibiotic therapy and the resolution of infection. The cure rates among participants with known outcomes (excluding patients lost to follow-up therapy) did not differ by group (p = 0.85). This study demonstrated that when patients remain engaged in care, OPAT can be effective in PWID and the homeless, with similar outcomes, but the loss of follow-up is a challenge (Beieler et al., 2019).

D’Couto et al. (2018) conducted a retrospective observational Level III-C study to assess the safety and effects of discharging PWID to receive OPAT at home, in a skilled nursing facility, or in a rehabilitation facility. The researchers used a centralized clinical database to identify hospitalized PWID with intravenous drug use in the preceding two years who were discharged between 2010 and 2015 to complete at least two weeks of parenteral antibiotics. Of the 52 patients who met the inclusion criteria, 21 were discharged home with OPAT, and the remaining 31 were discharged to a skilled nursing or rehabilitation facility for OPAT. Of PWID discharged to home OPAT, 81% (n = 17) completed therapy without complications, compared to only 64% (n = 20) of PWID released to skilled nursing or rehabilitation. The researchers suggested that carefully selected PWID would benefit from home OPAT as a safe and low-cost alternative to lengthy hospital stays and that discharge to a post-acute care facility may carry its risks (D’Couto et al., 2018).

The most recent Infectious Diseases Society of America Clinical Practice Guidelines reflect a less restrictive approach to completing parenteral antimicrobial therapy for select PWID (Norris et al., 2019). These clinical practice guidelines are appraised as Level IV-A based on the committees’ clinical expertise and the Grading of Recommendations, Assessment Development, and Evaluation scoring system. The consensus reached by the panel of experts recommends that home OPAT for PWID be made on a case-by-case basis (Norris et al., 2019).
**Opiate Withdrawal as a Driver of Patients Leaving the Hospital Against Medical Advice**

In a comprehensive and rigorous Level III-A systematic review, Ti and Ti (2015) used the Preferred Reporting Items of Systematic Reviews and Meta-Analysis to assess the literature examining hospital discharges against medical advice (AMA) in persons who use drugs. The review aimed to explore the prevalence and predictors of leaving AMA among persons who use drugs. Seventeen peer-reviewed studies conducted between 1997 and 2014 were included in the final analysis. The prevalence of leaving AMA ranged from 25 to 30%. The researchers concluded that leaving the hospital AMA is an increasing problem associated with myriad negative health consequences that are especially common in persons who use illicit drugs (Ti & Ti, 2015).

In a retrospective analysis, Eaton et al. (2020) evaluated patients admitted to a U.S. university hospital with injection-related infections from 2016 to 2017. The purpose was to identify motivating factors for a person with suspected or confirmed in-hospital intravenous drug use to leave against medical advice, which the researchers termed “patient-directed discharge.” Of the 83 patients who met the inclusion criteria, 28 (34%) were confirmed as having in-hospital intravenous drug use, 12 (14%) had patient-directed discharge, 9 (11%) had died, and 12 (14%) were readmitted within 30 days. Using McNemar’s test and logistic regression, the researchers identified that in-hospital drug use was common and significantly associated with patient-directed discharge, 30-day readmission, and death. The study brings to light essential safety considerations regarding in-hospital intravenous drug use.

**Safe Discharge to OPAT with a Peripherally Inserted Central Catheter Line**

Ho et al. (2010) conducted a Level III-A prospective observational study at a large international hospital. The study aimed to evaluate the outcomes of patients with intravenous
drug use discharged to OPAT with a central catheter line. Between January 2005 and December 2009, 29 patients were enrolled in the OPAT service. A security seal was placed over the central catheter line access port to prevent tampering. Twenty-eight of the 29 participants (96.9%) completed therapy without evidence of breakage of the tamper-proof seals. The researchers concluded that patients with intravenous drug use discharged to OPAT with a central catheter line could be safely treated when a tamper-proof seal is used when counseling is provided and patients are closely monitored. This finding is consistent with the works of Price et al. (2020) and Beierle et al. (2019).

**Summary/Synthesis of the Evidence**

The studies selected to guide this project highlight the need to develop alternative care delivery methods that are less restrictive, utilizing a multidisciplinary approach to care that is equitable and person-centered. The safety of discharge to OPAT was evaluated in seven primary studies, one clinical report, and one systematic review. The researchers found OPAT safe and cost-effective in PWID, including the homeless. Three studies discuss the ethical consideration of discharge to OPAT with long-term durable venous access in place. Recreational use of the line or line tampering in all three studies was rare. Two studies utilized tamper-evident tape to discourage this behavior. One study employed a risk stratification methodology to determine discharge safety with a peripherally inserted central catheter (Beierle et al., 2019; Camsari & Libertin, 2017; Ho et al., 2010). Finally, incorporating multidisciplinary teams that included addiction medicine and infectious disease experts was associated with improved outcomes completion of the therapy, reduced healthcare utilization and mortality (Eaton et al., 2020; Fanucchi et al., 2019; Marks et al., 2019; Price et al., 2020; Serota et al., 2023).
In summary, the studies selected to guide this DNP project aligned well with the organizational goals and available resources at this single-site academic medical center, thus contributing to the project’s success. Additionally, the processes implemented to improve health equity while ensuring safe and compassionate care were bolstered by the organization's principles of relationship-based care and culture of inquiry supported by the evidence to guide quality improvement initiatives.

Rationale

Two conceptual frameworks were selected to inform the tools and methodology chosen to guide the implementation of this DNP project: the Relationship-Based Care model by Koloroutis (2004) and the Advancing Research and Clinical Practice Through Close Collaboration (ARCC) evidence-based practice model by Melnyk and Fineout-Overholt (2002). The selected frameworks are part of the organization's mission, vision, and values and guide patient care practices in Patient Care Services. The Relationship-Based Care and ARCC models reinforce expected attitudes and behaviors of daily work, leadership, decision-making, and patient care activities.

Relationship-Based Care Model

Caring relationships and a holistic approach to patient care are foundational to nursing as a profession (Petiprin, 2023). The Relationship-Based-Care model (Koloroutis, 2004), grounded by Watson's theory of caring, is a conceptual framework that identifies three meaningful relationships fundamental to providing compassionate, patient-centered care: the nurse’s relationship with the patient and their family, relationships among colleagues, and the nurse’s relationship with self (see Appendix B). The Relationship-Based-Care model does not stop at the nurse and patient relationship but extends this framework to the highest levels within an
organization, and guides leaders who are working to transform what exists into what can be. Found within the framework of Relationship-Based-Care are the inspiration, infrastructure, education, and evidence ($I^2E^2$) formula for leading change within an organizational culture (see Appendix C). Engaging individuals and groups in transition can be challenging; the $I^2E^2$ model of change simplifies the process and uses appreciative inquiry to transform the culture (Koloroutis, 2004).

**Advancing Research and Clinical Practice Through Close Collaboration Model**

The second conceptual framework for this quality improvement initiative is the Advancing Research and Clinical Practice Through Close Collaboration (ARCC) Model (Melnyk & Fineout-Overholt, 2002). The ARCC Model is an evidence-based practice framework conceptualized in 1999 by Bernadette Melnyk for mentorship (see Appendix D). The ARCC framework includes various components, including culture and organizational systems necessary to facilitate clinical inquiry and evidence-based practice (EBP) implementation. Within this organization, ARCC provided the construct to advance the system-wide implementation of EBP at the health system’s Center for Nursing Science and was adopted by the Professional Governance Council in 2020 as the EBP model (UC Davis Health, 2022). The ARCC EBP framework helped guide the implementation of the education, tools, and multidisciplinary processes needed to achieve the project aims of increasing referrals of PWID to OPAT for the successful completion of parenteral antimicrobial therapy.

**Methods**

**Context**

The setting for this DNP project was a 646-bed Level I trauma and academic teaching hospital with Magnet designation in Northern California. The medical center is the only Level I
adult and pediatric trauma center for inland California and has a regional burn center. Within the medical center, there is a 112-bed Children’s Hospital. The Emergency Department (ED) totals 63,194 patient visits annually, with 29,841 inpatient admissions from the ED. The hospital has a Comprehensive Cancer Center and an extensive primary care network totaling 808,242 clinic visits annually (UCDH, 2021). As an academic teaching hospital, the organization has a School of Nursing and a School of Medicine. Total employees comprise 1,789 faculty, 957 residents and fellows, 1,054 students, 2,964 nurses, 1,252 physicians, and another 11,799 full-time and part-time ancillary staff who support the medical and academic mission of the organization. The hospital serves a 33-county catchment area that extends north to the Oregon border and east into Nevada.

Key stakeholders for the project consisted of registered nurses, nurse managers, Infectious Disease Services, Emergency Medicine Services, Substance Use Navigators (SUN), the Substance Use Intervention Team (SUIT), specialty pain pharmacists, Transitions of Care (TOC) team leaders and project managers, case managers, and social workers, front line clinical nurses, and providers. The project was supported by executive leaders who recognized the dire impact on hospital resources and longer lengths of stay caused by ongoing and sustained closures of community psychiatric, addiction, or skilled nursing facilities due to the COVID-19 pandemic in early 2020, continuing through early 2022.

Leveraging hospital resources and clinical expertise, a small pilot to treat serious injection-related infections in PWID as outpatients was initiated in early 2021. The pilot utilized an existing eight-chair hospital-based infusion clinic. The Acute Infections Management (AIM) clinic was initially launched in 2011 by the Infectious Diseases team. The basis for the clinic was to provide an alternative care setting for uninsured or underinsured patients requiring long-term
antimicrobials who would otherwise remain hospitalized. The clinic is located in the hospital and near the Emergency Department (ED), where Addiction Medicine providers known at the facility as the Substance Use Intervention Team (SUIT) and the Substance Use Navigators (SUN) teams are co-located. The AIM clinic operates 365 days per year, 15 hours daily, allowing for twice-daily antimicrobial dosing schedules. The hospital’s vascular access team (PICC nurses) are also co-located in the AIM clinic. The location, proximity to clinical experts, available resources, and design of the AIM clinic provided a unique opportunity to explore novel models of care in complex and challenging populations requiring prolonged hospitalization.

Outcomes from the nine-month pilot, which treated two patients over three separate encounters, resulted in a reduction of 103 inpatient days. The pilot's success demonstrated the feasibility and need for a more robust and well-defined clinical pathway to support the optimal care and management of PWID and could assist more patients. The design, implementation, and outcome of the pilot informed the primary test of change for the DNP quality improvement project. Developing a structured approach to care for this population aligned well with the organization’s mission and goals to advance health equity and expand distinctive clinical programs and partnerships to reduce LOS and improve hospital throughput.

**Pilot Study**

During the COVID-19 pandemic, community partners, including skilled nursing facilities, federally qualified health centers, psychiatric centers, and board and care locations, became largely inaccessible due to mandated closures or cutbacks to services due to staffing shortages. Patients with serious injection-related infections were particularly vulnerable. From April through December 2021, a small pilot study tested the feasibility of transitioning PWID to the AIM clinic for daily supervised outpatient parenteral antimicrobial therapy (SuPAT) to reduce
inpatient length of stay and improve the completion of antimicrobial therapy. Patients referred to the clinic were provided access to wrap-around services, including transportation and linkages to other community resources as needed. Over seven months, they received three separate encounters in the AIM clinic resulting in a reduction of 103 inpatient days and an approximate cost savings of $702,769 (median inpatient cost per day of $6283 x 103 days). This calculation assumes that these patients would have completed the entire duration of antimicrobial therapy as inpatients and did not leave AMA (see Appendix E).

The initial pilot, an internal, organic response to an identified need, provided insight into current system gaps and showed promise as an alternative approach to care for PWID. The pilot exposed a general lack of knowledge regarding SUN and SUIT team resources. Clinical staff lacked access to evidenced-based tools such as the Clinical Opiate Withdrawal Scale (COWS) and provider order sets for initiating partial opioid agonist therapy, thus compromising their ability to anticipate patient needs and intervene appropriately. As a result, PWID frequently left AMA due to intense cravings or acute withdrawal. These observations reinforced the need for an integrated, systematic, and sustainable SuPAT care model with an explicit and codified process to support a whole-person approach to care supported by a formal governance structure.

**Pre-Intervention**

The project gap analysis identified the need to secure executive sponsorship, overcome negative attitudes toward PWID, and improve nurse knowledge of caring for patients with substance use disorders as foundational priorities requiring early intervention to support a sustainable, large-scale quality improvement initiative.

Following the Relationship-Based Care and ARCC evidenced-based frameworks, assessing current knowledge, attitudes, and organizational readiness for change was necessary to
inform improvement activities. A 25-question Likert scale learning needs assessment was developed and administered in Qualtrics™. A flyer with a scannable QR code to access the survey was emailed to select nursing departments and made available to scan during daily safety huddles in October 2021 (see Appendix F). Participation in the survey was voluntary and anonymous. A total of 51 staff responded to the survey, of which 84% identified their primary occupation as a nurse. The remaining 16% reported their occupation as a clinical or ancillary provider. The survey showed that staff was most familiar with alcohol use disorders and less familiar with other substances (e.g., cocaine and methamphetamine). Only 15 (29.4%) respondents “strongly agreed” that they had the knowledge and skills to care for patients with substance use disorders. The survey data confirmed the need to develop introductory educational content to improve nurse knowledge and skills to care for PWID.

The educational content was prepared and presented by members of the Addiction Medicine team and delivered virtually to clinical staff nurses between January 2022 and January 2023. The topics covered stigma, bias, language, the pathophysiology of addiction, pharmacotherapies, and substance use resources available to staff. Approximately 112 nurses participated in each session with representation across the health system, including ambulatory services, the Children’s Hospital, and the Cancer Center. To encourage attendance, continuing education credits were awarded for each session attended upon completion of a post-session survey submitted online via Qualtrics. One survey question, “I learned new knowledge and skills from this educational activity,” was used to assess knowledge saturation. The percentage of nurses reporting they learned something new declined with each session, except for the last one. The final session featured a former patient telling their story of addiction, recovery, and the lived
experience of being hospitalized with a substance use disorder. Nurses completing the survey identified this patient’s story as emotional and inspirational (see Appendix G).

Executive support external to nursing and formal governance were integral to the project. In an academic medical setting, medical staff and their committees constitute the preeminent governance structure and are vital stakeholders when a project involves working with provider teams. The DNP student (aka the project lead) appealed to the Chief Quality Officer requesting permission to formalize the existing Substance Use Intervention Committee as an at-large Medical Staff Quality Committee subcommittee. Approval was granted, and a formal Substance Use Intervention Committee charter was drafted and approved in March 2022. Once approved, access to project management support was given. A project manager supported the committee and maintained all committee meetings, agendas, minutes, and data. The first official chartered meeting was convened in May 2022.

Affiliation with a medical committee served several purposes. First, it created a mutually beneficial partnership between the provider teams and the front-line clinical nurses, pharmacists, and nurse leaders in Patient Care Services. Second, it broadened awareness of the work of the Substance Use Intervention and Substance Use Navigator teams and conferred legitimacy on these lesser-known teams. Finally, the influence and authority of a medical staff committee helped garner the resources needed to develop new screening tools and order sets, expediting the implementation of system changes.

**Interventions**

Evidence from the literature supports a holistic and structured approach to care that addresses substance use disorder as a chronic health condition (Bearnot et al., 2019; Price et al., 2020; Serota et al., 2023). Implementing the proposed SuPAT care model depended on
identifying patients eligible for discharge to the AIM clinic for continued antimicrobial therapy. Ideally, a screening and referrals workflow would be automated through the EMR to link addiction medicine expertise to patients and clinicians in the inpatient setting. However, the proposed tools, which included (a) admission screening questions, (b) the Clinical Opioid Withdrawal Scale (COWS), (c) buprenorphine induction order sets, (d) clinical alerts, and (e) system-generated referrals to the SUN and SUIT teams, were in development but not ready to be deployed within the EMR. In place of these tools, multidisciplinary rounds served as a surrogate to support the identification and referral of PWID for the SuPAT intervention.

Multidisciplinary rounds take place on the inpatient nursing units Monday through Friday. The unit's case manager and assistant nurse manager lead the rounds. The case managers and assistant nurse managers were informed of the planned intervention to identify patients admitted with known or suspected injection drug use or other substance use disorders and to initiate consults in EMR to the Infectious Disease, SUN, and SUIT teams (see Appendix H). This DNP student, an Associate Chief Nursing Officer, and an RN working collaboratively as initiative co-leads attended the multidisciplinary rounds in person for the first two weeks to provide support and to identify barriers (e.g., tools, systems, and processes).

The bundled team approach, named the intravenous antibiotic and addiction team (IVAT) review process, was derived from published studies detailing the IVAT team review process in place at the University of Alabama at Birmingham (Eaton et al., 2019). Although the IVAT process for the intervention pathway was less structured than the University of Alabama process, it fulfilled its purpose of linking addiction medicine experts with infectious disease teams in the inpatient setting. The IVAT intervention targeted two medical-surgical nursing units, surgical specialties and trauma. These inpatient units were selected from organizational data that
identified them as having proportionately high numbers of high-risk patients who left the hospital against medical advice.

An IVAT review team workflow was codified (see Appendix I). When patients with injection drug use were identified, consult orders were placed by the case manager or assistant nurse manager to Infectious Disease and the SUIT or SUN team as appropriate. The decision for SUN vs. SUIT consult is based on the type of substance used. This information is obtained through a patient’s self-report, documentation in the clinical notes, or a positive result on the admission toxicology screening labs. For patients with methamphetamine and other stimulant use disorders, SUN team consults were placed. For patients with opioid use disorders, a SUIT consult was placed.

In November 2022, after the project had concluded, the IVAT interventions became fully automated in the EMR. A schematic of the new EMR workflow is depicted in Appendix J.

Nurses complete two screening questions for all patients at admission. The questions assess the risk for withdrawal from substance use. The first question is, “Have you taken any opioids, prescribed or not, in the last seven days?” A positive response to this question triggers the Clinical Opiate Withdrawal Scale in the nurse flowsheet and is completed at least once per shift minimum. The Clinical Opiate Withdrawal Scale (COWS) is a validated eleven-point scoring tool shown in Appendix K (Wesson & Ling, 2003). In our EMR build, a COWS score greater than ten triggers a clinical alert, notifying the provider teams of the elevated score with a recommendation for a SUIT team consult. Both the consult and the order set for initiation of partial opioid agonist therapy are embedded in this alert, which reduces clicks and the need to navigate to other screens. The second question is, “Are you afraid you will withdraw from any substance while you are hospitalized?” A positive response to this question triggers an auto
consult with the SUN team, who will see the patient in 24 to 48 hours. A training document was created to educate nurses on the workflows associated with the COWS scoring tool within the EMR (see Appendix L).

At the project facility, the SUN team consists of non-physician peer support persons who often have a history of substance use disorders. A SUN team member interviews the patient and assesses their readiness to change. The SUN team member may incorporate other validated tools in the assessment, including the Alcohol Use Disorders Identification Test (AUDIT-C), an alcohol screening survey to help identify patients with active alcohol use disorders, and the Drug Abuse Screening Test (DAST). The DAST screening tool is a sensitive screening instrument that can detect abuse of drugs other than alcohol in adults and children (Skinner, 1982; Yudko et al., 2007). For patients who are unready or unwilling to explore treatment options, the SUN team member provides education on harm reduction strategies (e.g., needle exchange programs) and outpatient linkages for ongoing counseling and support services. Notably, the SUN team member works to establish a relationship with the patient, providing a contact number in the event of subsequent visits to the hospital ED or if readmitted.

For patients with opioid use disorders, a SUIT (i.e., Addiction Medicine team) consult is placed. A SUIT team member sees the patient, assesses readiness, and, if appropriate, initiates a partial opioid agonist therapy i.e. buprenorphine or methadone as indicated by the patient's preferences and social situation. The Infectious Disease team is well integrated into the inpatient workflows. Most patients with severe injection-related infections had already received an Infectious Disease consult or had one pending during the multidisciplinary rounds.

The DNP project lead assumed the care coordinator role for patients referred to the IVAT team with assistance from inpatient clinical nurses. Coordination of care activities included
ensuring consult orders were placed appropriately with closed-loop communication to each
group to ensure that a consult had populated their worklist and to provide any other vital clinical
information. Throughout the course of the patient's stay, daily notes were reviewed. Once a
patient was medically stable for discharge, a facilitated discussion occurred by phone or secure
text among the group members to determine fitness for discharge for continued antimicrobial
therapy in the AIM clinic. Based on patient interactions, this discussion also included the team’s
analysis of the safety and risks of continued durable venous access with a peripherally inserted
central catheter (PICC) line after discharge. A determination for continued access was based on
(a) patient compliance with not accessing the line during hospitalization, (b) discharge location,
and (c) consult with vascular access nurses. The vascular access nurses provided an expert
evaluation on the likelihood of re-establishing vascular access daily, which can be as long as 40
days. For some patients re-establishing venous access daily for a prolonged period would not
have been possible due to the severity of vein damage from sustained injection drug use. In these
instances, Infectious Disease specialists make alternative antimicrobial recommendations,
including oral or long-acting lipoglycopeptides. In select cases, the PICC line may be continued
if the team determines that the benefit outweighs the risks.

The final step of discharging the patient to the AIM clinic requires an AIM therapy plan to
be entered into the EMR by the discharging provider. The therapy plan generates an automatic
referral to the AIM clinic. It populates the worklist in EMR for the AIM clinic advanced practice
provider to review and accept the patient. Once the advanced practice provider accepts the AIM
referral and care plan, the patient is scheduled for the following day in the AIM clinic. Nurse
staff in the AIM clinic have adopted a type of concierge service model to establish a relationship
with the patient as a bridge between the transition from the inpatient setting to the outpatient
setting. In this model, the AIM clinic nurse meets with the patient on the inpatient unit for a person-to-person introduction. During this meeting, the AIM nurse does an informal intake assessment and provides the patient with a card with essential information, including appointment time, clinical contact number, location, and parking, to ensure a smooth transition. The nurse also assesses for barriers to care, e.g., transportation needs and other factors, such as the care of other family members. Like the SUN navigators, the AIM nurse establishes relationships with patients and other support persons. This process has yet to be a focus of any formal study; however, patients who continue in the AIM clinic report that the relationships with staff help keep them engaged in their care, especially when they must return to the clinic daily for two weeks or longer.

**Gap Analysis**

A gap analysis is a simple tool to help identify opportunities existing between the current knowledge or practice and the desired future state. Current practice related to the care of PWID and OPAT was compared to the best evidence. The information was used to formulate a plan of action. The preliminary gap analysis helped inform planned targeted interventions and identify areas within the microsystem needing consideration to close the gap between the current and desired states (see Appendix M). Six key areas were identified and targeted for the development of an integrated and systematic approach to care: (a) the admission screening process; (b) EMR optimization; (c) patient screening and referral processes; (d) executive sponsorship and governance (e) overcoming bias and negative attitudes towards PWID; and (f) discharge disposition and sustaining the project.
The timeline for this project is depicted in a Gantt chart (see Appendix N). The five phases of the project are aligned with the stages of the nursing process: (a/b) assessment/diagnosis; (c) planning; (d) implementation; and (e) evaluation. The pre-implementation work was substantial and necessary to support such a large-scale systems approach to care. The planned intervention utilized multidisciplinary rounds to identify patients requiring more than 14 days of parenteral antimicrobial therapy and who had substance use disorders. The test of change concluded in October 2022. The EMR enhancements, launched in November 2022, took significantly longer than anticipated. Data collection for the final analysis of the measurement of the outcomes began in November 2022 and concluded in January 2023. Efforts to scale and sustain the project began formally in January 2023 and ended in April 2023.

To help manage the project scope and deliverables, a Work Breakdown Structure (WBS) was developed early to help guide the project along a critical path (Waxman, 2018). The WBS shows the project's current work and planned deliverables (See Appendix O). The associated work packages were aligned, grouped, and subdivided into smaller units within their respective project phase within the framework. A vital feature of this project was the implementation of the Clinical Opiate Withdrawal Scale. The informatics build requests submitted in February 2022 had a planned implementation of August 2022 but were delayed until November 2022.

The responsibility and communication plans were developed to provide a visual map of the key stakeholders, methods, and timeframes for communicating important information to crucial group members and C-suite executives (see Appendix P). Due to COVID-19 restrictions,
communications were conducted virtually during monthly meetings and by email. The DNP project lead is an Associate Chief Nursing officer responsible for and overseeing many departments. The work began by identifying key stakeholders, organizing meetings, and setting a formal committee structure vital to this work. The departments most closely related to the project are identified in the communication and responsibility matrix and include many C-suite executives, Infectious Disease, Addiction Medicine, and Emergency Medicine teams. In May 2022, the formal committee launched, providing a more robust platform to engage other stakeholders across nursing, advanced practice providers, physicians, transitions of care, case managers, social workers, and pharmacists. From January 2022 through January 2023, the Addiction Medicine team presented quarterly education to a nurse-sanctioned education day. Throughout the year, these presentations created a new awareness of the stigma, bias, and inequities that PWID often experience during care in the healthcare setting. The foundational knowledge gained helped reframe old thinking and adopt new care models for a challenging and complex patient population.

**SWOT Analysis**

The project's strengths, weaknesses, opportunities, and threats (SWOT) were analyzed (see Appendix Q). Since the pandemic, the organization has dedicated substantial resources to help reduce inpatient length of stay. Alignment with the clinical strategic plan, which laid out the organizational priorities of delivering equitable, timely, and cost-effective healthcare, contributed to the project's overall success. Another internal strength is that the subject matter experts with clinical expertise, clinical infrastructure, and staff necessary to provide supervised OPAT in this population are already in place. The Acute Infections Management Clinic (AIM) was the location determined to provide continued support after discharge to ensure a patient safety net without
any additional cost or FTE. Located in the main hospital, the clinic provides a seamless connection and access to providers and other professionals who offer linkages to community-based outpatient programs for ongoing support. Internal weaknesses in an academic setting are the number of new learners circulating throughout the facility at any given time. These new learners may need to be made aware of the resources or have the same shared mental model regarding the care of this patient population. Socialization of the changes and the resources requires constant attention and reinforcement.

A significant opportunity exists for developing a new paradigm of care and deploying a model to guide the paradigm. Academic health systems are considered experts and leaders in generating new research and information influencing clinical practice. The organization's notoriety can advance the dissemination of the new care pathway to outside organizations. Residents and fellows who engage in the yearlong addiction medicine fellowship and are subsequently hired at other organizations will have experience in the new pathway, thus facilitating adoption and spread.

An external threat to the project is a lack of community resources for PWID to receive ongoing addiction treatment. The lack of resources was compounded during mandated closures due to COVID-19. Individuals without private insurance are disproportionately affected. A second threat is posed by current governmental and regulatory policies, including highly restrictive Board of Pharmacy regulations that define which providers can prescribe assistive medications, such as naltrexone, buprenorphine, and methadone. Providers must possess an x-waiver to prescribe these medications in outpatient settings. Under current regulations, it is easy to initiate these inpatient medications; however, it is more challenging to connect a patient to a provider who has the proper waivers for a post-discharge methadone clinic. The lack of waivered
providers significantly threaten this DNP project's success in promoting early discharge from the inpatient setting.

**Comprehensive Financial Analysis**

To calculate the return investment (ROI) for this project, several steps were undertaken first to quantify implementation costs (ROI denominator) and the net returns (ROI numerator). The Agency for Healthcare Research and Quality (AHRQ) ROI tool was used to capture expenditures and cost savings. The ROI was calculated as the ratio of two financial estimates: the net economic returns (cost avoidance) as part of the improvement actions / the total financial investment of the improvement actions. Outcomes demonstrating financial gains (cost avoidance) due to the project were generated by net changes in efficiency (LOS) and payments or penalties incurred as part of the services and other quality measures, including readmissions at 14 days and AMA discharges. The denominator was the costs incurred to plan, develop, initiate, and monitor the improvement actions (AHRQ, 2022). The project’s denominator costs were calculated based on projections for planning, training, and start-up, Year One, and subsequent Years Two and Three. Costs were evaluated for eight categories (a) personnel, (b) meetings, (c) supplies, (d) training, (e) equipment and depreciations, (f) information systems, (g) outreach and communications, (h) external consultants see (Appendix R). Implementation costs for this project were minimal, as the project utilized an existing hospital-based outpatient clinic operational 12 hours, 365 days/a year. The clinic is staffed with registered nurses, an advanced practice nurse, patient care technicians, and a unit clerk. Most initial costs were indirect, absorbed in the existing work time of the hospital's AIM clinic unit director and executive director. The project, which is FTE neutral, kept baseline costs low and remained stable through Year one. In Years two and three, personnel costs increase to account for the progression in nurse
salaries as part of the current collective bargaining agreement. Overall costs for the project were projected to be less than $150K per year.

Supplies, meetings, and training costs follow a similar trajectory. Training costs for nurses during the start-up and Year one remained low as the initial training was completed at a quarterly sanctioned nurse education day. Staff training costs are anticipated to increase in Years Two and Three as optimizations of COWS and other tools become more integrated and require increased nurse proficiency. Significant costs associated with this initiative were the project management and analyst support needed to create and launch the informatics tools as part of the project. Initially estimated to be $39K, delays from interoperability issues encountered within EMR required additional end-user testing, delaying the tools' launch by three months. This delay increased costs by another $25K. The total implementation cost of the entire project, annualized over three years, is estimated to be $25,8145.67, with a total cost of $774,437.

Analysis of the cost avoidance/cost savings, which provides the data for the ROI numerator, was performed by gathering three years of data to ensure parity between pre-COVID-19 data and the pre-intervention period in 2020. Data was received from the organization's health information management team (HIM) on patients with the associated Medicare Severity Diagnosis-Related Group or MS-DRG-289 Acute and Subacute Endocarditis with Complication, version MS-DRG v39.0, 10/01/2021 through 09/30/2022. All years being similar, the most recent calendar year (CY) 2020 was used as the baseline comparator for cost and length of stay outcome.

The query for CY 2020 returned 82 patients identified as having infectious endocarditis. Of the 82 patients, ten were coded as having substance use disorder with either stimulants or opioids. Out of ten, five (50%) left the hospital as a patient-directed discharge. The mean length
of stay was 20.9 days, with an average cost of $154,361 per patient. This data highlighted the magnitude of the healthcare burden associated with infective endocarditis at this DNP project site, proving the need for a more systematic approach that supports alternative models of care with the potential for significant cost savings and reduction in LOS. To test this hypothesis, a small pilot was completed in April 2021-December 2021. A total of three patients admitted with severe infections related to injection drug use were discharged to a hospital-based outpatient setting (AIM clinic). A third of the patients were admitted with endocarditis. The remainder had severe osteomyelitis. These three patients completed 103 days of ongoing antimicrobial therapy in the AIM clinic. Using CY 2020 assumptions, the average cost per day of an inpatient unit is $7385; the reduction of 103 inpatient days combined resulted in a gross savings of $757,544.

Financial considerations for this project included several options. The first option was to maintain the status quo. In this option, patients admitted with severe infections secondary to injection drugs continued to receive care in an inpatient setting until they either left against medical advice (AMA) or completed therapy, which could be as long as 60 days. Many of those patients leave AMA and fail to complete treatment. This option is also the costliest as it creates a mismatch between resource utilization and the intensity of services provided to patients who are otherwise stable for discharge but are restricted due to stigma, bias, or other social determinants of health, such as houselessness. It is also noteworthy that the GMLOS allowed for infectious endocarditis based on third-party payer coverage is ~6 days; thus, for patients who remain hospitalized for 20-60 days, much of this care is often not reimbursed. Finally, lower acuity patients are occupying valuable inpatient beds limiting the ability to admit more acute patients, many requiring surgical or specialty procedures. The status quo is costly and can result in the
loss of revenue, community reputation, case mix index, and the inability to accept referrals from outside organizations or providers whose patients require a tertiary level of care.

To create a systems approach to care, options two and three proposed incorporating universal screening for substance use disorder in all patients who present for care. Universal screening could be systematized to trigger best practice advisories or consult orders to the SUIT or SUN teams. The benefit of early intervention during hospitalization from addiction medicine specialists includes initiating medication-assisted therapies to prevent acute withdrawal, thus preventing patients from leaving AMA and failing to complete therapy (Englander et al., 2017). This option is aligned with current research, which supports the just and ethical treatment of PWID, including initiating inpatient medications to help alleviate cravings and the stress and extreme discomfort associated with withdrawal to prevent AMA discharges and failure to complete therapy (Park et al., 2015). However, it does not address the issue of increased cost, long lengths of stay from lower revenue-generating patients, and overall hospital throughput.

The third option builds on the current practice of outpatient parenteral antimicrobial therapy (OPAT) as the standard of care for treating individuals who require long-term antimicrobial therapy (Ho et al., 2010; O’Callaghan et al., 2019; Price et al., 2020; Tice, 1995). Most patients receive OPAT at home or in a community, such as a skilled nursing facility (SNF) or infusion center (Gordon et al., 2011; Norris et al., 2019). In this model, patient discharges are not delayed for initiating partial opioid agonist therapy or other specialty consults. Instead, the patient is discharged to a relatively high-resource hospital-based clinic for continued treatment in a closely supervised outpatient antimicrobial therapy (SuPAT) setting that offers a level of safety and support that allows the patient to return daily to a managed setting where they can receive ongoing therapy and addiction treatment and linkages to community resources.
Full implementation of the project occurred from July 2022-October 2022. A total of eight patients with injection drug use received treatment in the same outpatient setting as the pilot. Similar cost savings were achieved with eight patients completing 130 days of combined therapy in the outpatient setting, totaling an estimated $956,124 (130 x $7354.8) savings/cost avoidance of approximately $85K per patient. With the projected cost of $774,437 to initiate and maintain the project over three years, the ROI is fully realized when nine patients complete long-term antimicrobial therapy in AIM, which was achieved within 18 months of the implementation of the pathway (Appendix S).

**Study of the Intervention(s)**

The project aims to improve the completion of antimicrobial therapy in PWID by implementing a hospital-wide clinical pathway promoting early screening, recognition, intervention, and discharge for continued parenteral antimicrobial therapy aligned with the clinical strategic plan of optimizing care systems to improve operational efficiencies. The relationship-based and evidenced-based practice frameworks that guided the intervention fostered a culture of inquiry and relationships in providing care, critical to the healthcare organization’s Magnet designation. The organizational mission of improving health equity ensured that two key executives supported these efforts; the Chief Nurse Officer and the Chief Quality Officer and who are credited for providing extensive resources and support for this organizational change.

Evidence in the literature supports an integrated model of care, which includes pharmacotherapy with partial opioid agonists in patients with opioid use disorders. Hospitalization can become a “reachable moment” to initiate and coordinate treatment for patients with substance use disorder (Bearnot et al., 2019, p. 21; Velez et al., 2017, p. 296).
Psychosocial support, harm reduction strategies such as naloxone distribution, safe injection practices, and linkages to outpatient and community resources are essential components within this archetype (Eaton et al., 2020; Englander et al., 2018; Marks et al., 2019; Price et al., 2020; Serota et al., 2023). The evidence also identifies that discharge to a less restrictive outpatient setting for ongoing antimicrobial therapy in select PWID is safe, cost-effective, and patient-centered (Beieler et al., 2019; Norris et al., 2019; Suzuki et al., 2018; Vazirian et al., 2018). The perspectives expressed by the authors of these studies cited were consistent with those of the organization’s infectious disease and addiction medicine experts. Together these teams provided the recommendations to establish the SuPAT model of care.

The knowledge gained during the initial pilot demonstrated the value of referral and discharge to the AIM clinic for continued antimicrobial therapy in select PWID. However, the pilot underscored the gaps that existed when patients transitioned into the inpatient setting. Inpatient staff and providers were generally not aware of SUN and SUIT resources or the existing AIM clinic. The pilot, which had begun organically, was dependent on the tacit knowledge of a single provider rather than from codified and explicit processes. The GAP and SWOT analysis identified the need for standard processes and methods for early identification and referral linking experts and resources to PWID. Participants in the Learning Needs Assessment Survey conducted on the trauma and cardiology units in October 2021 substantiated these early evaluations.

Primary and secondary outcome measures were the completion of antimicrobial therapy and readmissions within 14 days for a prospective cohort of PWID. Process measures were selected to assess the adoption and integration of the new codified processes developed for clinical personnel caring for PWID in the inpatient setting. Run charts were used to monitor the
frequency of SUN, SUIT consults, and initiation of buprenorphine induction in patients identified as having an opioid use disorder. The quality and safety department tracks and maintains the clinical activity of the SUN and SUIT teams, which is updated quarterly. Data captured and displayed on pivot tables and run charts includes the total number of encounters with the consults for both teams individually overlayed over total patient encounters for the same period. Within those encounters, rates for AMA, readmissions, and length of stay are also tracked.

Length of stay and leaving against medical advice were chosen as balancing measures. Statistical analysis was performed on data comparing the intervention group to a similar non-intervention group. The non-intervention group was identified through a retrospective chart review using coding data to identify patients admitted with either endocarditis or osteomyelitis and substance use disorder from July through October 2022 but not referred to the AIM clinic for the SuPAT intervention. Summary statistics for both primary and secondary outcomes were generated.

**Outcome Measures**

This DNP project aimed to improve the completion of antimicrobial therapy in PWID by implementing a hospital-wide clinical pathway with early screening, recognition, intervention, and discharge for continued parenteral antimicrobial therapy in a monitored outpatient setting. The primary outcome measure was the completion of therapy (Yes/No). The secondary outcome was readmissions within 14 days. These measures were selected based on the literature identifying that approximately 25-30% of hospitalized PWID are unwilling or unable to conform to the restrictions of an inpatient setting, leave AMA, and fail to complete therapy (Ti & Ti, 2015). Failure to complete therapy creates a cycle of high emergency department utilization
(ED), increased readmissions, and increased morbidity and mortality (Choi et al., 2011; Suzuki et al., 2018).

Completion of therapy in PWID was determined when the patient completed the required antimicrobial therapy to achieve a clinical cure based on negative culture results and discharge by the Infectious Disease. This included patients who received a long-acting lipoglycopeptide infusion at discharge from the inpatient setting and returned to the AIM clinic on day seven to complete therapy.

Readmission within 14 days included all incidences of readmission, whether associated with their substance use disorder or not. For example, one patient was readmitted for induction of buprenorphine and another for recurring abscess necessitating drain placement and an additional 30 days of antimicrobial therapy. Both are counted in the numerator for readmissions.

Patient data for the intervention group included both the pilot and intervention groups. Data was tracked and entered into an Excel sheet through project completion and followed for readmissions, ED visits, and or death. Data for the non-intervention group was obtained using coded data to identify a similar cohort from July 2022 through October 2022, coinciding with the intervention period. A total of 38 charts coded as endocarditis or osteomyelitis with substance use disorder were returned in the query. Eleven duplicate encounters were identified and removed. One chart was excluded for no documented evidence of injection drug use for the encounter. A total of twenty-six charts were selected for inclusion. The DNP student conducted the initial medical records review, with a second reviewer from the department of Hospital Infection Prevention and Epidemiology engaged to ensure the consistency and accuracy of data in the selected records.
Data elements were abstracted from EMR and entered into an Excel spreadsheet. Data was reviewed for accuracy and completeness. Upon completion of the intervention period, as detailed in the Gantt chart, the data abstraction and entry were completed and sent to an assigned statistician from the department of the Clinical and Translational Science Center within the organization, who conducted a statistical analysis on the primary and secondary outcomes and other variables of interest to identify if other conditions, e.g., discharge location or type of substance impacts the ability to complete antimicrobial therapy in the outpatient setting and the degree of that impact.

An assigned analyst manages data for the Substance Use Intervention Committee from the Quality and Safety division of the organization. All hospital discharges are queried electronically using coded data to identify patients discharged with substance use disorders, including alcohol, opioids, stimulants, and cocaine. These charts become the denominator data for SUN and SUIT consults, buprenorphine inductions, length of stay, readmissions, death, and discharge disposition, including leaving against medical advice. The data is managed on an Excel spreadsheet with PIVOT tables and is displayed as run charts. The data is presented quarterly and summarized in the annual report for the Medical Staff Quality Committee (see Appendix T).

**Statistical Analysis**

Descriptive statistics compared the SuPAT intervention group to the non-intervention group. Patients were compared on demographics, type of substance used, type of infection, type of services received, discharge with PICC, medications for opioid use disorders, consults by SUN, SUIT, and ID, and discharge characteristics. When there were enough observations, a Chi-Square test of independence was performed to assess the relationship between the SuPAT intervention group and the non-intervention group. If enough observations did not support the
approximation for the chi-square test, the Fisher exact test was performed. Fisher's exact test is limited to a categorical predictor with two categories only. A two-sample t-test was performed for continuous variables. Data analysis was performed for both groups using statistical software R, version 4.0.3. Data is displayed on a table as percentages and corresponding p values for each categorical value.

**CQI Method and Data Collection Tools**

**Tableau**

The organization's operational analytics team is dedicated to developing and supporting various organizational dashboards. Data on these dashboards are extracted from multiple sources, including EMR, coding, and other groups that maintain source data required by outside regulatory or quality organizations. Links to various dashboards are located on a single landing page on the organization’s internal website.

The Acute Infections Management Clinic (AIM) operational dashboard displays total monthly volumes with the number of visits by day of the week and hour of the day. Additional filters in Tableau support custom views that can be filtered for patients referred to AIM for the antibiotic, the referral source (e.g., hospital, ED, PCN), and referring provider and service.

The COWS Alert dashboard, once live, will capture alerts that fire in EMR for patients scoring greater than ten. This new report is currently being validated and is yet to be launched. However, the dashboard will allow data filtering by department down to patient detail and has an associated run chart view that can be accessed, providing a visual of the number of alerts over time. This dashboard provides valuable information on nurse adoption of the COWS tool and the accuracy of the nurse’s assessment. The data will be used to improve the sensitivity and
specificity of the instrument or determine if optimization is needed (i.e., adjusting the alert threshold from eight to a higher or lower number).

**Excel**

An Excel dashboard is maintained by the Substance Use Intervention Committee project manager and is updated and reviewed quarterly. Coded data for all patients with addiction medicine or substance use navigation team consults are uploaded to the spreadsheet. Data from the pivot table is displayed as both numbers and as a run chart showing consults of both teams overlaid over total hospital encounters. Tabulations on the spreadsheets show other data, including readmissions and patients who leave AMA. These tables provide the run charts needed to track key performance indicators for the project.

**Electronic Medical (EMR)**

An EMR-generated patient list was utilized during the initial intervention to aid multidisciplinary rounds in the intervention units. The list provided valuable patient information, including admission diagnosis, which the project lead used to identify patients who might benefit from addiction medicine and infectious disease specialty consults. Specific “dot phrases” created in providers’ notes helped promote addiction medicine and pain pharmacy consults in patients admitted with substance use disorders.

Tools created for this project in EMR include the Clinical Opioid Withdrawal Scale, Best Practice Advisories alerting providers for a COWS score greater than ten, new buprenorphine induction order sets, and auto consults to the SUN and SUIT teams.

**Health Information Management and Decision Support**

The health information management and decision support teams provided pre-intervention data specific to diagnosis codes most frequently observed in PWID (e.g., DRG 289,
infectious endocarditis). This information informed business plans and associated cost projections, helping to quantify the return on investment needed to show benefit to the organization post-intervention. Subject controls for the intervention period were selected from coded data using the same methodology as the pre-intervention period.

**Qualtrics Survey**

A 25-item Qualtrics pre-intervention nurse learning needs assessment consisted of multiple choice, Likert scale, and free-text questions. Participation was voluntary, with responses collected anonymously. Items one through six addressed participants' years of experience, educational level, and demographics. The remaining nineteen questions assessed the respondent’s knowledge of substance use disorders and the tools and resources available within the health system. One question asks participants about previous personal experience with a loved one or colleague with a substance use disorder. This open-ended question allowed the respondent to provide free text comments regarding their thoughts and feelings toward persons with substance use disorders. The information was used to inform the educational content for meaningful learning, including consideration of social stigma and bias in caring for these vulnerable patients. (see Appendix U).

**Incident Reports**

When patients leave against medical advice (AMA), nursing or provider staff are encouraged to complete a report documenting the incident via the organization’s incident reporting system. The incident reporting database was accessed early in the project to determine which patient care departments had the highest incidence of persons leaving AMA. The information was used in selecting the intervention units.
Analysis

Descriptive statistics were used to summarize the individual-level characteristics of 37 PWID hospitalized with a serious injection-related infection between April 2021 and October 2022. Summary statistics were generated for primary outcomes and all predictors for intervention and non-intervention groups.

Data for the intervention group (n=11) were collected prospectively and included the three patient encounters from the pilot, which occurred from April 2021-December 2021. The non-intervention group (n=26) was obtained through a retrospective chart review using coded data to identify similar patients with endocarditis or osteomyelitis secondary to injection drug use. Data for both groups was maintained in an excel database. Other variables were also analyzed to identify if any statistical significance, p < 0.05, existed. Rates expressed as percentages between the two groups were generated as well.

The sample population between both groups comprised thirty-seven patients hospitalized with serious injection-related infections. Eleven (29.7%) patients received the supervised OPAT (SuPAT) intervention, and 26 (70.2%) did not receive the intervention. Patients were predominately male (86.5%), with a median age of 52. Almost half were non-Hispanic /white (44.4%), and most were unhoused at hospitalization (81.1%). There were no statistically significant differences between the intervention and non-intervention groups across demographic characteristics and types of infection (see Appendix V). Concerning the primary outcome, patients discharged to the AIM clinic completed therapy at a higher rate (81.8%) than patients who were not discharged to the AIM clinic (73.1%). The completion of therapy between the two groups was not found to be statistically significant (p=0.695). Appendix W displays the results of
the data analysis between the intervention and non-intervention groups for the primary and secondary outcomes, including other variables that could impact the ability to complete therapy.

Microsoft Excel was used to develop run charts to display the process measures of SUN and SUIT consults and balancing measures of patients who leave against medical advice.

Overall there is insufficient sample size to detect variances that may exist among these two groups. However, given the similarities between both groups, there is observed variation among providers when selecting which PWID can continue therapy in the AIM clinic. Several causes for this selection bias may be rooted in stigma and negative attitudes of healthcare providers towards those who inject drugs, soft paternalism, or lack of skills when caring for PWID.

**Ethical Considerations**

The hospital's internal review board IRB determined that the project was non-research. The hospital's local IRB committee issued a letter of non-research determination (see Appendix X). A letter of agency support was issued (see Appendix Y). Leader and staff participation was voluntary, and anonymity was protected. The survey link to the Learning Needs Assessment was anonymous. No identifying characteristics were required from participants or patients. To ensure the highest standards of confidentiality, any data reported, published, or communicated outside those involved in the care of these persons was redacted of any patient identifiers and descriptors so that any reasonable person would be unable to identify themselves or others represented in any data presented or published.

The ethical construct of beneficence and autonomy are woven throughout this project. Improving health equity in stigmatized and vulnerable populations aligns well with the University of San Francisco’s Jesuit Core Values and the American Nurses Association Code
of Ethics for Nurses, which reaffirms that health and caring are universal, as are love, compassion, and respect (American Nurses Association, 2015).

Substance abuse often results in substantial personal loss, including relationships, employment, secure housing, and mental and physical health. Moreover, PWID and the homeless are subjected to structural impediments, including bias, stigma, and other barriers encountered when engaging with the healthcare system, further eroding their fragile condition (Bearnot et al., 2019; Dasgupta et al., 2018). Care for this complex and vulnerable patient population requires consideration of nontraditional treatment pathways capable of delivering the highest standards of care while preserving the dignity of each individual. St. Ignatius espoused that we cannot have faith without having concern for justice and human dignity; thus, social justice is at the heart of the Ignatian pedagogy. Social justice denotes that we are our brother’s keepers and are responsible for caring for others, especially those most vulnerable in our society (Chin, 2016). Provisions Eight and Nine of the ANA Code of Ethics for Nurses underscore the nurse's duty to engage in activities that reduce health disparities through advocacy and support of causes that further social justice policies promoting equity in current healthcare policy and social constructs (American Nurses Association, 2015). Service rooted in justice and love requires a willingness to look past the chaos and lay aside internal biases that may impede care. Doing so embodies the ethical principle of beneficence and the Jesuit tenant of service to those who are “the least” in our society.

The tools, teams, and processes selected and implemented as part of this DNP project were grounded in the Jesuit tenets of justice and equity while seeking to ensure beneficence and the right to self-determination (autonomy).
Results

The desired outcome of this quality improvement project was to improve the completion of antimicrobial therapy in PWID by utilizing a hospital-based outpatient clinic for supervised OPAT (SuPAT). The primary intervention used to achieve the stated outcome was to identify PWID at the time of admission to the inpatient nursing units using a systematized process in EMR that would drive direct and indirect actions aimed at linking PWID and clinical staff to Infectious Disease and Addiction Medicine experts to aid in the care of these patients in the inpatient setting. Thus the process measures of SUN and SUIT consults were selected. The primary and secondary outcomes, as well as balance measures, were chosen for the same reasons as these experts when involved early in the care of PWID is associated with increased completion of antimicrobial therapy (Eaton et al., 2020; Marks et al., 2019; Serota et al., 2020). Patients who leave AMA often fail to complete therapy. Incorporating these expert teams early can be protective against leaving AMA discharge and was selected as the balance measure to this project.

The primary outcome, completion of therapy in PWID, was achieved. Patients discharged to the AIM clinic completed treatment at a higher rate (81.8%) compared to patients who were not discharged to the AIM clinic (73.1%). However, the completion of therapy between the two groups was not statistically significant ($p=0.695$). The secondary outcome of readmission within 14 days did not show improvement within the intervention group having two readmissions in less than 14 days compared to zero patients readmitted in the non-intervention group. The process measures of SUN and SUIT consults were variable but showed a slight increase during the intervention period; however, neither was statistically significant (SUN $p=0.447$ and SUIT $p=0.403$) for the completion of therapy between the two groups. Patients who left against
medical advice were much higher in the non-intervention group (23.1%) compared to the intervention group (9.1%). However, this was not statistically significant. Surprisingly, the IVAT team review intervention was statistically significant for the completion of therapy between the two groups at p=0.005.

**Overall Sample**

The project sample was comprised of thirty-seven patients hospitalized with serious injection-related infections. Eleven (29.7%) patients received the supervised OPAT (SuPAT) intervention, and 26 (70.2%) did not receive the intervention. The majority of the patients were male (86.5%), almost half were non-Hispanic white (44.4%), and most were unhoused when treated (81.1%). There were no significant differences between the intervention and non-intervention groups across demographic characteristics and types of infection.

**Hospitalization Characteristics**

Among all patients included in the analysis (n=37), most patients were admitted for long-term antimicrobial therapy to treat osteomyelitis (70.3%), followed by endocarditis (18.9%), skin and soft tissue (5.4%) and cellulitis (5.4%). Infections caused by gram-positive organisms, primarily methicillin-susceptible *Staphylococcus aureus* (MSSA) and methicillin-resistant *Staphylococcus aureus* (MRSA), were identified in 93.3% of the patients. Substance use with stimulants, i.e., methamphetamines and cocaine, was higher than opioid use in both groups. In the non-intervention group, stimulant use was identified in 88.5% (n=22) of the patients and 72.7% (n=8) in the intervention group; however, the type of substance used between the two groups was not statistically significant, p=0.335. Polysubstance abuse, including alcohol, benzodiazepines, and marijuana, in addition to the primary substance being either a stimulant or opioid, was identified in 94.6% (n=35) of the patients. Opioid use was more than double among
the intervention group, 27.3% (n=3), compared to the non-intervention group, where opioid use was only 11.5% (n=3).

Specialty consults with ID, SUN, or SUIT were compared between the groups. Among those in the intervention group, 27.3% (n=3) of patients received a SUIT consult compared to only 15.4% (n=4) in the non-intervention group. Among all patients eligible for the initiation of partial opioid agonist therapy, 67% (4/6) received medications to treat the opioid use disorder. Of particular interest, 50% of those who received a partial opioid agonist were in the non-intervention group compared to only 16.7% in the intervention group. Overall, the number of SUN consults was much higher in both groups, with 63.6% in the intervention group and 50% in the non-intervention group receiving a SUN consult. This was likely due to the high number of patients using stimulants for which currently there are no specific pharmacotherapeutic interventions; thus, the SUN team navigators were the most appropriate resource. Consultations by either SUIT or SUN were not statistically significant for the completion of therapy, with \( p=0.403 \) for SUIT and \( p=0.447 \) for SUN. Notably, the primary intervention implemented in this project was the IVAT team review process incorporated into the daily multidisciplinary rounds to identify hospitalized PWID and linking them to addiction medicine and infectious disease teams proved to be statistically significant (\( p=.005 \)) for the completion of antimicrobial therapy between the intervention and non-intervention groups.

**Post-Hospitalization Outcomes**

Discharge locations for all patients (n=37) were divided among *home* (n=15; 40.5%), the *AIM clinic* (n=9; 24.3%), *other*, the selection for houseless persons discharged to the street, shelter, or other location (n=7; 18.9%), and a *skilled nursing facility* (n=6; 16.2%). Of the nine intervention patients discharged to the AIM clinic, 78% (n=7) were experiencing various degrees
of houselessness, ranging from living in a car or camper or relying on friends and family. Two patients (18.2%) initially referred to the intervention group in the AIM clinic had to be admitted to an SNF for ongoing therapy due to severe deconditioning from prolonged hospitalization. In the intervention group, 81.8% (n=9) completed the recommended duration of antimicrobial therapy compared to 73.1% (n=19) in the non-intervention group. The difference in therapy completion between the two groups was not statistically significant (p=0.695). Four PWID (36.4%) in the intervention group completed antimicrobial therapy as outpatients with a PICC line in place.

Completion of antimicrobial therapy was the primary outcome selected for this project. Patients who leave AMA fail to complete treatment, resulting in high ED utilization and readmissions (Suzuki et al., 2020). The percentage of patients who left AMA was higher among the non-intervention group, 23.1%, compared to 9.1% for the intervention group. However, this difference was not statistically significant (p=0.649). ED utilization and readmissions were equal among both the non-intervention and intervention groups, with three patients in each group having at least three visits to the ED. One patient (30.0%) in the intervention group accounted for two ED visits. One occurrence was due to a planned admission for induction of buprenorphine which was done in the ED by the SUIT team. The second occurrence resulted from treatment failure, necessitating admission for drain placement and re-initiation of antimicrobial therapy, which was resumed in the AIM clinic. There were no deaths identified. Reductions in LOS between the two groups approached statistical significance (p=0.09). The number of hospital days saved was higher for the intervention group (mean=22.1; median=28) than the non-intervention group (mean=12.6; median=6), demonstrating a small-scale change's impact on important metrics such as decreasing length of stay.
The results of this project add to the current literature demonstrating that (a) OPAT in PWID is safe and cost-effective, (b) houselessness or the need for durable long-term venous access should not routinely exclude PWID from consideration for OPAT, (c) interventions that connect inpatients with addiction medicine support, is beneficial, especially in patients with opioid use disorders. Finally, the completion of antimicrobial therapy and reduced inpatient LOS can significantly improve care delivery for PWID and other vulnerable, challenging, and complex populations.

Discussion

Summary

This doctoral project aimed to improve outcomes for PWID by creating a novel pathway that would provide access for PWID in a supervised OPAT (SuPAT) setting within an existing hospital-based outpatient infusion clinic, thus offering a safe, lower-cost, less restrictive setting than the current state of treatment allowed. By design, beneficiaries received support for transportation, food insecurity, housing, and addiction recovery and treatment in addition to supervised OPAT (SuPAT) in the infusion clinic. Evidence in the literature and guidance from the hospital's internal experts in addiction medicine and infectious disease contributed to the pathway’s design. Coordinated efforts from many multidisciplinary teams with support from wrap-around services made the implementation possible. The project achieved its primary aim to improve the completion of therapy in PWID. One of the resources contributing to the project's success was access to an existing hospital-based outpatient clinic available to patients 365 days a year, which many hospitals do not have. Higher acuity outpatient settings will be needed to accommodate more challenging and complex patients as care migrates out of the hospital.
The project findings were consistent with the literature concerning cost, safety, efficacy, and concerns regarding discharge with durable venous access (Beieler et al., 2019; Ho et al., 2010). Despite the small number of patients included in this project improvement, the benefits proved significant regarding safety, cost, and reductions in LOS. A total of 233 inpatient days were saved, with little-to-no upfront costs. The resultant cost savings was $932,109 ($85K/per patient), calculated as cost avoidance from penalties incurred for non-reimbursable/avoidable days exceeding the geometric mean length of stay (GMLOS) of ~6 days for the most common DRG of endocarditis. Additionally, the median number of days saved in the project intervention group was 28 compared to 6 in the non-intervention group. This reduction in the LOS improved throughput and allowed additional admission of patients with more acute conditions. While the direct impact and meaning to patients were not measured, treatment in the AIM clinic offers a non-judgmental approach to care, abstinence is not required, and drug screens are not performed. As such, this quality improvement project addressed system barriers within the current state and the beliefs and biases that perpetuate inequities disproportionately borne by society’s most vulnerable.

Of particular interest was to evaluate the safety of discharging PWID with durable venous access (i.e., PICC for OPAT). Concerns over line tampering engender reluctance to discharge PWID with vascular access; however, research studies have demonstrated that line tampering rarely occurs (Beieler et al., 2019; Ho et al., 2010; Suzuki et al., 2018; Vazirian et al., 2018). Evidence from the DNP project was consistent with these findings. In the intervention group, 36.4% (n=4) were discharged to the AIM clinic with a PICC line. All patients in the intervention group with a PICC (n=4) reported varying degrees of houselessness. In the non-intervention group, 24% (n=6) had PICC lines when discharged to local SNFs for continued parenteral
antimicrobial therapy. One patient in the non-intervention group left the SNF before treatment was completed and was lost to follow-up. Although not statistically significant (p=0.454), patients in the intervention group with PICC lines had similar outcomes to those discharged to an SNF. In the intervention group, three patients completed therapy without any indication of line tampering or infection, while the fourth patient was lost to follow-up.

This DNP project experience with PWID who had PICC lines in our supervised OPAT setting is consistent with published literature, concluding that line tampering or recreational use is rare (Beieler et al., 2019; Ho et al., 2010; Vazirian et al., 2018). These findings suggest that the need for durable venous access in select patients should not routinely exclude PWID from consideration for antimicrobial therapy in the outpatient setting, whether the individual is housed or not.

The increased use of opioids and other illicit substances has fueled a dual epidemic of opioid use disorder and infectious disease (National Academies of Sciences, Engineering, and Medicine, 2020). Analysis of the IVAT intervention is consistent with findings in the published literature that multidisciplinary teams consisting of addiction medicine and infectious disease specialists promote the completion of antimicrobial therapy in PWID at a higher rate (Eaton et al., 2019; Fanucchi et al., 2019; Marks et al., 2019; Price et al., 2020; Serota et al., 2023). The IVAT review process for this project was shown to be statistically significant (p=.005).

Identifying which component contributed most to this finding needs discovery. It is interesting to note that 50% of the patients in the non-intervention group received a partial opioid agonist compared to the intervention group only received medications for opioid use disorder 16.7% of the time. This is likely related to patients in both groups having infections due to stimulant use at a higher rate (n=31,83.8%) than those hospitalized with infections due to opioids (6, 16.2%). The
question remains, what was the cause for the IVAT team review process success if initiation of partial opioid agonist therapy in the inpatient setting occurred only 50% of the time? Looking further into the analysis of the data, infectious disease and addiction medicine (SUIT) consults independently of each other showed no improvement in the completion of therapy, yet together as an integrated and multidisciplinary team, the IVAT review process was associated with improved outcomes resulting in the completion of therapy within the intervention group. Serota (2023) notes a similar experience with the serious injection-related infection (SIRI) team at Jacksonville Memorial Hospital in Miami, Florida. The SIRI team intervention is viewed as a “complete package.” However, in reality, the package consists of many components embedded into the process that contribute to the overall success of the intervention but may not be easily recognized or understood (Serota et al., 2023).

Similarly, the IVAT team review process was analyzed as a “package” that surprisingly proved statistically significant for improving outcomes in PWID. Yet, what component(s) may have contributed to the statistical significance is unclear. Like all complex adaptive systems, the IVAT team review process comprises many integrated teams and subsystems, all working interdependently, thus making it challenging to identify a single action contributing to this unexpected outcome.

This project identified many structural and upstream barriers that impact care in PWID and other vulnerable populations. Nurses are uniquely situated to impact the care of PWID and others with substance use disorders during hospitalization; however, this requires time, knowledge, and skills (Joseph et al., 2020). Many nurses report a lack of confidence in their ability to engage patients regarding substance often describing these patients as non-compliant, manipulative, and at times violent (Lewis & Jarvis, 2019; van Boekel et al., 2013). These
situations create feelings of moral distress stemming from the overwhelming feelings of helplessness that can occur from ethical dilemmas while engaged in the care of the PWID.

The implications for nursing practice identified as part of this DNP project point to the need for improved training and clarity in the nurse's role in the assessment and management of patients with substance use disorder. As a means of empowerment and assurance that nurses have the knowledge, resources, and tools needed to deliver expert care that is empathetic and structurally competent (Joseph et al., 2020).

**Interpretation**

The findings of this quality improvement project were consistent with published studies identifying OPAT as a safe alternative for PWID (Beieler et al., 2019; Norris et al., 2019; Price et al., 2020; Vazirian et al., 2018). However, the project model of OPAT differed slightly from other studies, as patients were required to come to the AIM clinic daily to receive ongoing intravenous antimicrobials. The location of the AIM clinic proved ideal, with easy access for patients and wrap-around services, including addiction medicine, substance use navigators, social workers, and others able to provide resources to help overcome barriers that threaten a patient's well-being, including food insecurity, transportation, and stable housing.

Although no qualitative data was obtained from patients about their experience, several patients wrote letters of thanks upon completing their therapy, expressing their gratitude to the staff caring for them in the AIM clinic. One patient, supported by Addiction Medicine, actively re-engaged in treatment after a difficult relapse and re-initiation of therapy, thus demonstrating that we do not know when that “reachable moment” will occur; however, we can be ready when it does.
Limitations

The results of this quality improvement initiative acknowledge there are several limitations. First, the contemporaneous control group may not have included every PWID hospitalized during the intervention period. Second, his DNP project was implemented in a single-site urban academic medical center with access to many specialty teams and resources rarely available at smaller community hospitals, which may limit generalizability to other populations and settings. Third, the small number of patients in this quality improvement project reduced the ability to determine if statistically significant differences existed between the intervention and non-intervention groups. Fourth, patients selected as the non-intervention group were not randomized but were retrieved based on a query of a select group of DRGs commonly associated with substance use, endocarditis, and osteomyelitis. Although two independent persons reviewed charts, the selection may not have entirely represented those in the intervention group. For example, the housing status of those in the non-intervention group could not be verified. Finally, the PWID patients included in this project were all male and older than other PWID populations in the literature, which may impact outcomes for others implementing a similar project.

Other limitations were associated with the inpatient clinical tools developed linking inpatients to the Addiction Medicine specialty, which were resource- and time-intensive. Despite having executive leader support, the launch of the Clinical Opiate Withdrawal Scale (COWS) was delayed several times due to EMR interoperability issues, lack of project management resources within the informatics team, end-user testing issues, and committee approvals. These issues took nearly a year to resolve before implementation, imparting the critical learning that
any tools needed in the EMR as part of any project should begin at the outset of the planning stage.

Overall, the limitations of this quality improvement do not lessen the findings but provide valuable information and insight regarding the implementation of any large-scale quality improvement initiative while adding to the current body of knowledge regarding the care of PWID.

Conclusions

Promoting health equity and improving outcomes in PWID are not mutually exclusive. This DNP quality improvement project adds to the growing body of evidence that supports the safety and efficacy of a pathway of supervised OPAT for select PWID. In coordination with infectious disease, addiction medicine, and other wraparound services, supervised OPAT provides a safe, reliable, and cost-effective way to deliver compassionate and patient-centered care—shifting the paradigm from moral failure to treating chronic disease. Viewed through a lens undistorted by stigma or bias, care is rendered for PWID the same way others are treated for chronic diseases such as diabetes or congestive heart failure—with equity, compassion, and respect.

Funding

The facility for this DNP project enjoyed broad organizational support. No direct funding was received. Time and resources required for the project were allocated from within the fiscal year operational budget. The hospital provided “in kind” funding for this DNP project lead. The project design, implementation, interpretation of results, and reporting were all handled by hospital or campus employees as part of their regular job duties.
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among health professionals towards patients with substance use disorders and its
consequences for healthcare delivery: Systematic review. *Drug and Alcohol Dependence,
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life learning experience”: A qualitative study of hospitalized patients with substance use
https://doi.org/10.1007/s11606-016-3919-4
Appendix A

Evidence Evaluation Table

<table>
<thead>
<tr>
<th>Purpose of article or review</th>
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<tbody>
<tr>
<td>To evaluate treatment outcomes in people who inject drugs (PWID) and the homeless in the facility OPAT program.</td>
<td>Design: Retrospective Cohort Study</td>
<td>Sample n=596. - homeless PWID (9% n=53) - housed PWID (8% n=48) - homeless non-PWID (8% n=45) - housed non-PWID (75% n=450)</td>
<td>Patients who are experiencing homelessness and those who inject drugs receiving OPAT. Two primary exposures evaluated: -Pt. reported injection drug use -housing status</td>
<td>Data collection was performed using REDcap, a data capturing software program linked to the EMR. Populated from the EMR. -hospitalization dates -demographics -Manual entry -drug use -homelessness -comorbidities, -diagnosis -discharge complications -clinical cure -lost to follow up</td>
<td>-Statistical calculations performed using SAS(v. 9.4). -Chi-square design and analysis of variance were conducted to assess group differences in demographics, infection types and clinical outcomes</td>
<td>Primary and secondary outcomes further evaluated by univariable logistic regression and presented as odds ratios. -non-PWID housed group as the control group -sensitivity analysis conducted to account for large numbers of PWID</td>
<td>Cure rates: Among known outcomes there was no difference by group Among patients retained in care, PWID achieved similar rates of cure compared with non PWID groups. -housing status and drug use were significantly associated with cure P&lt;.001 -Clinical cure rates lower for housed and homeless PWID 50.0% and 47.2% respectively Age -PWID younger than non-PWID Gender majority of all groups were male Comorbidities</td>
</tr>
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Definition of abbreviations: Outpatient antimicrobial therapy (OPAT), Harborview Medical Center (HMC), University of Washington (UW), Person who injects drugs (PWID)
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| Definition of abbreviations: Outpatient antimicrobial therapy (OPAT), Harborview Medical Center (HMC), University of Washington (UW), Person who injects drugs (PWID) | discharges from respite and alternative antibiotic plans were developed. | Secondary outcomes- -Hospital LOS -secondary bacteremia -line tampering -30 day readmission
Definitions: -Current drug use-use within three months of hospitalization. -Homelessness-lack of stable housing. -Immuno-compromised those with organ transplant or prolonged steroid, biologic agents. -not cured-patients placed on oral antibiotics or died before treatment completions -secondary bacteremia- bacteremia with a different pathogen than the index pathogen -readmission related to OPAT | and homeless lost to follow up with the following assumptions that patients with unknown clinical outcomes did not achieve cure. -Multivariate regression was performed on the outcomes of cure and 30 day readmission to OPAT using backward elimination to select final model including potential confounders of age, sex, relevant comorbidities (DM and HIV). -PWID more likely to have Hep C -Non-PWID more likely to have diabetes and be immune suppressed Infection types: -bacteremia most common infection -Osteomyelitis Discharge location: -home majority PWID-60.4% -housed non-PWID 59.1% -Respite care -not associated with improved outcomes Secondary outcomes: LOS-shortest for homeless PWID 15.5 days vs. 18 Bacteremia-Homeless PWID highest risk | excluded for consideration of OPAT. |

**APA reference**
Purpose of article or review

Design / Method / Conceptual framework

Sample / setting

Major variables studied with definitions

Measurement of major variables

Data analysis

Study findings

Level of evidence (critical appraisal score) / Worth to practice / Strengths and weaknesses / Feasibility / Conclusion(s) / Recommendation(s) / APA reference

**APA reference**

**Definition of abbreviations**: Clinical Opioid Withdrawal Scale (COWS), evidenced based practice (EBP),

To develop a nursing driven opioid withdrawal management tool. Using the validated Clinical Opiate Withdrawal scale (COWS) to address the increase of opioid addicted patients.

**Design**: An Evidenced based quality improvement practice project to improve opioid withdrawal management rates

**Methods**: The COWs protocol was implemented in two phases: Phase one- Training and education on how to use the tool with a case study to assess knowledge and training. Nurses were not allowed to use the tool unless they scored 80% or higher on the testing. Phase two- was initiation of the COWs tool on any patient admitted with a positive urine drug screen for opiates. Data collected over an 8-week period.

**Sample**
N=43 patients who presented between July 1, 2018-July 31, 2018, with positive urine drug screens for opioid use.

**Setting**: A level I trauma progressive care step down unit UC San Diego, San Diego, CA.

**IV Primary outcomes**: the frequency of nursing attempts at managing opioid.

**DV Secondary outcomes**: Process measures evaluating the rate of compliance with completion of the COWS tool on patients with a positive urine drug screen for opioids.

**Definitions**: patients admitted with a positive urine screen for opioids.

% Completion of COWS score on patients who had the COWS tool a positive urine screen for opioids on admission.

During an 8-week period, data was collected weekly from the EMR. Compliance was tracked as a percentage of the number of patients who had the COWS tool completed/ all patients admitted with a positive urine screen for opioids.

Data collected was analyzed with descriptive statistics x² test of proportions.

Of the 43 patients admitted with positive urine drug screens positive for opioids, 28 experienced opioid withdrawal symptoms, 27 scored more than 0 on the COWS score and only two scored more than 5. All others did not exhibit symptoms enough to warrant intervention.

The process measure of completion of the COWS score on all opioid positive patients was 96% with documented appropriate nursing management in response to an elevated COWS Implementation of the COWS resulted in a significant improvement of appropriate changes to the treatment plan.

**Level V/A**

**Worth to practice**: This quality improvement project provides valuable information on how nurses can use the COWS to identify the early symptoms of withdrawal and alter the treatment plan to provide better care for this patient population.

**Strengths**: Provides some practical application on how to train nurses on the use of the COWS

**Weaknesses**: -small sample -study design -single center and single unit pilot project -homogenous study -cost effectiveness could not be calculated

**Feasibility**: -COWS is yet to be built in the EMR

**Conclusions**: Study provides important information that can help inform nursing assessment and care of patients who may be
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### APA reference

**Definition of abbreviations:** Clinical Opioid Withdrawal Scale (COWS), evidenced based practice (EBP),

Pre-COWS n=28 and n= 28 post COWS with $X^2 = 29$, $P<.0001$, 95% CI, 41.71-83.74

experiencing acute opioid withdrawal and that the protocol is safe and effective in helping guide appropriate nursing care.
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<tbody>
<tr>
<td>To assess the safety and outcomes of PWID receiving IV antimicrobial therapy discharged to either home or to a skilled nursing or rehabilitation facility (SNF/rehab)</td>
<td>Design Retrospective observational study</td>
<td>Sample 52/170 met inclusion criteria n=52 PWIDs receiving OPAT discharged to home or SNF n=21 -home n=31 -SNF/rehab</td>
<td>IV PWIDs receiving OPAT at home PWIDs receiving OPAT in a SNF DV -duration of antimicrobial therapy -line complications (thrombosis, infection) -IDU relapse -readmission -lost to follow up -death</td>
<td>-Data obtained from RPDR, EMR, and OPAT data base to include -ethnicity -age -sex -index hospitalization -infectious disease diagnosis -planned antibiotic course -if available, safe d/c plan, counseling, family involvement in the substance use disorder plan After discharge substance use history and planned addiction treatment and monitoring were abstracted from the EMR Retrospective chart review was used to describe patient characteristics and outcomes</td>
<td>Descriptive statistics of central tendency used to analyze data -characteristics and outcomes of patients discharged home versus to a facility were compared using 2-sided Fisher’s exact tests.</td>
<td>Patients discharged to home on OPAT did not have significantly higher rates of complications compared to those who were discharge to a rehab facility. For carefully selected patient’s d/c to home may be a safe and lower cost alternative to prolonged inpatient admission or SNF/rehab stays which carry their own risk/ D/c to home n=21, 17 (81%) completed their planned antibiotic courses without complication compared to SNF/rehab n=31, 20 (64%)</td>
<td>Level III/C</td>
</tr>
</tbody>
</table>

**Definitions of Abbreviations:** Outpatient Parenteral antimicrobial therapy (OPAT), Person who injects drugs (PWID), skilled nursing facility (SNF), electronic medical record (EMR), Intravenous drug use (IDU), Research patient data registry (RPDR),

**To assess the safety and outcomes of PWID receiving IV antimicrobial therapy discharged to either home or to a skilled nursing or rehabilitation facility (SNF/rehab)**

**Design** Retrospective observational study

**Method** Research Patient Data Registry (RPDR), a centralized clinical database for hospitals used to identify patients admitted between January 1, 2010, and December 31, 2015, with diagnoses of endocarditis, prosthetic joint infection, septic arthritis, osteomyelitis. With a concurrent diagnosis of substance use disorders, including opioid use disorder. Patients followed by the hospital OPAT program after discharge including d/c to SNF or rehab. A comparison group from the OPAT database was used to identify rates of line infections, readmissions and death among all patients enrolled in the OPAT period during the same time (2013-2015)

**Sample** S2/170 met inclusion criteria n=52 PWIDs receiving OPAT discharged to home or SNF n=21 -home n=31 -SNF/rehab

**Setting** Single academic tertiary and primary care medical center in Boston, Mass

**Definitions** IDU defined as known or suspected IDU (IV, intramuscular, or skin popping) in the 1–24 months preceding admission and ongoing IDU as occurring within the month preceding admission

**IV** PWIDs receiving OPAT at home PWIDs receiving OPAT in a SNF

**DV** Duration of antimicrobial therapy -line complications (thrombosis, infection) -IDU relapse -readmission -lost to follow up -death

**Data Analysis** Descriptive statistics of central tendency used to analyze data -characteristics and outcomes of patients discharged home versus to a facility were compared using 2-sided Fisher’s exact tests. The small size of the study population did not permit multivariable modeling.

**Study Findings** Patients discharged to home on OPAT did not have significantly higher rates of complications compared to those who were discharged to a rehab facility. For carefully selected patient’s d/c to home may be a safe and lower cost alternative to prolonged inpatient admission or SNF/rehab stays which carry their own risk/ D/c to home n=21, 17 (81%) completed their planned antibiotic courses without complication compared to SNF/rehab n=31, 20 (64%)
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**APA reference**

**Definitions of Abbreviations:** Outpatient Parenteral antimicrobial therapy (OPAT), Person who injects drugs (PWID), skilled nursing facility (SNF), electronic medical record (EMR), Intravenous drug use (IDU), Research patient data registry (RPDR),

**Conceptual Framework**
N/A

**Hospital OPAT**
Patients requiring 2 or more weeks of IV antibiotics

<table>
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<tr>
<th>Data analysis</th>
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<tr>
<th>completed the antibiotic courses without complication</th>
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<tbody>
<tr>
<td>n=6 (11%) line infections, n=6 (11%) had injection drug use /relapsed</td>
</tr>
<tr>
<td>n=12 (23%) required readmission</td>
</tr>
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</table>

**Conclusions**
Persons who inject drugs discharged home were not more likely to have complications than those discharged to a SNF/rehab. Home OPAT may be a safe discharge option in carefully selected patients.

**Recommendations**
Consideration for working to send patients with IDU to home and daily follow up in AIM clinic.
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<tr>
<td>To evaluate the frequency of and associations between patient directed discharge (PDD), drug use, readmissions, and death among PWID a the University of Alabama Birmingham (UAB).</td>
<td>Design: Retrospective analysis</td>
<td>Sample n=83 hospitalized patients referred for the IVAT intervention</td>
<td>IV -PDD -in hospital IDU - 30-day readmissions -death</td>
<td>Primary analysis the frequency of associations between -PDD, -in hospital IDU, -30-day readmission -death</td>
<td>-Statistical calculations performed using SAS(v. 9.4).</td>
<td>83 patients met inclusion criteria: -28 (34%) had in hospital IDU -12 (14%) had PDD -9 (11%) died -12 (14%) were readmitted within 30 days.</td>
<td>Level III/B</td>
</tr>
<tr>
<td>Methods: -Persons receiving the Intravenous Antibiotics and Addiction Team (IVAT) intervention at UAB between the period of October 2016- December 2017.</td>
<td>Setting: University of Alabama Birmingham Hospital</td>
<td>IVAT</td>
<td>-PDD is anyone who leaves prior to completion of d/c orders.</td>
<td>-Statistical calculations performed using SAS(v. 9.4).</td>
<td>In the primary analysis, McNemar’s test was used to evaluate the frequency of associations</td>
<td>In hospital drug use is significantly associated with: -PDD (P=.003), -30-day readmission (P=.005) -death (P=.003)</td>
<td>Worth to practice: Treatment of patients for infections related to drug use cannot be successful without treating the underlying addiction. Coming to the hospital provides that “reachable “ moment where patients have access to both medical care and addiction services.</td>
</tr>
<tr>
<td>Definitions: -psychiatric diagnosis -DSM -5 criteria and documented by ICD-10 code during hospitalization.</td>
<td>In-hospital drug use -suspect or reported illicit drug use plus a positive UDS with drugs other than what was prescribed</td>
<td>In-hospital drug use -suspect or reported illicit drug use plus a positive UDS with drugs other than what was prescribed</td>
<td>Medication for OUD</td>
<td>Secondary analysis included univariate and multivariate logistic regression models to explore associations with the same outcomes of -PDD -In hospital IDU -30-day readmission -death</td>
<td>Information was gathered from the EMR with the exception of death which was obtained from death records from 83 patients met inclusion criteria: -28 (34%) had in hospital IDU -12 (14%) had PDD -9 (11%) died -12 (14%) were readmitted within 30 days.</td>
<td>In a cohort of hospitalized patients receiving inpatient care injection related infection, illicit drug use, PDD, 30-day readmissions and death were common.</td>
<td>It is noteworthy that this practice occurred patients who were being treated with buprenorphine and only 2 patients who were receiving methadone which provides insight as to the best medication to put patients on to reduce cravings and withdrawals.</td>
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<td>Hepatitis C Positive antibody on admission with HCV confirmatory test</td>
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<td>Median age -36 years -47 (56%) were male -78 (94%) were white -46 (55%) were uninsured -68 (82%) reported illicit opioid use before admission</td>
<td>Use of a multidisciplinary team to help manage this patient population with an appendix that shows the 9-point scoring tool used by the IVAT team.</td>
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**Definition of abbreviations**: Patient directed discharge (PDD), Medications for opioid use disorder (MOUD), Intravenous Antibiotic and Addiction Team (IVAT), Injection drug use (IDU), urine drug screen (UDS), outpatient antimicrobial therapy (OPAT)
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**Readmission**
- any readmission within 30 days to a UAB hospital for any reason
- a different pathogen than the index pathogen
- readmission related to OPAT

**Patients treated with MOUD**
- 76% received buprenorphine and naltrexone
- 17% received methadone
- 7% received naltrexone

**Cause for admissions**
- 38% infection
- endocarditis (IE)
- 13% vertebral osteomyelitis or epidural abscess
- 21% osteomyelitis/septic arthritis
- 4% bloodstream infections
- 12% skin and soft tissue infections

**Comorbidities**
- 61 (73%) HepC
- 3 (4%) HIV
- 40 (48%) had a psychiatric diagnosis
- 10 (12%) had a history of endocarditis

**Weaknesses**
- limited generalizability
- single center facility
- homogenous study participants mostly men and white.
- cost effectiveness could not be calculated

**Feasibility**
- provides information on the make-up and tools used by the IVAT team.

**Conclusions**
Study provides important information that can help inform treatment pathways and protocols to help identify patients who may be at risk for PDD and ultimately readmission and death.

**Recommendations**
- early patient identification with early therapy can prevent PDD and improve completion of therapy
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### Definition of abbreviations:
Patient directed discharge (PDD), Medications for opioid use disorder (MOUD), Intravenous Antibiotic and Addiction Team (IVAT), Injection drug use (IDU), urine drug screen (UDS), outpatient antimicrobial therapy (OPAT)

### In Hospital drug use
- **n=28**
- UDS positive for:
  - 21 (75%) opioids
  - 14 (50%) stimulants
  - 4 (14%) cannabis
  - 9 (32%) benzodiazepine
  - 18 (64%) poly substances
  - 11 (39%) had evidence of buprenorphine
  - 2 (97%) had methadone

### Deaths
- **n=9**
  - 6 in hospital
  - 5 sent for autopsy but negative for buprenorphine meaning they were not prescribed or not taking.

### Autopsy Results:
- 4-opioid overdose with fentanyl
- 1 MVA

---

The table above is a structured representation of the study's methodology and findings, including the definitions of key terms and abbreviations used in the article. The APA reference provides the source for further reading, and the definition section clarifies the use of technical terms within the context of the study.
**Definition of Abbreviations:** Opioid Use Disorder (OUD), Serious Injection related infections (SIRI), outpatient parenteral antimicrobial therapy (OPAT), peripherally inserted central catheter (PICC), substance use disorder (SUD), University of Kentucky (UK), buprenorphine/naloxone (BUP), infectious endocarditis (IE), inpatient buprenorphine initiation and discharge transition planning (B-OPAT)

As part of a pilot study, a novel, integrated care model was developed where patients with OUD&SIRI receive addiction consultation and buprenorphine induction while hospitalized, followed by ongoing management in an outpatient clinic that combines office-based opioid treatment with buprenorphine pharmacotherapy and counseling services with OPAT.

**Design**
Case study

**Methods**
Initiation of a novel integrated care model where patients with OUD and SIRI receive addiction consultation, counseling, and buprenorphine induction while hospitalized, followed by ongoing management in an outpatient clinic that combines office-based opioid treatment with buprenorphine pharmacotherapy and counseling services with OPAT. Patients were screened and informed consent was obtained. Comprehensive SUD assessment by a DATA-2000 waivered physician.

The University of Kentucky medical center
- March 1, 2017 – October 2, 2018
- Patients hospitalized with OUD & SIRI
- Three case vignettes
- No houseless persons included

- SIRI requiring > 2 weeks ABX
- d/c with PICC
- Stable for d/c to home
- Addiction consultation services with initiation of Buprenorphine before d/c
- Attend BUP appointments 1-3x/week
- Attend counseling appointments
- Take BUP daily
- Work on personal treatment goals
- Administer ABX as ordered
- Care of PICC & dressing
- Attend appointments
- Weekly PICC dressing changes
- Negative urine tox screen at each visit

Three case studies
- Pt. #1 CC completed the protocol and remained abstinent at the three-month follow-up. Patients remained abstinent at the three months follow up period.
- Pt. #2 BB - During 12-week period, the pt. had negative urine tox screens but relapsed at the three months follow up period.
- Pt. #3 missed first outpatient appointment and was readmitted to the hospital to complete antimicrobial therapy.

Patients with OUD that remain engaged in treatment can become successful participants with complex care needs.
- No existing outpatient care models integrating OUD and OPAT treatment in given the safety concerns.

**Level of Evidence**
V-A

**Worth to Practice**
The vignettes showed the complexity of care required to keep these patients engaged in care.

**Strengths**
- Case studies representative of real-world application
- Reinforces the importance of addiction medicine teams and initiation of targeted pharmacotherapy for OUD during inpatient admission.

**Weaknesses**
- The intensity of resources required
- Incentive payments of $50 for each session outpatient session completed.
- An additional $250 incentive will be provided upon completing the 12 weeks care model.
- Although incentive payment was independent of the results of the urine tox screen required at each visit may have artificially influenced patient participation.

**Feasibility**
Good applicability in a highly resourced academic setting.

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**APA reference**

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**Data**
- Patient #1 CC
  - Completed the protocol and remained abstinent at the three-month follow-up.
  - Patients remained abstinent at the three months follow up period.
- Patient #2 BB
  - During 12-week period, the pt. had negative urine tox screens but relapsed at the three months follow up period.
- Patient #3 missed first outpatient appointment and was readmitted to the hospital to complete antimicrobial therapy.

**Data Analysis**
- Provide statistical analysis to support the findings of the study.

**Study Findings**
- Patients with OUD that remain engaged in treatment can become successful participants with complex care needs.
- No existing outpatient care models integrating OUD and OPAT treatment in given the safety concerns.

**Recommendation(s)**
- Further studies are needed to evaluate the long-term effectiveness of the integrated care model.
- Collaboration with other healthcare providers to ensure comprehensive care.
- Implementation of a standardized discharge planning protocol to improve patient retention.

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**Purpose of article or review**
- Designs, methods, and conceptual frameworks
- Sample settings
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<tr>
<td>Conclusion</td>
<td>The case study identifies the need for well-coordinated care, including the barriers to care when the patient is houseless or unwilling to assume care of self-administration of home antimicrobials.</td>
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<tr>
<td>Recommendation</td>
<td>Beneficial to patients and the healthcare system in creating a multidisciplinary care pathway that results in early identification of patients with SUD/OUD and initiating therapy during the inpatient stay.</td>
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<tr>
<td>To report experiences with intravenous drug users (IVDU) in an outpatient parenteral antibiotic treatment (OPAT) service using a peripherally inserted central catheter (PICC)</td>
<td>Design Prospective observational study</td>
<td>Methods - patients with IVDU patients requiring OPAT - January 2005-December 2009 - used pre-defined criteria to identify appropriate patients - referral to OPAT by specialty teams - PICCs inserted during hospitalization by radiologist under US guidance. - Criteria for inclusion: --adequate housing -- reliable guardian -- signed contract agreeing to daily OPAT clinic visits &amp; would not access the</td>
<td>Sample n=29/906 IVDU patients met criteria for enrollment</td>
<td>outpatient parenteral antibiotic treatment (OPAT) service</td>
<td>- Mortality - completion of therapy - PICC abuse - Readmissions for infection or treatment related complications during OPAT - 30 day follow up period</td>
<td>- Deaths/other SAEs n=0 - 28/29 completed OPAT (96.6%) - PICC security seal breaches n=0 - Hospital readmission n=6(20.7%) - 5/6 readmissions resumed and completed therapy in OPAT - 1 patient dropped out at 30 days into OPAT treatment - median length of OPAT =18 days</td>
<td>- 28/29 (96.6%) patients completed course of IV antibiotics in OPAT - IVDU patients may have better outcomes when managed as an outpatient compared to prolonged inpatient admissions - Overall, the incidence of readmissions and PICC infections in the IVDU patients was similar to that found in non-IVDU infective endocarditis patients treated in OPAT. There were no deaths, serious adverse events, or line tampering. There was no excess of hospital</td>
</tr>
</tbody>
</table>

**Definition of abbreviations:** Intravenous drug user (IVDU), Outpatient Antimicrobial Therapy (OPAT), peripherally inserted central catheter (PICC), Persons who inject drugs (PWID), methicillin-sensitive staphylococcus aureus (MSSA)

**APA reference**
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<td>PICC line for IVDU</td>
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<td>30 days prior to hospitalization</td>
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<td>-Indian 10.3%</td>
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<td>-Past IDU</td>
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<td>Using illicit drugs via IV route &gt; 30 days prior to hospitalization</td>
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<td>Past Non-IDU</td>
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<td>Using illicit drugs via routes other than IV injection or alcohol abuse/dependence &gt; 30 days prior to hospitalization</td>
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<td>-Treatment = lack of clinical response to the OPAT as recorded by the ID physician</td>
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<td>-Relapse-reemergence of clinical symptoms of infection after initial remission of symptoms as</td>
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<td>-use of novel tamper proof seal on PICC to deter line tampering</td>
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<td>-contractual agreement to adhere to OPAT daily regimen</td>
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<td>-strict selection criteria resulting in possible exclusion of other patients who may have benefitted from OPAT</td>
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<td>Good applicability in large academic tertiary facilities similar to DNP site</td>
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<tr>
<td><strong>Definition of abbreviations:</strong> Intravenous drug user (IVDU), Outpatient Antimicrobial Therapy (OPAT), peripherally inserted central catheter (PICC), Persons who inject drugs (PWID), methicillin-sensitive staphylococcus aureus (MSSA)</td>
<td>recorded by ID physician -Line infection Infection at the site of IV line as recorded by the ID physician.</td>
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<td>Discharging patients with a PICC line to OPAT does not need to be a deterrent to discharge. Patients may be more successful in completing therapy in the outpatient setting with the right support and controls in place.</td>
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<td>Recommendations Considerations for selection criteria of patients as well as use of a tamper evident seal for the PICC</td>
</tr>
</tbody>
</table>
### Definitions of Abbreviations:

- Outpatient Parenteral antimicrobial therapy (OPAT)
- Injection drug use (IDU)
- Opioid use disorder (OUD)
- Addiction medicine (AM)
- Medication-assisted treatment (MAT)
- Electronic medical record (EMR)
- Emergency department (ED)
- Addiction medicine consultation group (ADC)
- Not seen by addiction medicine (NADC)

### Purpose of article or review

To determine whether inpatient consultation with an addiction medicine specialist improves clinical outcomes and reduces readmission rates for patients hospitalized with severe infectious complications of OUD.

### Design / Method / Conceptual framework

- **Design**: Retrospective chart review
- **Method**: A retrospective chart review of patients admitted between January 2016 and January 2018.
- **Setting**: Barnes-Jewish Hospital St. Louis MO.
- **Sample**: 125 patients met inclusion criteria - n=87 received addiction medicine consult (ADC) - n=38 (30.4%) received an addiction medicine consult (NADC)
- **IV**: Received addiction medicine consult (ADC) or did not (NADC)
- **DV**: Completion of antimicrobial therapy
- **Definitions**: AMA discharges and elopements - readmission within 90 days and ICU utilization

### Sample / setting

- **Data obtained from EMR and National Social Security Death Index to include**
  - Ethnicity
  - Age
  - Sex
  - IV heroin
  - Comorbidities
  - Causative organism
  - Admission diagnosis
  - Completion of antimicrobial therapy
  - AMA discharge and elopements
  - Readmissions at 90 days
  - ICU utilization during readmissions
  - Mortality

### Major variables studied with definitions

- Retroactive chart review was used to describe patient characteristics and outcomes
- Data obtained from EMR and National Social Security Death Index to include
  - Ethnicity
  - Age
  - Sex
  - IV heroin
  - Comorbidities
  - Causative organism
  - Admission diagnosis
  - Completion of antimicrobial therapy
  - AMA discharge and elopements
  - Readmissions at 90 days
  - ICU utilization during readmissions
  - Mortality

### Measurement of major variables

- EMR data were cleaned and merged using statistical analytic software version 9.4 (SAS institute, Cary, North Carolina)
- Descriptive statistics were performed with Prism 7 software (GraphPad, LaJolla, California)
- Odds ratios were calculated along with 95% CI

### Data analysis

- Fisher exact tests were used for statistical significance testing for categorical variables
- Age between the two groups used the Mann-Whitney U test

### Study findings

- Data obtained from EMR and National Social Security Death Index to include
  - Ethnicity
  - Age
  - Sex
  - IV heroin
  - Comorbidities
  - Causative organism
  - Admission diagnosis
  - Completion of antimicrobial therapy
  - AMA discharge and elopements
  - Readmissions at 90 days
  - ICU utilization during readmissions
  - Mortality

### Conclusions

- Patients seen by addiction medicine are more likely to receive MAT which promotes completion of antimicrobial therapy and reducing AMA discharges, elopements, and readmissions.
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<td>notes and medication administration records</td>
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<td>-mortality assessed using the EMR and the national Social Security death index.</td>
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<td>-each admission was treated as an independent event; therefore, some patients were included in the study more than once.</td>
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<td>-the review included screening Ed visits and readmissions within 90 days of discharge at all 15 hospitals in the BJC healthcare system as well as 20 neighboring hospitals in the Saint Louis metropolitan region.</td>
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<td>-hospital readmissions were related to the patient’s OUD or recent infectious complications -spontaneous deliveries of an infant were excluded from the analysis.</td>
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<td>Mortality was identified through EMR or the</td>
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<td>-all tests for significance were two tailed, with P values less than .05 Kaplan-Meyer estimates were used to describe the survival distribution for time to readmissions</td>
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<td>The log rank statistic was used to test the difference in time to readmission</td>
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<td>The study was approved by Washington University Institutional Review Board</td>
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<td>Incorporate Addiction Medicine consults and MAT protocols into EMR and other inpatient workflows.</td>
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### Conceptual Framework
N/A
### Purpose of article or review

Expert panel convened by the Infectious Disease Society of America (IDSA) to update the 2004 clinical practice guidelines for the prescription and management of outpatient antimicrobial therapy (OPAT).

### Design / Method / Conceptual framework

**Study Design**
Clinical Practice Guideline

**Methods**
- Librarians used to identify studies using MeSH and text words for OPAT.
- Additional searches were run for the concepts of dialysis, VADS, monitoring, and stewardship.
- After excluding duplicates, 23,435 citations remained.

**Inclusion criteria**
- All publications in English or containing English abstracts

**Exclusion criteria**
- Editorials, letters, and comments.

**Databases**
- Accessed on Ovid platform
- MEDLINE In-Process & Other Non-

### Sample / setting

**Sample Search**
- Yield = 23,435 after screening by 6 reviewers n = 3102
- 2-part screening first abstract and then the full article
- 26 articles were retained

**Setting**
- Panel review
- 4 in persons meetings
- Numerous conference calls

### Major variables studied with definitions

**Independent Variable**
- Antimicrobials
- VADS
- Monitoring
- Stewardship
- Patient considerations
- Age
- Home health or self-administration
- Discharge location
- PWID
- Antimicrobial selection
- Type of VAD used
- Chronic kidney disease
- Frequency of monitoring
- ID consult

**Dependent Variables**
- Characteristics of studies included
- Outcomes related to OPAT based on patient features, types of infusion

### Measurement of major variables

Strength and quality of evidence evaluated using Grading of Recommendations Assessment, Development and Evaluation (GRADE).

### Data analysis

- 2-3 panel members assigned to each section for review of literature.
- Synthesis of the evidence and recommendations.
- The Cochrane Collaboration Risk of Bias Tool was used to assess risk for bias in clinical trials.

### Study findings

- Use of validated tool to assess bias in various types of studies
- Consensus of ID specialists
- Exhaustive review of the literature
- Rationale provided for recommended administration and population
- Models of care delivery defined for specific situations

### Feasibility

- Heterogeneity and small number of included studies in each evidence table was not combined quantitatively into a metaanalysis.

### Worth to practice:

- Recommendations for OPAT in PWID should be made on a case-by-case basis.
- Having a way to evaluate what patients will be successful in OPAT will be a critical factor in appropriate patient selection.

### Strengths

- Peer reviewed
- Use of validated tool to assess bias in various types of studies
- Consensus of ID specialists
- Exhaustive review of the literature
- Rationale provided for recommended administration and population
- Models of care delivery defined for specific situations

### Weaknesses

- Heterogeneity and small number of included studies in each evidence table was not combined quantitatively into a metaanalysis.

### Feasibility

Based on the findings it is feasible to successfully treat PWID in OPAT.
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| Indexed Citations and MEDLINE (1946 to present), Embase (1980 to present), Cochrane Central Register of Controlled Trials (1991 to present), Health Technology Assessment Database (2001 to present), and National Health Service Economic Evaluation Database (1995–2015). -supplement the electronic search, members contacted experts and hand-searched journals, conference proceedings, and reference lists. Initial literature searches were done in October 2014, with updates performed 28 October 2015 and 31 January 2017. |
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**Definitions**
- OPAT-administration of parenteral antimicrobial therapy in at least 2 doses on different days without intervening hospitalization
- Point estimates, confidence intervals, and P values were reviewed.
- Errors identified were corrected.
- P values of <.05 were considered statistically significant.
- Interval spanned 1 point added for magnitude of effect size > 2 or < 0.5.
- If strength of rating very low then considered insufficient to draw a conclusion about the outcome of interest.
- Newcastle and Ottawa scale (NOS) used to assess bias.
- 3 external peer reviewers.
- Final guidelines were reviewed by the IDSA.

**Conclusion**
The updated guidelines recognize the need to develop newer models of care for PWID and treatment in home OPAT should be made on a case-by-case basis.

**Recommendations:**
Successful implementation of a pathway to allow PWID transition to home OPAT should be made on a case-by-case basis with weigh in from other clinical experts.
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- Reviewers
  - 11 ID physicians from both academic and private practice.
  - 3 pediatric ID physicians
  - ID pharmacists
  - Member of the Infusion Nursing Society
  - Guideline methodology expert
  - 2 professional librarians

- Standards and Practice Guidelines Committee and IDSA Board of Directors
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<tbody>
<tr>
<td>To evaluate a new pilot program testing suitability of PWID who require intravenous antibiotics in conjunction with addiction treatment in an OPAT program.</td>
<td>Study Design</td>
<td>Retrospective study</td>
<td>Sample</td>
<td>PWID n=68</td>
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<td>Method</td>
<td>-patients admitted between April 1, 2018, thru March 31, 2019</td>
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<td>-any infection required IV</td>
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<td>Setting</td>
<td>Brigham and Women’s Hospital in Boston, MA.</td>
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<td>IV:</td>
<td>-Patients discharged to OPAT</td>
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<td>-patients not discharged to OPAT</td>
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<td>DV:</td>
<td>-Adherence to OPAT</td>
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<tr>
<td>-PICC line complications--30-day readmission-relapse to IVDU</td>
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<td>-Chart review performed to screen for Infection related to IVDU.</td>
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<tr>
<td>Eligibility criteria were agreed upon by a multidisciplinary group, ID, OPAT leadership, addiction psychiatry, care coordination and risk management.</td>
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<td>Extracted data included: sociodemographic data</td>
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<td>-psychiatric and substance use histories, -site of infection requiring Antibiotics</td>
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<td>-whether or not patients met OPAT eligibility criteria, - and ultimate disposition.</td>
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<tr>
<td>For patients discharged on OPAT, additional data were</td>
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<tr>
<td>Descriptive statistics used to summarize the data.</td>
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<tr>
<td>Demographic and clinical variables between those who were and were not discharged on OPAT were compared using χ^2 or Fisher’s exact test for categorical variables and Student t test for continuous variables.</td>
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<td>-males n=34 (50%)</td>
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<td>-white n=52 (76%)</td>
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<td>-No reported deaths or overdoses</td>
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<td>20 patients = 570 avoidable inpatient days</td>
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<tr>
<td>There was no difference between individuals who went home on OPAT and the comparison group in terms of 30-day readmission rate (30.0% vs 16.7%, P = .32)</td>
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<td>-Individuals not discharged on OPAT did not have consistent follow-up after discharge.</td>
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<td>-no data on relapse rate, antibiotic completion rate, or PICC line complication rate</td>
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<td>III/C</td>
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<tr>
<td>Worth to Practice</td>
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<tr>
<td>Consideration for early intervention for treatment of SUD.</td>
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<td>Strengths</td>
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<td>-organizational support for the program</td>
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<td>-exclusion of homeless and AMA</td>
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<td>-most patients were already on MOUD</td>
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<td>-patients have access to a specialty SUD clinic where they are treated for SUD as well as followed by ID physician on staff</td>
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<td>-all patients received consult from inpatient addiction service</td>
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<td>Weaknesses</td>
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<td>-small sample</td>
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<td>-single institution</td>
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<td>-limited ability to generalize findings to other institutions that do not have an addiction medicine service and other support services.</td>
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<td>-did not evaluate patients who were not included in the pilot program</td>
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<td>-only evaluated patients with OUD and no patient with cocaine or methamphetamine use</td>
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</table>

**Definition of abbreviations:** Medications for Opiate Use Disorder (MOUD), Outpatient antimicrobial Therapy (OPAT), Peripherally Inserted Central Catheter (PICC), Persons who inject drugs (PWID), Substance Use Disorder (SUD)
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<th>Major variables studied with definitions</th>
<th>Measurement of major variables</th>
<th>Data analysis</th>
<th>Study findings</th>
<th>Level of evidence (critical appraisal score) / Worth to practice / Strengths and weaknesses / Feasibility / Conclusion(s) / Recommendation(s) / APA reference</th>
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**APA reference**

**Definition of abbreviations:** Medications for Opiate Use Disorder (MOUD), Outpatient antimicrobial Therapy (OPAT), Peripherally Inserted Central Catheter (PICC), Persons who inject drugs (PWID), Substance Use Disorder (SUD)

- extracted, including completion of IV antibiotics, adherence to follow-up visits, PICC line complications, -30-day readmission rate -relapse to IDU

-2 deaths not in patients who did not have home OPAT -No inpatient mortality occurred in either group

**Feasibility**
Currently the institution has a team of both addiction medicine (AM) and ID trained physicians that would be key in the success of this program.

**Conclusions**
OPAT can be delivered safely while receiving therapy for SUD and that therapy should be initiated before hospital discharge.

**Recommendations**
Involving addiction medicine specialist from the outset is an important safety consideration.
**Purpose of article or review**: To better assess the impact of infectious disease (ID) and addiction medicine (AM) team on ID and SUD treatment and healthcare utilization outcomes.

**Design / Method / Conceptual framework**: Prospective Observational Cohort study

**Sample / setting**: SIRI team patients were prospectively enrolled into an observational cohort study between August 2020 and May 2022. Data were compared to a retrospective cohort of patients at the same hospital with an associated injection drug use infection in the year preceding the SIRI team implementation (historical controls).

**Sample / setting**: N=129 -59 (45.7%) received the SIRI intervention -70 (54.3%) received the standard of care -62% male -46.5% were non-Hispanic white -68.2% were homeless at the time of admission -99.2% used opioids -8.6% used stimulants -8.3% were HCV seropositive -23.4% HIV positive

**Sample / setting**: IV Patient characteristics: -age -race -uninsured at admission -opioid/stimulant use -HIV, Hep C -MOUD on admission -homelessness -type of infection present -organism

**Sample / setting**: DV Primary outcome- a hospital readmission -death w/in 90 days of discharge

**Sample / setting**: Secondary outcomes included readmission and mortality, completion of the antibiotic course, initiation of MOUD, length of stay and PDD

**Sample / setting**: Substance use was identified by physician notes ID notes urine drug screening results proceeding inpatient detoxification program notes.

**Sample / setting**: -opioid use was defined as categorized if there was evidence of heroin, illicit fentanyl, or opioid analgesic use within the prior year. -stimulant included the use of cocaine, methamphetamine, amphetamine, and 3,4 -methyleneoxyphephenol - methamphetamine (MDMA) -the category of severe infection including Staphylococcus aureus, bacteremia, endocarditis osteomyelitis, septic arthritis fungemia, prosthetic device infection, or septic pulmonary emboli and treated with greater than 14-day course of antibiotics -OUD treatment included administration of any doses of buprenorphine or methadone during hospitalization as MOUD initiation

**Sample / setting**: -descriptive statistics were stratified by treatment condition to examine imbalances between the SIRI team and control group -comparison of SIRI team intervention and control patients was evaluated on demographics, substance use, comorbid conditions, type of infection, services received while inpatient (MOUD, antibiotic course), and discharge characteristics using \(X^2\) and fishers exact test for categorical variables and Wilcoxon rank sum test for continuous variables.

**Sample / setting**: -Poisson regression models with robust standard errors were used to directly estimate the risk ratio associated with the SIRI team intervention on 90-day readmission or death both unadjusted -the rate of death or hospital readmission within 90 days of discharge was 24.1% among SIRI team patients and 43.5% in the controls -after adjusting for the severity of infection, SIRI team patients had a 45% risk reduction of being readmitted or dying in 90 days and a 57% risk reduction of being readmitted to the hospital in 90 days compared to the controls -SIRI team patients were significantly more likely to have completed their course of antibiotics.

**Levels of evidence (critical appraisal score) / Worth to practice / Strengths and weaknesses / Feasibility / Conclusion(s) / Recommendation(s) /** Level III/A

**Worth to Practice**: -having an integrated ID/SUD team was associated with improvements in healthcare utilization, MOUD initiation, and antimicrobial completion for PWID with severe injection related infections (SIRI)

**Strengths**: -the national academies of sciences, engineering and medicine refer to OUD and infectious diseases as inextricably linked and suggest that an integrated approach is required to address the syndemic. -inpatient MOUD is associated with improvements in both infection healthcare utilization and outcomes -the SIRI team approach builds trust with the patient which also helps improve outcomes

**Weaknesses**: -lack of randomization and a non-contemporaneous

**Definitions of Abbreviations**: Severe Injection Related Infection (SIRI), Outpatient Parenteral antimicrobial therapy (OPAT), Person who injects drugs (PWID), Substance use disorder (SUD), medication for opioid use disorder (MOUD), Injection Drug Use (IDU), Patient Directed Discharge (PDD)

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<tbody>
<tr>
<td>Definitions of Abbreviations: Severe Injection-Related Infection (SIRI), Outpatient Parenteral antimicrobial therapy (OPAT), Person who injects drugs (PWID), Substance use disorder (SUD), medication for opioid use disorder (MOUD), Injection Drug Use (IDU), Patient Directed Discharge (PDD)</td>
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- The SIRI intervention group was evaluated by self-report of use of MOUD or other substances as well as their housing status at 90 days and adjusting for severity of injection related infection.
- Results were reported as unadjusted RR or adjusted relative risk ratio RR with corresponding 95% confidence interval CI.
- Comparison of readmission dash free survival after hospital discharge between SIRI I team and control patients using Kaplan-Meier survival analysis and log-rank test with event censored at 90 days post discharge.
- All analysis were performed using SAS 9.4 statistical software SAS Institute, Cary, North Carolina and significance level was set at of <.05.
- No significant differences between the SIRI team and control group across demographics,
- Control group does not prove that the intervention definitely caused the improved outcomes.
- Unmeasured characteristics such as trauma or income may have differed between the study groups and confound the association between intervention and outcome.
- Not all hospitalized patients with SIRI were referred to the IRI team during the intervention.
- The control cohort was retrospective therefore it was difficult to ascertain deaths and readmission data from other health care facilities.

Feasibility

- Limited external validity due to the unique care environment at the implementing institution as other sites may not have the team of infectious disease and substance use navigators or addiction.

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**Definitions of Abbreviations:** Severe Injection -Related Infection (SIRI), Outpatient Parenteral antimicrobial therapy (OPAT), Person who injects drugs (PWID), Substance use disorder (SUD), medication for opioid use disorder (MOUD), Injection Drug Use (IDU), Patient Directed Discharge (PDD)

Comorbidities, and type of injection -related infections -controls had higher rates of SSTI -SIRI team patients had more vertebral osteomyelitis

**Conclusion**
Integration of ID treatment with harm reduction services including access to lower barrier SUD treatment and oral antibiotics was associated with improvements in admission free survival among PWID hospitalized with IDU associated infections

**Recommendations**
- begin MOUD in the inpatient setting
- Discussion of harm reduction strategies and initiation of oral therapy to promote early discharge to the outpatient setting shows promise for reducing length of stay and improving outcomes in PWID
To better assess the evidence base in the literature related to the safety and effectiveness of OPAT for PWID, we conducted a review of the published literature.

### Design
**Methods**
- PubMed
- Google Scholar
Through April 2018

**Sample**
- Inclusion of 10 publications
- 2 prospective studies without comparison groups
- 8 retrospective studies

**Setting**
- 6 United States
- 2 Canada
- 1 Australia
- 1 Singapore

**IV**
- Patient characteristics:
  - Types of infections:
    - 37.9% most common infection was bone and joint
    - 21% endocarditis
    - 16.1% skin and soft tissue infection
    - 13.4% bacteremia
    - 5% abscess
- D/c location:
  - Home n=6
  - Medical respite facility n=3
  - SNF n=3
  - Residential treatment facility n=1
  - Group home n=1

**Demographics**:
- Median age range 34.5-47.7 years of age
- Males range from 53%-89.7%

**OPAT**
- Completion ranged from 72%-100% from 18 to 42 days.
- Mortality reported as 0% in 7 studies but higher in 3 studies: 1.9%, 5.0%, and 10.3% respectively.
- OPAT associated with decreased costs ranging from $11,707 to $25K per OPAT episode.

### Level V/C
- OPAT completion and complications may be comparable to those without history of IDU.
- Misuse of the IV catheter was low.
- Cost savings could be substantial.

### Worth to Practice
- As a cost reduction strategy, OPAT for PWID could result in substantial savings.
- Additionally, mortality and line complications appear to be lower than what would be expected.

### Strengths
- This review provided some references to single studies that have applicability to this project.

### Weaknesses
- Small number of published studies for inclusion.
- Study designs were observational without any controls.
- Most retrospective which can introduce bias.
- No longer retrospective which can introduce bias.
- High variability in inclusion and outcome criteria.
- Limited generalizability.

### Feasibility
- For OPAT in PWIDs is dependent on appropriate resources and wrap around.
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**APA reference**

**Definitions of Abbreviations:** Outpatient Parenteral antimicrobial therapy (OPAT), Person who injects drugs (PWID), skilled nursing facility (SNF), Injection drug use (IDU),

- data were extracted from studies included: study location design, sample size, demographic data of participants, substance use histories, types of infections, details of OPAT intervention, OPAT completion rate, mortality, readmissions, nonadherence to OPAT treatment, line-related adverse events including deliberate tampering/misuse, relapse to substance use, and cost savings
- prescription opioids n=1 - cocaine n=3 methamphetamine n=2 benzodiazepines n=1

**Definitions**
- recent history of injection drug use (IDU), defined as IDU within the past 4 weeks n=2, past 3 months n=2, or past 12 months n=2 and history of n=3

**Conclusion**
Patients with a history of IDU may be able to complete OPAT at home or in the community with no worse outcomes than those who do not use illicit substances.

**Recommendations**
The potential for cost savings could be substantial enough to support 24/7 services or a community partnership with SNF beds for PWID where they can receive both IV antimicrobials but MAT treatment as well. This would be dependent on patient volumes and community served by the facility i.e. urban setting vs. small community setting.
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<tbody>
<tr>
<td>To identify examine the prevalence and predictors of leaving the hospital against medical advice (AMA) among persons who use drugs (PWUD) and potential interventions to minimize those phenomenon</td>
<td>Systematic Review</td>
<td>Initial search yield =1649 possible studies n=17 studies published between 1977-2014 meeting final inclusion criterion retrospective study n=13 case control n=2 cross-sectional n=1 mixed methods n=1</td>
<td>Positive correlation -recent injection drug use -Aboriginal ancestry -weekends -welfare check day Negative correlation -in hospital methadone use -social support -older age -admission to a community-based model of care</td>
<td>studies included -general medical inpatients n=9 -PWID n=3 -HIV positive PWID n=1 -patients with pneumonia n=2 -patients with cirrhosis n=1 female post-partum patients n=1 n=610 187 general hospital in patients n=2 727 175 post-partum female patient discharges n=23 198 patients with pneumonia n=581 380 admissions with patients with cirrhosis</td>
<td>Used PRISMA guidelines for inclusion/exclusion -control for bias by duplicating the search and using two reviewers to conduct the screening independently -completion of a standard form on each eligible record with information on study design, setting, sample size, characteristics and major findings -independent review for accuracy and completeness.</td>
<td>-Positive association between substance misuse and leaving the hospital AMA among patients in acute care</td>
<td>Level III/A</td>
</tr>
<tr>
<td>Definition of abbreviations: Against medical advice (AMA), persons who use illicit drugs (PWUD), substance related disorders, persons who inject drugs (PWID), Substance Use Disorder (SUD), intravenous substance abuse, Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA), Aboriginal ancestry.</td>
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**Purpose**

To identify examine the prevalence and predictors of leaving the hospital against medical advice (AMA) among persons who use drugs (PWUD) and potential interventions to minimize those phenomenon.

**Design**

Systematic Review

**Methods**

- 5 electronic databases used: CINAHL, EMBASE, MEDLINE, PsycINFO, Web of Science from database inception thru Aug. 2014
  - search terms: “patient discharge”, “hospital discharge”, “against medical advice”, “drug use”, “substance related disorder” and “intravenous substance abuse”
  - English
  - peer reviewed journal
  - studies that report illicit drug use as a predictor of leaving the hospital AMA
  - studies of AMA discharge in PWUD as a population of interest.

**Sample**

Initial search yield =1649 possible studies n=17 studies published between 1977-2014 meeting final inclusion criterion retrospective study n=13 case control n=2 cross-sectional n=1 mixed methods n=1

**Setting**

- (16) studies conducted in US or Canada
  - (1) study conducted in Australia

**IV**

Positive correlation -recent injection drug use -Aboriginal ancestry -weekends -welfare check day

Negative correlation -in hospital methadone use -social support -older age -admission to a community-based model of care

**DV**

-prevalence of leaving the hospital AMA

**Definitions**

-substance abuse defined using the International Classification of Diseases, Ninth

-studies included -general medical inpatients n=9 -PWID n=3 -HIV positive PWID n=1 -patients with pneumonia n=2 -patients with cirrhosis n=1 female post-partum patients n=1 n=610 187 general hospital in patients n=2 727 175 post-partum female patient discharges n=23 198 patients with pneumonia n=581 380 admissions with patients with cirrhosis

**Worth to Practice**

The study suggests that there are some possible mitigation factors for reducing AMA in persons with SUD, such as treatment with methadone, social support, and treatment in an alternative outpatient or community setting. Targeting early recognition of withdrawal syndromes and appropriate treatment and referral to OPAT for continued therapy has the likelihood of decreasing AMA in this population.

**Strengths**

- authors found consistency in the evidence
- large n of study participants across 17 studies increasing the magnitude of the relationships between the -PRISMA
- rigor to minimize bias

**Weaknesses**

- most studies are retrospective in nature, limiting the rigor needed to show clear relationships of variables on the outcome of interest.

**Level**

Level III/A
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**Definition of abbreviations:** Against medical advice (AMA), persons who use illicit drugs (PWUD), substance related disorders, persons who inject drugs (PWID), Substance Use Disorder (SUD), intravenous substance abuse, Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA), Aboriginal ancestry.

- N/A
- Revision, Clinical Modification
- -chart reviews provide data and numbers but are unable to capture the broader social determinants that may be influencing this phenomenon
- Feasibility
  25—30% of PWIDs are leaving AMA which means they are not completing therapy. Achieving clinical cure, reducing readmissions due to worsening condition benefits both the person and the healthcare system.
- Conclusions
  More questions remain about the factors associated with a person’s decision to leave AMA. Other factors such as social determinants of health need to be studied to see what effect if any they have on this phenomenon.
- Recommendations
  AMA for the institution is a balance metric selected for this project. Finding a way to identify other contributing factors in real time would help inform future interventions that may improve outcomes for this vulnerable population.
### Purpose of article or review
Purpose is to test the hypothesis that patients with current IDU on OPAT would have less favorable treatment outcomes compared to those without current IDU.

### Design / Method / Conceptual framework
Design: Retrospective cohort chart review

**Methods**
- Retrospective chart review of Cleveland Clinic OPAT registry electronically and manually. Each patient identified with IDU 3 matched controls among those on OPAT and without current IDU. Propensity matched score matching on age, sex, OPAT year, and OPAT diagnosis.
- All patients discharged from the main campus from 2013-2014 and treated with OPAT from CoPAT registry were screened for inclusion.
- Used ICD-9 billing codes and problem lists to identify IDU through structured chart review.

### Sample / setting
**Sample**
- 5779 OPAT courses in the study period
  - Current patients with IDU: n=39 (0.7%)
  - Matched controls: 3:1 n=117 patients on OPAT with no IDU

**Setting**
- Cleveland Clinic a large multispecialty academic tertiary care hospital

### Major variables studied with definitions
**IV**
- - age
- - sex
- - OPAT year
- - OPAT diagnosis
- - blood borne infection HIV and HCV
- - DSM-IV conditions
- - current IDU
- - past IDU
- - current non-IDU
- - past non-IDU
- - patient disposition

**DV**
- - treatment failure
- - infection relapse
- - hospital readmission
- - # of ED visits
- - 90-day mortality

### Measurement of major variables
- Mortality data collected from the EMR and online public obituaries
- Outcome data was collected for both groups for 3 months post OPAT

### Data analysis
- **Univariable analysis**
  - Regression analysis was used to examine the association of current IDU with:
    - infection
    - treatment failure
    - infection relapse
    - hospital readmission
    - death within 90 days

- Poisson regression was used to examine the association of IDU with ED visits
- p-values <0.05 were considered significant
- Analyses done using “R” (a free statistical software)

- The control group charts

### Data analysis
- **Patients with current IDU**
  - Most common infection was cardiovascula\(r\) = 29 (74%)
  - 3 most commonly prescribed antimicrobials: vancomycin, oxacillin, ceftriaxone

- Higher occurrence of past IDU, current non-IDU, and past non-IDU
- Increased incidence of HCV compared to the control group (72% vs 9% p=0.001)

- Most were d/cd to a SNF \((n=32, 82\%)\)

### Study findings
- **Level II- A/B**

### Worth to practice
- **Worth to Practice**
  - The hypothesis that IDU patients would have less favorable outcomes in OPAT than who do not inject drugs was not proven. This challenges prior assumptions about the safety of OPAT for patient with IDU. The need to develop alternative ways to deliver care outside the inpatient setting is not only cost effective it is patient centered.

### Strengths
- - Study design with 3:1 matching control
- - Statistical analysis in an attempt to disprove the initial hypothesis

### Weaknesses
- - Small sample size
- - Difference in disposition between the two groups IDU to SNF and non-IDU to home.

- IDU to home number very small so not able to draw conclusions about the safety of OPAT at home for current patients with IDU.
- - No data that shows IDU patients stayed in the SNF during the entire duration of OPAT or any objective measure of sobriety during that period.
<table>
<thead>
<tr>
<th>Purpose of article or review</th>
<th>Design / Method / Conceptual framework</th>
<th>Sample / setting</th>
<th>Major variables studied with definitions</th>
<th>Measurement of major variables</th>
<th>Data analysis</th>
<th>Study findings</th>
<th>Level of evidence (critical appraisal score) / Worth to practice / Strengths and weaknesses / Feasibility / Conclusion(s) / Recommendation(s) / APA reference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

APA reference

**Definition of abbreviations:** Injection drug use (IDU), Outpatient antimicrobial Therapy (OPAT), Persons who inject drugs (PWID), Substance Use Disorder (SUD), treatment outcomes, Infectious Disease Society of America (IDSA)

electronic query of Enterprise database. Verification of IVDU was done manually.

**Conceptual Framework**
N/A

<table>
<thead>
<tr>
<th>hospital admission</th>
</tr>
</thead>
<tbody>
<tr>
<td>-Non IDU Illicit drug use using illicit drugs via routes other than IV or alcohol abuse/dependence &lt; 30 days prior to hospitalization</td>
</tr>
<tr>
<td>-Past IDU Using illicit drugs via IV route &gt; 30 days prior to hospitalization</td>
</tr>
<tr>
<td>Past Non-IDU Using illicit drugs via routes other than IV injection or alcohol abuse/dependence &gt; 30 days prior to hospitalization</td>
</tr>
<tr>
<td>Treatment failure= lack of clinical response to the OPAT as recorded by the ID physician</td>
</tr>
</tbody>
</table>

| were manually reviewed to ensure no IDU. |
| -For each patient with IDU 3 controls were selected using the R package Matchit and employing the nearest neighborhood method |
| -D/C to home(n=15 6%) In the control group the majority went home (n=86, 74%) only one-fourth were sent to a SNF (n=30, 26%) there was no significant association between IDU and the number of ED visits during OPAT course (IRR, 0.95; 95% CI: 0.38-2.13; p=0.91) |

**Feasibility**
Feasible in large tertiary facilities where resources and support for these types of alternative programs are more likely to exist. There is good applicability to current practice and this project.

**Conclusions**
The hypothesis was invalidated concluding that patients with current IDU on OPAT can have similar favorable outcomes as those without current IDU.

**Recommendations**
Consideration to send patients with IDU to home and daily follow up in AIM clinic.
<table>
<thead>
<tr>
<th>Purpose of article or review</th>
<th>Design / Method / Conceptual framework</th>
<th>Sample / setting</th>
<th>Major variables studied with definitions</th>
<th>Measurement of major variables</th>
<th>Data analysis</th>
<th>Study findings</th>
<th>Level of evidence (critical appraisal score) / Worth to practice / Strengths and weaknesses / Feasibility / Conclusion(s) / Recommendation(s) / APA reference</th>
</tr>
</thead>
</table>

**Definition of abbreviations:** Injection drug use (IDU), Outpatient antimicrobial Therapy (OPAT), Persons who inject drugs (PWID), Substance Use Disorder (SUD), treatment outcomes, Infectious Disease Society of America (IDSA)

- Relapse - reemergence of clinical symptoms of infection after initial remission of symptoms as recorded by ID physician
- Line infection - infection at the site of IV line as recorded by the ID physician.
Appendix B

Relationship-Based Care Model

Appendix C

I²E² Change Model

Specific change theories used by nursing

I²E²
Inspiration
Infrastructure
Evidence
Education

Appendix D

UCDH Evidenced-Based Practice Framework

ADVANCING RESEARCH THROUGH CLOSE COLLABORATION (ARCC)

UC DAVIS HEALTH’S NEW MODEL FOR EVIDENCE-BASED PRACTICE IMPLEMENTATION

CULTURE, SYSTEM & INFRASTRUCTURE TO SUPPORT EBP

EBP Philosophy, Support, Mentorship

Clinician Beliefs & Abilities

Organizational Culture & Readiness

Identification of Strengths & Barriers

Mentor Development

EBP Implementation

Outcome Evaluation: Patient Outcomes ↑ Nurse Satisfaction ↓ Hospital Costs

Lack of EBP Knowledge, Skill, Values

Strategies: Workshops & Journal Club

EBP PROCESS STEPS

0 1 2 3 4 5 6

Cultivate inquiry  Ask a clinical question Search & collect evidence Appraise evidence Integrate evidence into practice Evaluate outcome Disseminate outcomes

Adapted from Melnyk et al. 2002
## Appendix E

**Pilot April 2021-December 2021**

<table>
<thead>
<tr>
<th>PWID</th>
<th>Days in AIM</th>
<th>Readmissions &lt;30 days</th>
<th>Completed Therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pt. A</td>
<td>28</td>
<td>Admitted during OPAT &lt;24 hours LOS for wound evaluation</td>
<td>Yes</td>
</tr>
<tr>
<td>Pt. B-first course</td>
<td>42</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Pt. B-second course</td>
<td>33</td>
<td>Yes. &lt;48 hours LOS for Recurrent infection and drain placement in IR. and d/c back to AIM for another round of OPAT.</td>
<td>Yes</td>
</tr>
<tr>
<td>3 encounters</td>
<td>103 days saved</td>
<td>2 readmissions</td>
<td>$702,769 cost savings</td>
</tr>
</tbody>
</table>

- 3 patients in AIM total combined days of therapy by 103 days
- The median cost per day of $6823 = $702,769 in approximate cost savings assuming the patients (HCAI, 2020)
- Completed the entire duration in the hospital and did not leave AMA or were discharged to an SNF.
Learning Needs Assessment Survey

Persons with substance use disorders (SUD) or injection drug use (IDU)

October 26th - November 8th, 2021

The purpose of this survey is to gather information from front line staff regarding current knowledge of substance use disorders, and resources available to help improve outcomes in this vulnerable population.

Your feedback is being solicited because your department provides care for a disproportionate number of patients admitted for medical conditions secondary to substance use disorders (SUD) or injection drug use (IDU).

The information gathered will inform educational activities and implementation of evidence-based practices aimed at improving outcomes for this patient population and influence institutional changes in practice.
## Appendix G

### CNIII Nurse Education Summary

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Presenter</th>
<th>Evaluation Question</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 12, 2022</td>
<td>Caring for patients with opioid withdrawal</td>
<td>D.C., SUIT MD</td>
<td>Q3“I learned new knowledge and/or skills from this educational activity.”</td>
<td>99.11%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(111/112)</td>
</tr>
<tr>
<td>April 13, 2022</td>
<td>Pediatrics with SUD and opioid withdrawal</td>
<td>E.J.J.-SUIT Fellow</td>
<td>Q3“I learned new knowledge and/or skills from this educational activity.”</td>
<td>96.55%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(112/116)</td>
</tr>
<tr>
<td>October 12, 2022</td>
<td>Clinical Opiate Withdrawal Scale</td>
<td>C.M &amp; C.D. Nurse leader and Nurse Informaticist</td>
<td>Q3“I learned new knowledge and/or skills from this educational activity.”</td>
<td>95.08%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(116/122)</td>
</tr>
<tr>
<td>January 11, 2023</td>
<td>Addiction is a chronic illness-A Patient’s story</td>
<td>D.C- SUIT MD T.T. SUN team lead E.C-Patient</td>
<td>Q3“I learned new knowledge and/or skills from this educational activity.”</td>
<td>98.23%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(111/113)</td>
</tr>
</tbody>
</table>
Appendix H

IVAT Team Review Communication

Intravenous Antibiotic and Addiction Team (IVAT)

What- The IVAT team is a collaboration of Addiction Medicine (SUIT {Substance Use Intervention Team}) and Infectious Disease (ID).

Who- Any patient who requires long term antimicrobial therapy targeting complex infections with substance use disorder at risk for leaving AMA (Against Medical Advice).

How- During daily multidisciplinary rounds patients identified as needing term antimicrobial therapy >7 days, the medical team will place an AIM (Acute Infection Management) consult. The AIM APP will review the case and activate IVAT team as appropriate.

When- Daily- 365 days. The IVT team worklist is reviewed daily by the AIM APP. Together, the team will formulate a treatment plan that informs the medical teams, nurses, and discharge planners of the transition plan for continued IV therapy and/or addiction medicine support. Every effort will be made to help transition the patient from the inpatient setting to a less restrictive, cost effective and safe environment for continued IV therapy and wrap around services for substance use if needed.

Where- The pilot for this program is for patients currently admitted to D12 and D14 and will run from July 11, 2022, through October 21, 2022.

v.2 5-30-22
Appendix I

IVAT Multidisciplinary Team Workflow

<table>
<thead>
<tr>
<th>MDR rounds patient is identified as hx IDU and/or long term ABX</th>
<th>Medical teamplaces AIM consult</th>
<th>AIM APP reviews patients on the list daily</th>
</tr>
</thead>
<tbody>
<tr>
<td>APP contacts ID and SUN/SUIT as appropriate</td>
<td>IVAT team reviews the patient virtually</td>
<td>IVAT team develops plan for discharge and ongoing therapy</td>
</tr>
<tr>
<td>AIM Referral</td>
<td>Provider completes consult. The patient in scheduled in AIM clinic</td>
<td>AIM staff will do concierge visit with pt. prior to d/c.</td>
</tr>
<tr>
<td>Patient continues to receive IVT in AIM, May be discharged with PICC line</td>
<td>Other teams consult/provide support on an as needed basis</td>
<td></td>
</tr>
</tbody>
</table>

- DO NOT automatically discontinue the PICC line if present. The IVAT team will determine if the line can stay or needs to be removed.

- AIM clinic is open 365 days and can help with transportation to and from the clinic daily.

- If patient has an identified substance use disorder they can be followed by SUN/SUIT in AIM with referrals to community resources as needed.
Appendix J

COWS EMR Workflow Schematic

Proposed Inpatient Workflow for Clinical Opiate Withdrawal Scale

1. Inpatient Nurse Admission screening
   - Have you used opioids prescribed or not in the previous 7 days?
     - Yes
     - COWS scale is "turned on" in EMR
     - Nurse completes assessment every shift for 3 days (6 shifts total)
   - Are you concerned you are going to withdraw from any substance while you are hospitalized?
     - Yes
     - Auto consult for SUN: goes to current workflow in EMR
     - Score < 10 triggers BPA. To Provider: consult SUH
     - Score ≥ 25 triggers BPA & overdose 24 hour lockout
     - Score 0-10
       - Pt. is discharged
     - BPA is suppressed for 24 hours unless score ≥ 25

2. End
**Appendix K**

**Clinical Opiate Withdrawal Scale**

For each item, circle the number that best describes the patient's signs or symptom. Rate on just the apparent relationship to opiate withdrawal. For example, if heart rate is increased because the patient was jogging just prior to assessment, the increase pulse rate would not add to the score.

<table>
<thead>
<tr>
<th>Patient's Name: __________________________</th>
<th>Date and Time <strong>/</strong>/____</th>
</tr>
</thead>
</table>

**Reason for this assessment:**

<table>
<thead>
<tr>
<th>Resting Pulse Rate: ______ beats/minute</th>
<th>GI Upset: over last 1/2 hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measured after patient is sitting or lying for one minute</td>
<td>0 no GI symptoms</td>
</tr>
<tr>
<td>0 pulse rate 80 or below</td>
<td></td>
</tr>
<tr>
<td>1 pulse rate 81-100</td>
<td></td>
</tr>
<tr>
<td>2 pulse rate 101-120</td>
<td></td>
</tr>
<tr>
<td>4 pulse rate greater than 120</td>
<td></td>
</tr>
<tr>
<td>1 stomach cramps</td>
<td></td>
</tr>
<tr>
<td>2 nausea or loose stool</td>
<td></td>
</tr>
<tr>
<td>3 vomiting or diarrhea</td>
<td></td>
</tr>
<tr>
<td>5 multiple episodes of diarrhea or vomiting</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sweating: over past 1/2 hour not accounted for by room temperature or patient activity.</th>
<th>Tremor: observation of outstretched hands</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 no report of chills or flushing</td>
<td></td>
</tr>
<tr>
<td>1 subjective report of chills or flushing</td>
<td></td>
</tr>
<tr>
<td>2 flushed or observable moistness on face</td>
<td></td>
</tr>
<tr>
<td>3 beads of sweat on brow or face</td>
<td></td>
</tr>
<tr>
<td>4 sweat streaming off face</td>
<td></td>
</tr>
<tr>
<td>0 tremor</td>
<td></td>
</tr>
<tr>
<td>1 tremor can be felt, but not observed</td>
<td></td>
</tr>
<tr>
<td>2 slight tremor observable</td>
<td></td>
</tr>
<tr>
<td>4 gross tremor or muscle twitching</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Restlessness: Observation during assessment</th>
<th>Yawning: Observation during assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 able to sit still</td>
<td></td>
</tr>
<tr>
<td>1 reports difficulty sitting still, but is able to do so</td>
<td></td>
</tr>
<tr>
<td>3 frequent shifting or extraneous movements of legs/arms</td>
<td></td>
</tr>
<tr>
<td>5 unable to sit still for more than a few seconds</td>
<td></td>
</tr>
<tr>
<td>0 no yawning</td>
<td></td>
</tr>
<tr>
<td>1 yawning once or twice during assessment</td>
<td></td>
</tr>
<tr>
<td>2 yawning three or more times during assessment</td>
<td></td>
</tr>
<tr>
<td>4 yawning several times/minute</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pupil size</th>
<th>Anxiety or Irritability</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 pupils pinned or normal size for room light</td>
<td></td>
</tr>
<tr>
<td>1 pupils possibly larger than normal for room light</td>
<td></td>
</tr>
<tr>
<td>2 pupils moderately dilated</td>
<td></td>
</tr>
<tr>
<td>5 pupils so dilated that only the rim of the iris is visible</td>
<td></td>
</tr>
<tr>
<td>0 none</td>
<td></td>
</tr>
<tr>
<td>1 patient reports increasing irritability or anxiousness</td>
<td></td>
</tr>
<tr>
<td>2 patient obviously irritable or anxious</td>
<td></td>
</tr>
<tr>
<td>4 patient so irritable or anxious that participation in the assessment is difficult</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bone or Joint aches: If patient was having pain previously, only the additional component attributed to opiates withdrawal is scored</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 not present</td>
</tr>
<tr>
<td>1 mild diffuse discomfort</td>
</tr>
<tr>
<td>2 patient reports severe diffuse aching of joints/muscles</td>
</tr>
<tr>
<td>4 patient is rubbing joints or muscles and is unable to sit still because of discomfort</td>
</tr>
<tr>
<td>0 skin is smooth</td>
</tr>
<tr>
<td>3 piloerection of skin can be felt or hairs standing up on arms</td>
</tr>
<tr>
<td>5 prominent piloerection</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Runny nose or tearing: Not accounted for by cold symptoms or allergies</th>
<th>Gooseflesh skin</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 not present</td>
<td></td>
</tr>
<tr>
<td>1 nasal stuffiness or unusually moist eyes</td>
<td></td>
</tr>
<tr>
<td>2 nose running or tearing</td>
<td></td>
</tr>
<tr>
<td>4 nose constantly running or tears streaming down cheeks</td>
<td>0 skin is smooth</td>
</tr>
<tr>
<td>3 piloerection of skin can be felt or hairs standing up on arms</td>
<td></td>
</tr>
<tr>
<td>5 prominent piloerection</td>
<td></td>
</tr>
</tbody>
</table>

**Total Score _______**

The total score is the sum of all 11 items.

Initials of person completing assessment: __________________

---

A new section displays on the Admission Navigator for the Clinical Opiate Withdrawal Scale (COWS). Answer the questions related to opioid use in the past seven days prior to admission and if there is fear of withdrawal from any substance. Best Practice Advisories (BPAs) display for the provider based on the answers to these questions.
Opioid Use in the Previous 7 Days Prior to Admission?
Selecting Yes to the Opioid Use question brings in the questions from the COWS tool to complete.

COWS Documentation
Complete the documentation and view the score at the bottom of the section.

COWS Documentation
When the COWS score is between 1-9, continue to complete the scale every shift for the first three days post admission.

A nursing reminder task displays on the Nurse Brain when select Yes to the Opioid Use question.
Figure L.3

Complete the COWS scale from the Nurse Brain or the Admission Navigator.

The Clinical Opiate Withdrawal Scale (COWS) section in the Admission Navigator no longer displays once it has been greater than or equal to 72 hours post admission or the COWS score is documented at 10 or above.

When the score is 10 or above a Best Practice Advisory (BPA) fires for the provider in the Manage Orders activity in the patient’s chart. Options will appear to place an order for the Substance Use Intervention Team (SUIT) and the Substance Use Navigator (SUN).

The provider selects an Acknowledge Reason if these orders are not placed:
- Snooze/Defer to assess patient:
  - BPA is locked out for 90 minutes
- Treatment already appropriate
  - BPA is locked out for rest of encounter
- Not primary team
  - BPA is locked out only for that provider for the rest of the encounter

Manage Orders Activity

Fear of Withdrawal from Any Substance

When Yes “Positive” is selected in answer to the Fear of Withdrawal question, a Best Practice Advisory (BPA) fires for the provider in the Manage Orders activity in the patient’s chart. Options appear to place an order for the Substance Use Navigator (SUN).
Figure L-4

The provider selects an **Acknowledgement Reason** when the order will not be placed. The same lockout times apply as listed above.

**Note:** The BPA for the **Fear** question will not fire if the BPA has already fired for the **Opioid Use** question, which includes the SUN consult order.

---

**Fear of Substance Withdrawal BPA**

**Required Documentation**

The **Opioid Use** question and the **Fear of Withdrawal** question will be on the **Admission Required Documentation** list, to be completed within the first 24 hours of admission.
Figure L-5

Nurse Brain – Hyperspace

Complete the documentation and click Accept.

Nurse Brain – Hyperspace
## Appendix M

### Gap Analysis

<table>
<thead>
<tr>
<th>Activity/Status</th>
<th>Future State</th>
<th>Current State</th>
<th>Gap</th>
<th>Action Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admission Screening</td>
<td>Addition of two question on the admission intake form: 1) Have you used an opioid prescription or not in the previous 7 days? Yes, triggers COWS 2) Are you concerned you are going to withdraw from any substance while you are here in the hospital? Yes, auto orders a consult with the substance use navigator (SUN) team.</td>
<td>Patients are admitted to the inpatient setting with minimal screening for substance use. Trauma admissions require SBIRIT, but screening is limited to assessing alcohol consumption. SBIRIT screening performed by the trauma nurse practitioner. Paper DAST and AUDIT tools are used. Teams are not aware of specialty resources to address substance use disorders (SUD). Inpatient teams do not know how to access the resources easily.</td>
<td>There is a general lack of knowledge regarding substance use disorders, treatments, and the resources available to help provide expert guidance in the inpatient setting. Staff often identify these patients as challenging and difficult not realizing they may be experiencing withdrawal.</td>
<td>Educate front line nursing staff at CNIII All Here Days in January and in April 2022 regarding this vulnerable population and provide the knowledge, skills, and resources to help providers and staff care for these individuals. Present at one Leadership Retreat Incorporate the use of EBP fellows to assist with this project. Online education modules Identification and education of unit champions to work as part of the SUN/SUIT team</td>
</tr>
<tr>
<td>EMR Optimization</td>
<td>Automated workflows in EMR using assessment tools, clinical decision support and best practice advisories in both the inpatient and outpatient workflows in EMR to help</td>
<td>Scoring tools to identify patients and trigger specialty consults are either non-existent or on paper.</td>
<td>Currently the recommended workflows from EPIC are not activated in the current EMR as there have been no established workflows or processes to support use of these tools</td>
<td>Develop and implement EPIC recommended workflows across the health system Phase one- Implementation of EPIC recommended workflows in the inpatient setting Phase two- Implementation of EPIC workflows for ED and ambulatory</td>
</tr>
<tr>
<td>Patient Screening and Referral Process</td>
<td>Auto generated list of patients requiring long term antimicrobials reviewed daily by a multidisciplinary team of nurses, physicians and pharmacists to make appropriate referrals.</td>
<td>No systematized way to identify patients for referral to AIM clinic for supervised OPAT</td>
<td>Referral to AIM for OPAT in PWID is arbitrary and is as a means of last resort when patient is threatening to leave AMA.</td>
<td>Establish multidisciplinary team rounding to occur daily on patients who have long term antibiotics, on methadone or buprenorphine or had a SUN/SUIT consult placed.</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Overcoming stigma, bias and negative attitudes</td>
<td>Every person on admission will be spoken to in a non-judgmental fashion to inquire about substance use in a way that is compassionate and builds trust</td>
<td>Words matter - there are policies and language that need to be reviewed to ensure we are not introducing bias in how we speak with patients especially those who are most vulnerable. Overcoming negative attitudes and bias in persons who inject drugs is an important component to caring for these individuals. There needs to be mutual</td>
<td>There may be some negative attitudes on the part of some providers and healthcare professionals when it comes to treating addiction as impatient. Educational content is negligible for staff including ancillary, nursing and physicians</td>
<td>Begin education with staff at every level through CNIII All Here Days, Quarterly Leadership Retreat Identify key inpatient hospitalist champions who can partner with SUIT to provide clinical expertise in the inpatient setting More inpatient physicians with x waivers allowing for more broad prescribing of Buprenorphine and other medications.</td>
</tr>
</tbody>
</table>
### Discharge Disposition & Support

| Ongoing | Ensure that those who need the most resources have access to them to achieve the most optimal outcome. The organization has resources both in the ambulatory space for OPAT and prefer that PWID are discharged to a SNF, however this is often not an option as SNF are unwilling or slow to accept these individuals, which creates issues with long LOS, risk of leaving AMA. | Currently AIM is not well known about and accessing therapy plans are difficult. APPs in AIM wait for referrals rather than rounding on the units or attending flow huddles to learn of patients on a daily basis. | MVP Care plans Improved AIM therapy plans |

| Staff | Regular course offerings available to staff on addiction and addiction medicine for staff. Nurses and physicians who are certified in mental health can addiction medicine | trust and respect between the provider and the patient in order to illicit truthful and honest information which can be used to incorporate an holistic care pathway that addresses the psychosocial component of substance use as well as the medical condition for which they have been admitted. | medicine in the same way you can become a CCRN or CMSRN |
Appendix N

Gantt Chart

Improving Outcomes in PWID DNP GANTT Chart

<table>
<thead>
<tr>
<th>ID #</th>
<th>DNP Phases (may use framework or practicum emphasis)</th>
<th>Steps</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Assessment Phase**</td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>Initial Problem: Identified-Awareness of the issue</td>
<td></td>
</tr>
<tr>
<td>1.2</td>
<td>Literature review</td>
<td></td>
</tr>
<tr>
<td>1.3</td>
<td>Initial key stakeholder meeting</td>
<td></td>
</tr>
<tr>
<td>1.4</td>
<td>Process mapping</td>
<td></td>
</tr>
<tr>
<td>1.5</td>
<td>Assess and identify EPIC screening tools</td>
<td></td>
</tr>
<tr>
<td>1.6</td>
<td>Met with TOW re: MVP plan</td>
<td></td>
</tr>
<tr>
<td>1.7</td>
<td>1:1 interviews with SUN navigators</td>
<td></td>
</tr>
<tr>
<td>1.8</td>
<td>Review 6 month RAs for AHA</td>
<td></td>
</tr>
<tr>
<td>1.9</td>
<td>SWOT</td>
<td></td>
</tr>
<tr>
<td>1.11</td>
<td>Communication plan</td>
<td></td>
</tr>
<tr>
<td>1.12</td>
<td>WBS</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Design Phase Oct 2021</td>
<td></td>
</tr>
<tr>
<td>2.1</td>
<td>Meet with Statistic team</td>
<td></td>
</tr>
<tr>
<td>2.2</td>
<td>Mapped workflow for integration of COWS into EMR</td>
<td></td>
</tr>
<tr>
<td>2.3</td>
<td>EMR Project 1 team EMR build</td>
<td></td>
</tr>
<tr>
<td>2.4</td>
<td>SUN/OMAT Workgroup Meeting monthly</td>
<td></td>
</tr>
<tr>
<td>2.5</td>
<td>IRR Submission</td>
<td></td>
</tr>
<tr>
<td>2.6</td>
<td>Enter IT Ticket for EMR build COWS</td>
<td></td>
</tr>
<tr>
<td>2.7</td>
<td>Meet with Statistic team RE: Design study</td>
<td></td>
</tr>
<tr>
<td>2.8</td>
<td>Mapped nurse workflow for COWS</td>
<td></td>
</tr>
<tr>
<td>2.9</td>
<td>Qualitrics Learning Needs Assessment</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Implementation Phase Jan.-Oct., 2022</td>
<td></td>
</tr>
<tr>
<td>3.1</td>
<td>Staff Education Nursing-CNW All Here Jan 1/10/2022</td>
<td></td>
</tr>
<tr>
<td>3.2</td>
<td>Staff Education Nursing-CNW All Here Dec 1/10/2022</td>
<td></td>
</tr>
<tr>
<td>3.3</td>
<td>Staff Education Nursing-CNW All Here Dec 1/10/2022</td>
<td></td>
</tr>
<tr>
<td>3.4</td>
<td>Staff Education Nursing-CNW All Here Dec 1/10/2022</td>
<td></td>
</tr>
<tr>
<td>3.5</td>
<td>Staff Education Nursing-CNW All Here Dec 1/10/2022</td>
<td></td>
</tr>
<tr>
<td>3.6</td>
<td>PIDA IVAT July 11- October 21, 2022</td>
<td></td>
</tr>
<tr>
<td>3.7</td>
<td>Monthly Substance Use Committee Meetings</td>
<td></td>
</tr>
<tr>
<td>3.9</td>
<td>Policy 4122 created 7/22 COWS</td>
<td></td>
</tr>
<tr>
<td>3.11</td>
<td>COWS Tools launched in EMR 11/22</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Analysis Phase Nov. - Feb. 22</td>
<td></td>
</tr>
<tr>
<td>4.1</td>
<td>CQI data received from HIM as 11/23/2022</td>
<td></td>
</tr>
<tr>
<td>4.2</td>
<td>Data scrubbed, abstracted, formatted excel</td>
<td></td>
</tr>
<tr>
<td>4.3</td>
<td>Data submission to statistician on 12/10/2022</td>
<td></td>
</tr>
<tr>
<td>4.5</td>
<td>Final data reviewed and approved</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Culmination/Sustainability Phase 2023</td>
<td></td>
</tr>
<tr>
<td>5.1</td>
<td>Development of Operational reports for COWS for on</td>
<td></td>
</tr>
<tr>
<td>5.2</td>
<td>Launch of annual training for staff on the COWS</td>
<td></td>
</tr>
<tr>
<td>5.3</td>
<td>Develop Substance use intervention nurse champions</td>
<td></td>
</tr>
<tr>
<td>5.4</td>
<td>Presentation of excellence papers and posted</td>
<td></td>
</tr>
</tbody>
</table>

** Headings follow Practicum titles, the chosen DNP project conceptual framework can also be listed as key headings.
Appendix O

Work Breakdown Structure (WBS)
## Appendix P

**Communication and Responsibility Matrix**

<table>
<thead>
<tr>
<th>Name of the Communication</th>
<th>How often it will happen</th>
<th>Method of communication</th>
<th>Who will receive the communication</th>
<th>Goal</th>
<th>Who is responsible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project team meeting</td>
<td>Monthly</td>
<td>WebEx and email</td>
<td>Team consists of SUN, SUIT, ID, Transitions of Care, Social services, AIM/PICC leadership, Hospitalist leadership, EMR members on an Ad hoc basis</td>
<td>Review project from a clinical perspective, strategize about barriers and facilitators, provide updates</td>
<td>Carla Martin - Project lead</td>
</tr>
<tr>
<td>Stakeholder update</td>
<td>Monthly and on an as needed basis</td>
<td>In person, WebEx and email</td>
<td>IT, EMR, Executive Sponsor, Chief Quality Officer, USF Academic Advisors</td>
<td>Review project status, discuss systems barriers and updates, share progress. To received feedback from draft prospectus.</td>
<td>Carla Martin - Project Lead</td>
</tr>
<tr>
<td>Policy Committee</td>
<td>Initial approval and triennial review</td>
<td>Ellucid-Electonic policy database</td>
<td>Policy committee</td>
<td>Provide input as a subject matter expert and feedback on policy changes and impact on nurse workflow and education</td>
<td>Policy committee Chair Quality Director Carla Martin as SME</td>
</tr>
<tr>
<td>Name of the Communication</td>
<td>How often it will happen</td>
<td>Method of communication</td>
<td>Who will receive the communication</td>
<td>Goal</td>
<td>Who is responsible</td>
</tr>
<tr>
<td>---------------------------</td>
<td>--------------------------</td>
<td>-------------------------</td>
<td>-----------------------------------</td>
<td>------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Education CNIII All Here Day</td>
<td>As needed Quarterly</td>
<td>Online learning modules</td>
<td>Anyone in the organization</td>
<td>Goal is to provide the information to front line nurse staff who are caring for these patients to educate them on the pathophysiology of addiction, available resources and how to access the resources.</td>
<td>Center for Professional Practice of Nursing Carla Martin-Executive Sponsor for CNIII All Here Day Relationship Based Care Leads Center for Nursing Research</td>
</tr>
<tr>
<td>Relationship based care- See Me as a Person- EBP Council</td>
<td>Quarterly Quarterly</td>
<td>Hybrid in person and WebEx</td>
<td>All Nurses who are CNIII within the organization and across all settings. Anyone in the organization All EBP Mentors and Fellows</td>
<td>Goal is to sustain and improve upon staff knowledge and expertise</td>
<td></td>
</tr>
<tr>
<td>P &amp; T and Pain and Sedation</td>
<td>Monthly Meetings</td>
<td>WebEx</td>
<td>Pharmacy, Anesthesia, Physicians, Nurses</td>
<td>To illicit pharmacy expertise in managing pain and addiction in patients.</td>
<td>ID pharmacy liaison AIM/PICC leadership</td>
</tr>
<tr>
<td>PCS council weekly meeting Executive council</td>
<td>Meetings occur weekly but will present as needed to provide information or updates</td>
<td>Hybrid format in person and WebEx</td>
<td>All nurse leaders across the organization an in all settings</td>
<td>Provide project updates and education to the leadership staff who are supporting staff that care for patients with substance use disorders.</td>
<td></td>
</tr>
</tbody>
</table>
Appendix Q

SWOT Analysis

<table>
<thead>
<tr>
<th>Strengths</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Strong executive support</td>
</tr>
<tr>
<td>✓ Well aligned with organizational mission and priorities of healthcare equity</td>
</tr>
<tr>
<td>✓ Clinical specialty of ID and AM already in place</td>
</tr>
<tr>
<td>✓ Cost savings</td>
</tr>
<tr>
<td>✓ FTE neutral</td>
</tr>
<tr>
<td>✓ Improves efficiency and safety</td>
</tr>
<tr>
<td>✓ Established organizational frameworks (RBC &amp; ARCC) and Magnet</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Weakness</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Teams and services work in silos</td>
</tr>
<tr>
<td>✓ July-arrival of new residents</td>
</tr>
<tr>
<td>✓ Involves many departments and services</td>
</tr>
<tr>
<td>✓ Negative attitudes of HCW towards PWID</td>
</tr>
<tr>
<td>✓ Informatics workload slowing timeline for EMR upgrades</td>
</tr>
<tr>
<td>✓ No established workflows or processes for identification, monitoring and referral of PWID to specialty services</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Create a new paradigm of care for vulnerable populations</td>
</tr>
<tr>
<td>✓ Academic health organizations are viewed as experts and often generate new information which is disseminated on a larger scale</td>
</tr>
<tr>
<td>✓ Residents and Fellows completing the addition medicine fellowship and hired elsewhere bring with them new knowledge that allows for adoption and spread within the new organization.</td>
</tr>
<tr>
<td>✓ Reputation of the organization</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Reputation of the organization</td>
</tr>
<tr>
<td>✓ Regulatory agencies e.g. Board of Pharmacy with restrictions on MAT</td>
</tr>
<tr>
<td>✓ X waiver requirements</td>
</tr>
<tr>
<td>✓ Access to outpatient Methadone clinics</td>
</tr>
<tr>
<td>✓ Lack of community resources for outpatient follow up</td>
</tr>
<tr>
<td>✓ Lack of housing support for houseless PWID</td>
</tr>
<tr>
<td>✓ Ongoing pandemic resulting in closures or scale back of services</td>
</tr>
</tbody>
</table>
Appendix R

Financial Analysis - Implementation Costs (Denominator)

<table>
<thead>
<tr>
<th>Category of Costs</th>
<th>Planning</th>
<th>Training</th>
<th>Startup</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Total Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personnel</td>
<td>$102,000</td>
<td>-</td>
<td>$106,586</td>
<td>$106,586</td>
<td>$44,493.60</td>
<td>$44,493</td>
<td>$404,160</td>
</tr>
<tr>
<td>Meetings</td>
<td>$102,000</td>
<td>-</td>
<td>$5,208</td>
<td>$5,208</td>
<td>$5,321.04</td>
<td>$5,437</td>
<td>$123,174</td>
</tr>
<tr>
<td>Supplies</td>
<td>0</td>
<td>-</td>
<td>$7,732</td>
<td>$7,732</td>
<td>$7,810</td>
<td>$7,888</td>
<td>$31,163</td>
</tr>
<tr>
<td>Training</td>
<td>0</td>
<td>-</td>
<td>0</td>
<td>$30,750</td>
<td>$32,595</td>
<td>$32,595</td>
<td>$95,940</td>
</tr>
<tr>
<td>Equipment &amp; Depreciation</td>
<td>0</td>
<td>-</td>
<td>0</td>
<td>$40,000</td>
<td>$40,000</td>
<td>$40,000</td>
<td>$120,000</td>
</tr>
<tr>
<td>Information Systems</td>
<td>0</td>
<td>-</td>
<td>$19,500</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Outreach and Communication</td>
<td>0</td>
<td>-</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>External Consultants</td>
<td>0</td>
<td>-</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>$204,000</td>
<td>0</td>
<td>$139,026</td>
<td>$190,276</td>
<td>$130,220</td>
<td>$130,413</td>
<td><strong>$774,437</strong></td>
</tr>
</tbody>
</table>

Adopted from ARHQ Toolkit, Tool F.1 Calculating Implementation Costs (RO1 Denominator)


* There are no start-up costs other than what is captured under personnel and informatics as the patient is seen in an existing clinic.
## Appendix S

### Financial Analysis Total Cost Savings (Numerator)

<table>
<thead>
<tr>
<th>Effect Identified</th>
<th>A Comparison Period CY 2020 (IE)</th>
<th>B Pilot May 2021-Dec. 2021</th>
<th>C June 2022-December 2022</th>
<th>Net Change from baseline 20.6 Inpatient days</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue Increase/Cost Avoidance</td>
<td>Baseline*</td>
<td>Pilot **</td>
<td>Intervention ***</td>
<td>Change from Baseline</td>
<td>Source Data</td>
</tr>
<tr>
<td>A. Admissions/Readmissions Infective Endocarditis w/IVDU</td>
<td>n=10</td>
<td>n=3</td>
<td>n=8</td>
<td>N/A</td>
<td>UCDH HIM and CDS</td>
</tr>
<tr>
<td>B. Inpatient Length of stay/pt.(mean)</td>
<td>20.6 days</td>
<td>13 days</td>
<td>15.4 days</td>
<td></td>
<td>UCDH HIM</td>
</tr>
<tr>
<td>C. Total cost of inpatient care -(=$7354.80* per day for IE.)</td>
<td>206 days</td>
<td>39 days</td>
<td>123 days</td>
<td></td>
<td>Actual # of days for each patient combined (EMR)</td>
</tr>
<tr>
<td>D. #Actual days treated in AIM (combined total for all pts.)</td>
<td>0</td>
<td>103 days</td>
<td>130 days</td>
<td></td>
<td>Actual # of days treated in AIM all patients combined (EMR)</td>
</tr>
<tr>
<td>E. AIM Costs ~$1300/per day</td>
<td>0</td>
<td>$134,500.00</td>
<td>195,000.00</td>
<td></td>
<td>HCAI Hospital Chargemaster 2022</td>
</tr>
<tr>
<td>F. Cost avoidance(# of days pt. not hospitalized-treated in AIM) ($7354.80*per day)</td>
<td>0</td>
<td>($757,544.40)</td>
<td>($956,124.00)</td>
<td></td>
<td>Calculated based on known assumptions</td>
</tr>
<tr>
<td>G. TOTAL COST per pt. (C/4)</td>
<td>$151,508.88</td>
<td>($-105,462.40)</td>
<td>$17,939.55</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Revenue Loss (potential)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H. Loss from actionable/avoidable days GMLOS for MS-DRG 289 ~6 days</td>
<td>(146 days )</td>
<td>(21 days )</td>
<td>(75.2 days )</td>
<td></td>
<td>Lost revenue ~6 days. GMLOS</td>
</tr>
<tr>
<td>I. Lost revenue/potential for new admits based on average LOS 4.5 days</td>
<td>146 days/32.4 new admits</td>
<td>21 days/4.7 new admits</td>
<td>75.2 days/16.7 new admits</td>
<td></td>
<td>GMLOS is ~6 days. Loss of revenue from an inability to open beds to new patients</td>
</tr>
<tr>
<td>Readmissions w/in 30 days</td>
<td>N/A</td>
<td>3**</td>
<td>3</td>
<td></td>
<td>*One readmission for induction of opioid agonist therapy</td>
</tr>
<tr>
<td>Liability/litigation (PDD)</td>
<td>5(50%)</td>
<td>0</td>
<td>2(25%)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Net Financial Effect (Total) per pt. (G-H)</td>
<td>($-92,229.19)</td>
<td>$49,048.40</td>
<td>$71,377.56</td>
<td></td>
<td>$ 84,737.18 potential costs savings on average per patient discharged to the AIM clinic</td>
</tr>
</tbody>
</table>

*All baseline budget assumptions are based on costs and LOS associated with infectious endocarditis (IE) DRG 289 CY 2020 n=82/combined LOS 1721 days/combined costs $12,657,023.00 (UCDH Clinical Decision Support 2/2022).

++Pilot and intervention groups include both IE, osteomyelitis and SSTI
Appendix T

SUN-SUIT Consults 2022

SUN-SUIT Consults CY 2022

Intervention Period

EMR Tools

Jan 121
Feb 152
Mar 194
Apr 210
May 206
Jun 189
Jul 163
Aug 218
Sep 169
Oct 215
Nov 362
Dec 187

SUN
SUIT
Discharges PVCIS-SUD
Appendix U

Qualtrics Survey Results

Survey Summary Key Findings

Credentials - highest percentages
- Most are registered nurses: 83.67%
- Bachelor's degree: 46.00%
- 3-5 years of healthcare experience: 29.41%

Demographics - highest percentages
- Female: 86.27%
- 25-34 year old age category: 33.33%
- Race - white: 52.73%

- Previous personal experience with someone that had a substance use disorder - YES: 54.90%

Knowledge Questions regarding SUD
- Most familiar with Alcohol: 40.65%
- Least familiar with Cocaine: 42.05%
- Most have attended a course or lecture on SUD: 58.82%
- Most strongly agree they have the knowledge and skills to care for patients with SUD: 29.41%
- Opioids are highly addictive - definitely true: 62.75%
- Taking prescribed opioids for more than a few days increases risk of addiction: 37.25%

Knowledge of current resources available
- Most are not familiar with the Substance Use Navigators (SUN) and Substance use intervention team (SUIT): 58.82%
- Most have never cared for a patient with a SUN or SUIT consult: 62.75%
- Most are not knowledgeable at all of MAT treatment available to treat opioid use disorders: 50.98%
- Most are not knowledgeable at all of the Clinical Opioid Withdrawal Scale (COWS): 52.94%
- Most are not familiar at all regarding the AIM clinic: 40.82%
- Very few staff were aware that AIM clinic is open 365 (weekends and holidays): 17.20%

Stigma and Labels Associated with Addiction
- Most staff strongly disagree with using terms such as "addict" or "drug user": 59.18%

Conclusions

The data gathered targeted two specific units in the inpatient setting - the post-cardiac surgery unit and the trauma unit. These units were targeted because they interact with populations that are hospitalized with infections or serious injuries secondary to substance use disorders.

Overall staff were most familiar with Alcohol use disorders and less familiar with Cocaine and methamphetamine.

While most state that they have had education on substance use disorders, they data shows that they have little knowledge of the MAT protocols, access to specialty addiction medicine consult teams (SUN & SUIT) available to them as well as Infectious disease consults with discharge to AIM clinic which is open 365 and is located on the first floor of the main hospital interestingly enough, at the employee main entrance.

The healthcare personnel that responded tended to be younger with less than 5 years as a healthcare provider. Most were female and white.

Data gathered from this small population reveals the need for widespread education to front line staff thus supporting the need for this project, which is to develop a clinical pathway for persons admitted for a medical condition but also have a substance use disorder.
# Appendix V

## Characteristics of Patients Hospitalized PWID

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Supervised OPAT (SuPat) (N=11)</th>
<th>Standard care Nonintervention (N=26)</th>
<th>Total (N=37)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>0 (0.0%)</td>
<td>5 (19.2%)</td>
<td>5 (13.5%)</td>
<td>0.295¹</td>
</tr>
<tr>
<td>Male</td>
<td>11 (100.0%)</td>
<td>21 (80.8%)</td>
<td>32 (86.5%)</td>
<td></td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
<td>0.149²</td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>45.0 (11.5)</td>
<td>51.2 (11.7)</td>
<td>49.3 (11.8)</td>
<td></td>
</tr>
<tr>
<td>Median (Q1, Q3)</td>
<td>51.0 (36.0, 51.5)</td>
<td>54.5 (43.2, 60.0)</td>
<td>52.0 (41.0, 57.0)</td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td>26.0 – 63.0</td>
<td>26.0 – 75.0</td>
<td>26.0 – 75.0</td>
<td></td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
<td></td>
<td></td>
<td>0.718¹</td>
</tr>
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¹ Fishers Exact Test for Count Data
² Linear Model ANOVA
³ Pearson’s Chi-squared test
### Appendix W

**Summary Statistics — Non-intervention Group vs. Intervention SuPAT (AIM Clinic)**

<table>
<thead>
<tr>
<th></th>
<th>Intervention (SuPAT) AIM Clinic (N=11)</th>
<th>Non-intervention (N=26)</th>
<th>Total (N=37)</th>
<th>p-value</th>
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<td>Opioids</td>
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<td>Infection Type</td>
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Fisher's Exact Test for Count Data
Linear Model ANOVA
Pearson's Chi-squared test
Primary Outcomes *
Secondary Outcomes **
Appendix X

IRB Approval Letter

October 20, 2021
Carla Martin, MSN, RN

On October 20, 2021 the UC Davis IRB Administration reviewed the following protocol:

<table>
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<th>Type of Review</th>
<th>Other</th>
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<tr>
<td>Title</td>
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<tr>
<td>Investigator</td>
<td>Martin, Carla, MSN, RN</td>
</tr>
<tr>
<td>IRB ID</td>
<td>1824007-1</td>
</tr>
<tr>
<td>Documents Submitted</td>
<td>Other - HRP-21C-Determination-Request.pdf</td>
</tr>
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</table>

Comments/Conditions: This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are being considered and there are questions about whether IRB review is needed, please submit a modification request to the IRB for another determination.

While this project doesn’t require IRB review, if your project involves accessing UC Davis Health patient information and/or sharing data with a third party, you should consider:

- If you are seeking de-identified data from the EMR, please contact the Biomedical Informatics team for assistance at https://health.ucdavis.edu/biostatistics/index.html.
- If you are seeking to access PHI from the EMR or another database owned by UC Davis Health (e.g. department DIQA database), please contact the UCD Health Compliance Department using the Compliance Inquiry Form at https://health.ucdavis.edu/compliance/contact/ or via email at hs-researchcompliance@ouc.ucdavis.edu to obtain appropriate direction prior to accessing EMR/databases.

This assurance, on file with the Department of Health and Human Services, covers this determination:

FWA No: 00094657
Expiration Date: April 14, 2025
I/ORC: 0006251
Appendix Y

Letter of Agency Support

UNIVERSITY OF CALIFORNIA, DAVIS

September 2, 2021

University of San Francisco
School of Nursing and Health Professions
2130 Fulton St.
San Francisco, CA. 94117

ATTN: KT Waxman, DNP, MBA, RN, CENP, CHSE, FSSH, FAAN
   Director, Executive Leadership DNP Program
   Elena Capella, EdD, MSN/MPA CNL, CPHQ, LNCC
   DNP Committee Chair

Dear Drs. Waxman and Capella,

This is a letter of support for Carla S. Martin, MSN, RN to implement her DNP Comprehensive Project; Increasing Referrals to Outpatient Parenteral Antimicrobial Therapy in Persons Who Inject Drugs. Implementation of a Person-Centered Care Pathway. The project will be implemented at UC Davis Medical Center, Sacramento, California.

Permission is granted to use the name of our agency in their DNP Comprehensive Project Paper and in future presentations and publications.

Sincerely,

Toby Marsh, RN (nhe/him/his)
Chief Nursing and Patient Care Services Officer
UC Davis Medical Center
2315 Stockton Blvd., North Addition 3023
Sacramento, CA 95817
916-734-2470
tkmarsh@ucdavis.edu
Appendix Z

Statement of Non-Research Determination Form

Student Name: Carla S. Martin

Title of Project:
Improving Outcomes in Persons Who Inject Drugs: A Multidisciplinary Healthcare Initiative

Brief Description of Project

In the context of the opioid epidemic, hospitalizations due to secondary infectious complications, including endocarditis, are increasing in Persons Who Inject Drugs (PWID) (Vazirian et al., 2018). These individuals are more likely to leave against medical advice (AMA) and are high utilizers of the emergency department (ED), often requiring multiple readmissions (Suzuki et al., 2018; Ti & Ti, 2015). According to Vazirian et al. (2018), Outpatient parenteral antimicrobial therapy (OPAT) is the standard of care for patients requiring long-term antimicrobial therapy; however, PWID have been restricted from OPAT for fear they will tamper with or access the line for recreational drug use.

A quality improvement project grounded in Relationship Based Care (RBC) (Koloroutis, 2004) and Advancing Research Through Close Collaboration (ARCC) (Melnyk and Fineout-Overholt, 2002) frameworks sought to improve the completion of antimicrobial therapy in PWID at a 646-bed academic and Level I trauma center.

A novel care pathway, supported by infectious disease, addiction medicine, and other wrap-around services provided support allowed PWID to be discharged to a less restrictive setting for continued antimicrobial therapy. Eleven patients received supervised OPAT in a hospital-based clinic. Nine of 11 (82%) intervention patients completed therapy. Peripherally inserted central catheters (PICC) were present in four...
(40%) of the intervention group. A total of 233 inpatient days were saved, with an estimated cost savings of nearly $1M.

These outcomes demonstrated that supervised OPAT, supported by wrap-around services, is a safe, cost-effective alternative to prolonged hospitalizations in PWID.

A) AIM Statement: The project aim was to improve the completion of antimicrobial therapy in PWID from a facility baseline of 50 to 67% by implementing a hospital-wide clinical pathway promoting early screening, recognition, intervention, and discharge for continued parenteral antimicrobial therapy in a monitored outpatient setting by December 2022.

B) Description of Intervention

Evidence from the literature supports a holistic and structured approach to care that addresses substance use disorder as a chronic health condition (Bearn et al., 2019; Price et al., 2020; Serota et al., 2023). Implementing the proposed SuPAT care model depended on identifying patients eligible for discharge to the AIM clinic for continued antimicrobial therapy. Screening and referrals workflow were automated through the EMR to link addiction medicine expertise to patients and clinicians in the inpatient setting. The tools included (a) admission screening questions, (b) the Clinical Opioid Withdrawal Scale (COWS), (c) buprenorphine induction order sets, (d) clinical alerts, and (e) system-generated referrals to the SUN and SUIT teams. Multidisciplinary rounds supported the identification and referral of PWID for the SuPAT intervention until all the tools were launched.

C) How will this intervention change practice?

The knowledge gained during the initial pilot demonstrated the value of referral and discharge to the AIM clinic for continued antimicrobial therapy in select PWID. Creating a novel pathway provided access for PWID in a supervised OPAT (SuPAT) setting within an existing hospital-based outpatient infusion clinic, thus offering a safe, lower-cost, less restrictive setting
than the current state of treatment allowed. By design, beneficiaries received support for transportation, food insecurity, housing, and addiction recovery and treatment in addition to supervised OPAT (SuPAT) in the infusion clinic. Evidence in the literature and guidance from the hospital’s internal experts in addiction medicine and infectious disease contributed to the pathway’s design. Coordinated efforts from many multidisciplinary teams with support from wrap-around services made the implementation possible. The project achieved its primary aim to improve the completion of therapy in PWID.

D) Outcome Measures

- The primary outcome measure was the completion of antimicrobial therapy (Yes/No).
- The secondary outcome was readmissions within 14 days.

References


# DNP Statement of Determination

## Evidence-Based Change of Practice Project Checklist*

The SOD should be completed in NURS 7005 and NURS 791/E or NURS 749/A/E

### Improving Outcomes in Persons Who Inject Drugs: A Multidisciplinary Healthcare Initiative

Mark an “X” under “Yes” or “No” for each of the following statements:

<table>
<thead>
<tr>
<th>Statement</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
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<tr>
<td>The aim of the project is to improve the process or delivery of care with established/accepted standards, or to implement evidence-based change. There is no intention of using the data for research purposes.</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>The specific aim is to improve performance on a specific service or program and is a part of usual care. All participants will receive standard of care.</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>The project is not designed to follow a research design, e.g., hypothesis testing or group comparison, randomization, control groups, prospective comparison groups, cross-sectional, case control. The project does not follow a protocol that overrides clinical decision-making.</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>The project involves implementation of established and tested quality standards and/or systematic monitoring, assessment or evaluation of the organization to ensure that existing quality standards are being met. The project does not develop paradigms or untested methods or new untested standards.</td>
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<td></td>
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<tr>
<td>The project involves implementation of care practices and interventions that are consensus-based or evidence-based. The project does not seek to test an intervention that is beyond current science and experience.</td>
<td>X</td>
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<tr>
<td>The project is conducted by staff where the project will take place and involves staff who are working at an agency that has an agreement with USF SONHP.</td>
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<td></td>
</tr>
<tr>
<td>The project has no funding from federal agencies or research-focused organizations and is not receiving funding for implementation research.</td>
<td>X</td>
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</tr>
<tr>
<td>The agency or clinical practice unit agrees that this is a project that will be implemented to improve the process or delivery of care, i.e., not a personal research project that is dependent upon the voluntary participation of colleagues, students and/ or patients.</td>
<td>X</td>
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</tr>
<tr>
<td>If there is an intent to, or possibility of publishing your work, you and supervising faculty and the agency oversight committee are comfortable with the following statement in your methods section: “This project was undertaken as an Evidence-based change of practice project at X hospital or agency and as such was not formally supervised by the Institutional Review Board.”</td>
<td>X</td>
<td></td>
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</table>

### Answer Key:
- If the answer to all of these items is "Yes", the project can be considered an evidence-based activity that does not meet the definition of research. IRB review is not required. Keep a copy of this checklist in your files.
- If the answer to any of these questions is "No", you must submit for IRB approval.

*Adapted with permission of Elizabeth L. Hohmann, MD, Director and Chair, Partners Human Research Committee, Partners Health System, Boston, MA.

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University of San Francisco, School of Nursing and Health Professions

REV 07/15/19, 001619, 073120; ed_mkh_fsd_10-5-20; DNP Faculty Approval 11.19.20

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To qualify as an Evidence-based Change in Practice Project, rather than a Research Project, the criteria outlined in federal guidelines will be used: [http://answers.hhs.gov/ohrp/categories/1569](http://answers.hhs.gov/ohrp/categories/1569)

**UNIVERSITY OF SAN FRANCISCO | School of Nursing and Health Professions**

**DNP Statement of Determination**

**Evidence-Based Change of Practice Project Checklist Outcome**

*The SOD should be completed in NURS 7005 and NURS 791E/F or NURS 749/AVE*

X This project meets the guidelines for an Evidence-based Change in Practice Project as outlined in the Project Checklist (attached). Student may proceed with implementation.

☐ This project involves research with human subjects and must be submitted for IRB approval before project activity can commence.

Comments:

<table>
<thead>
<tr>
<th>Student Last Name:</th>
<th>Martin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student First Name:</td>
<td>Carla</td>
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</tbody>
</table>

Student Signature: ___________________________ Date: 2/28/2023

Chairperson Name: Elena Capella EdD, MSN/MPA, CNL, CPHQ, LNCC
Chairperson Signature: ___________________________ Date: ____________

Second Reader Name: Sara Horton-Deutsch, Ph.D., RN, FAAN, ANEF, Caritas Coach
Second Reader Signature: ___________________________ Date: ____________

DNP SOD Review Committee Member Name: ___________________________
DNP SOD Review Committee Member Signature: ___________________________ Date: ____________