

# Suboptimal Addiction Interventions for Patients Hospitalized with Injection Drug Use-associated Infective Endocarditis

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## ABSTRACT

**BACKGROUND:** Infective endocarditis is a serious infection, often resulting from injection drug use. Inpatient treatment regularly focuses on management of infection without attention to the underlying addiction. We aimed to determine the addiction interventions done in patients hospitalized with injection drug use-associated infective endocarditis.

**METHODS:** This is a retrospective review of patients hospitalized with injection drug use-associated infective endocarditis from January, 2004 through August, 2014 at a large academic tertiary care center in Boston, Massachusetts. For the initial and subsequent admissions, data were collected regarding addiction interventions, including consultation by social work, addiction clinical nurse and psychiatry, documentation of addiction in the discharge summary plan, plan for medication-assisted treatment and naloxone provision.

**RESULTS:** There were 102 patients admitted with injection drug use-associated infective endocarditis, 50 patients (49.0%) were readmitted and 28 (27.5%) patients had ongoing injection drug use at readmission. At initial admission, 86.4% of patients had social work consultation, 23.7% had addiction consultation, and 24.0% had psychiatry consultation. Addiction was mentioned in 55.9% of discharge summary plans, 7.8% of patients had a plan for medication-assisted treatment, and naloxone was never prescribed. Of 102 patients, 26 (25.5%) are deceased. The median age at death was 40.9 years (interquartile range 28.7-48.7).

**CONCLUSIONS:** We found that patients hospitalized with injection drug use-associated infective endocarditis had high rates of readmission, recurrent infective endocarditis and death. Despite this, addiction interventions were suboptimal. Improved addiction interventions are imperative in the treatment of injection drug use-associated infective endocarditis.

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The United States is experiencing an epidemic of nonmedical prescription opioid and heroin use.<sup>1</sup> This includes an estimated 1.29 to 2.59 million individuals that practice injection drug use.<sup>2</sup> This practice predisposes individuals to a number of complications, including infective endocarditis. People who inject drugs have a significantly higher incidence of infective endocarditis than the general population. In addition, when compared to noninjection drug-using peers with infective endocarditis, these individuals have higher rates of recurrent infective endocarditis and mortality after the initial episode of infective endocarditis.<sup>3-5</sup>

Acute management of infective endocarditis often involves significant utilization of resources, including extended antibiotic treatments, prolonged hospitalizations, and at times, surgical interventions. However, prevention of recurrent infective endocarditis and associated mortality in patients with injection drug use-associated infective endocarditis also requires treatment of the underlying cause of infective endocarditis, addiction. Optimal treatment of addiction combines psychosocial supports, medication-assisted treatment, and harm reduction strategies.<sup>6,7</sup> However, historically, addiction has been undertreated in the US.<sup>8</sup>

While there is literature on the poor outcomes of patients with injection drug use-associated infective endocarditis, there has not been an evaluation of the addiction management that occurs during hospitalization for these individuals. In this study, we aim to assess the interventions for addiction in patients hospitalized with injection drug use-associated infective endocarditis.

## METHODS

### Study Design and Patient Population

We performed a retrospective review of individuals admitted with injection drug use-associated infective endocarditis at a large academic tertiary care center in Boston, Massachusetts from January 1, 2004 through August 31, 2014. The study was approved by the hospital Institutional Review Board.

### Data Collection

International Classification of Diseases, Ninth Revision codes were searched to identify individuals discharged with a diagnosis of infective endocarditis (112.81, 421.0, 421.1, 421.9, 424.90, 424.91, 424.99). These charts were reviewed to confirm infective endocarditis diagnosis, which was defined by modified Duke criteria.<sup>9</sup> Medical records were reviewed for active injection drug use, defined as injection drug use within 3 months of infective endocarditis and determined to be the cause of infective endocarditis. In addition, data were collected regarding demographic characteristics, date of admission and discharge, discharge medications, and surgical interventions.

After the sentinel admission for injection drug use-associated infective endocarditis, all charts were reviewed for readmission for any reason. Medical records were reviewed for reason for admission, presence of active injection drug use (in this case defined as injection drug use

since the prior discharge or within 3 months, whichever is a shorter time period), date of admission and discharge, discharge medications, and surgical interventions.

Medical records and the social security database were evaluated for death and date of death.

## CLINICAL SIGNIFICANCE

- Patients with injection drug use-associated infective endocarditis have high rates of readmission, recurrent endocarditis, and death.
- Treatment of addiction is suboptimal in these patients, despite being the predisposing cause of infective endocarditis.
- Providers need to improve rates of addiction specialist involvement, medication-assisted therapy, and harm-reduction strategies for patients hospitalized with injection drug use-associated infective endocarditis.

## Addiction Interventions

For all admissions, data were collected regarding addictions interventions. The medical record was reviewed for consultation by social work, addiction clinical nurse, or psychiatry. Discharge summary plans were evaluated for documentation of opioid use disorder, addiction, or injection drug use. In addition, discharge summaries were reviewed for plan for medication-assisted treatment with methadone, buprenorphine, or naltrexone. This was defined as a plan for continuation of medication-assisted treatment, follow-up with or referral to a provider for the purpose of initiation of medication-assisted treatment, or medication-assisted treatment identified in the discharge medication

reconciliation. In addition, discharge summaries were reviewed for evidence of opioid overdose education and naloxone distribution.

Of note, between 2004 and 2006, not all notes were available in the electronic medical record and scanned records were not yet available. Therefore, in 9 patients it was not possible to verify social work, addiction clinical nurse, and psychiatry consults. However, demographic information, surgical consults, surgical interventions, and discharge planning was complete for every patient.

## Statistics

Descriptive statistics were performed with Stata 13 (Stata-Corp LP, College Station, TX). To ensure reliability of the data extraction, author JT reviewed 10% of records and found >99% concordance.

## RESULTS

Between January 1, 2004 and August 31, 2014, 747 patients were admitted with infective endocarditis. Of those, 102 had documented active injection drug use. Their characteristics are listed in [Table 1](#).

During sentinel admission, 70.1% of patients had a cardiothoracic surgery consultation, and of those, 57.4% underwent surgery. The frequency of social work, addiction clinical nurse, and psychiatry consults are listed in [Table 2](#). The frequency of documentation of opioid use disorder, addiction, or injection drug use as a problem in the

**Table 1** Characteristics of Patients with Initial Admission for Infective Endocarditis Associated with Active Injection Drug Use, January 2004-August 2014

Characteristic	Value
Total patients with endocarditis	747
Associated with active injection drug use	102
Age, y – n (%)	
<20	2 (2.0)
20-29	38 (37.3)
30-39	27 (26.4)
40-49	27 (26.4)
50-59	7 (6.9)
≤60	1 (1.0)
Sex – n (%)	
Male	56 (54.9)
Female	46 (45.1)
Race/ethnicity – n (%)	
White	75 (73.5)
Black	12 (11.8)
Hispanic	6 (5.9)
Unknown	9 (8.8)
Human immunodeficiency virus antibody – n (%)	
Negative	79 (77.5)
Positive	5 (4.9)
Not performed	18 (17.6)
Hepatitis C virus antibody – n (%)	
Negative	30 (29.4)
Positive	65 (63.7)
Not performed	7 (6.7)
Outside hospital transfer – n (%)	
Yes	57 (55.9)
No	45 (44.1)
Prior infective endocarditis – n (%)	
No	81 (79.4)
Yes	21 (20.6)

discharge summary, and the plan for medication-assisted treatment and naloxone prescription are also listed in **Table 2**.

**Table 2** Addictions Interventions for Patients Admitted with Current or Previous Admission for Endocarditis Associated with Injection Drug Use

	Sentinel Admission (n = 102)	Readmission (n = 131)	IDU Readmission (n = 42)	Admission with Surgery (n = 48)	All Admissions (n = 233)
<b>Inpatient consults</b>					
Social work	82/95 (86.3)	66/123 (53.7)	16/39 (41.0)	42/45 (93.3)	148/219 (67.6)
Addiction clinical nurse	22/93 (23.7)	9/122 (7.4)	4/39 (10.3)	14/45 (31.1)	31/215 (14.4)
Psychiatry	23/96 (24.0)	12/123 (9.8)	4/40 (10.0)	8/45 (17.8)	35/219 (16.0)
<b>Discharge planning</b>					
Discharge summary	57/102 (55.9)	30/131 (30.5)	23/42 (54.8)	11/48 (22.9)	97/233 (41.6)
Plan for MAT	8/102 (7.8)	18/131 (13.7)	5/42 (11.9)	3/48 (6.3)	26/233 (11.2)
Naloxone prescription	0/102 (0)	0/131 (0)	0/42 (0)	0/48 (0)	0/233 (0)

For all admissions, data were collected regarding addictions interventions, including inpatient consultation by social work, addiction clinical nurse, or psychiatry. Discharge summary plans were evaluated for documentation of opioid use disorder, addiction, and injection drug use, plan for medication-assisted treatment and prescription of naloxone. Between 2004 and 2006, not all notes were available in the electronic medical record, and scanned records were not yet available. Therefore, in 9 patients it was not possible to verify social work, addiction clinical nurse, and psychiatry consults unless mentioned in the discharge summary. This is reflected in the variable denominators for these values.

IDU = injection drug use; MAT = medication-assisted treatment with methadone, buprenorphine, or naltrexone.

Of the 102 patients admitted with injection drug use-associated infective endocarditis, 50 (49.0%) were ever readmitted, for a total of 131 readmissions. Active injection drug use was documented in 28 of the 50 readmitted patients and in 42 of the 131 (32.1%) total readmissions. Fourteen of the 102 (13.7%) patients were readmitted with recurrent infective endocarditis, and of those, 12 had recurrent injection drug use-associated infective endocarditis. The median time to readmission was 35.5 days (interquartile range [IQR] 9-75.8 days), and median time to readmission for recurrent infective endocarditis was 216 days (IQR 109.3-445 days).

Plan for medication-assisted treatment was documented for 16 (15.7%) patients and in 26 of the 233 (11.2%) admissions. Of the 26, one patient was started on methadone, one was given a phone number for a specific buprenorphine clinic, and the other 24 were continued on their previous treatment from pre-established providers, none of which were arranged during their hospitalization.

At least 26 of the 102 (25.5%) patients are deceased. The median time to death from the sentinel day of admission was 305.5 days (IQR 118-707). The median age at death was 40.9 years (IQR 28.7-48.7).

## DISCUSSION

This study found that the treatment of patients with injection drug use-associated infective endocarditis was largely focused on management of the infectious process and that interventions addressing addiction in these hospitalized patients were lacking. Individuals with injection drug use-associated infective endocarditis have high rates of morbidity and mortality.<sup>3-5</sup> Relapse of injection drug use in this population confers risk of reinfection, readmission, potential need for surgical intervention, and death. Therefore, in patients hospitalized with injection drug use-associated infective endocarditis, treatment of addiction is crucial.

Social work consultations were the most common intervention in patients with injection drug use-associated

infective endocarditis. Yet, despite relatively high rates of psychosocial support, identification of addiction in discharge planning was infrequent, and initiation of medication-assisted treatment was nearly nonexistent. This practice is consistent with a troubling tendency in the medical community to regard addiction as a social problem rather than a medical illness.<sup>8</sup>

Substance use disorder is a chronic medical illness resulting from neurobiological changes that cause drug dependence and cravings.<sup>10</sup> Like many individuals with chronic medical conditions, patients with addiction can benefit from medication-assisted treatment. Randomized controlled trials have repeatedly proven medication-assisted treatment to be an effective treatment of opioid use disorder by increasing survival and treatment retention while decreasing cravings and illicit opioid use.<sup>11-14</sup> Unfortunately, we found that adoption of medication-assisted treatment was rare, and in almost all cases, represented a continuation of treatment that had been established by other providers prior to hospitalization.

In addition to the low rates of medication-assisted treatment, we found a lack of adoption of harm-reduction strategies, such as overdose education and naloxone distribution. These patients have high rates of unintentional overdose (34.6% in one study) and increased risk of drug-related death following hospitalization.<sup>15,16</sup> Implementing overdose education and naloxone distribution has been observed to reduce opioid overdose-related death in this population and is a potentially lifesaving intervention for patients at risk of ongoing injection drug use.<sup>17</sup>

Multiple factors likely contribute to the paucity of addiction interventions provided to patients with injection drug use-associated infective endocarditis. In most medical training programs, students and residents receive minimal education about addiction and effective treatments for substance use disorders.<sup>18</sup> Further, despite the Mental Health Parity Act of 2008, there remains a dearth of addiction treatment facilities nationwide, and provision of medication-assisted treatment is encumbered by federal regulations limiting prescription of opioid replacement therapy.<sup>8,19</sup> In addition, the persistent stigma associated with drug use often leads providers to treat addiction differently than other chronic medical conditions, and may make patients reluctant to engage in medical care.<sup>20</sup>

Our study has multiple limitations. It is a retrospective medical record review study performed at a single institution. It is possible that variation in regional, institutional, or individual practices exists but this was an attempt to look at the practice in one institution. Identification of active injection drug use was difficult, as documentation was inconsistent and some discussions about addiction or linkage to outpatient care not included in the medical record may not have been captured. Furthermore, multiple patients received primary care and follow-up care at other institutions, thus, readmission statistics and death rates are likely underestimated.

Overall, we found that patients hospitalized with injection drug use-associated infective endocarditis had serious

infections with high rates of injection drug use-associated readmissions, recurrent infective endocarditis, and death. Despite this, beyond psychosocial support, addictions interventions to address a major health hazard as well as the primary predisposition for infective endocarditis were uncommon. Improved interventions for addiction are imperative and should include the adoption of medication-assisted treatment and harm-reduction strategies.

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