




PERSPECTIVE

Expanding the Team: Optimizing the Multidisciplinary Management of Drug Use-Associated Infective Endocarditis

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Amidst a substance use epidemic, hospitalizations and valve surgeries related to drug use-associated infective endocarditis (DU-IE) rose substantially in the last decade. Rates of reoperation and mortality remain high, yet in many hospitals patients are not offered valve surgery or evidence-based addiction treatment. A multidisciplinary team approach can improve outcomes in patients with infective endocarditis; however, the breadth of expertise that should be incorporated into this team is inadequately conceptualized. It is our opinion that incorporating addiction medicine services into the team may improve outcomes in DU-IE. Here, we describe our experience incorporating addiction medicine services into the multidisciplinary management of DU-IE and share implications for other hospitals and health systems looking to improve care for people with DU-IE.

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INTRODUCTION

When viewed solely through surgical loupes, valve operations in drug use-associated infective endocarditis (DU-IE) may appear to be a Sisyphean task.¹ Amidst a substance use epidemic in the USA, hospitalizations for DU-IE doubled between 2008 and 2014.² Mirroring this trend, DU-IE valve surgeries have risen by as much as twelve-fold since 2007³—approaching one-third to one-half of all IE valve surgeries.^{3, 4} Contributing to this swell, the rate of reoperation in DU-IE is significantly higher than in non-DU-IE,^{5, 6} in part due to increased incidence of recurrent endocarditis.^{5, 7, 8} Although in-hospital and 30-day mortality is similar between

DU-IE and non-DU-IE,^{6, 9} midterm mortality (6 months to 5 years, 53%)⁶ and long-term mortality (10 years, 56%)⁸ remain dismal among patients with DU-IE, which is partly driven by return to substance use.¹⁰

The sobering nature of these statistics has sparked commentary on the futility of reoperation in cases of DU-IE,^{11, 12} and drives others to think about structural factors and individual stigma that may contribute to inadequate hospital care for people with substance use disorders.¹³ An expanded multidisciplinary team (MDT) approach may inform this debate and improve the early diagnosis and treatment of DU-IE. The deployment of a MDT approach using protocols endorsed by the European Society of Cardiology and American College of Cardiology^{14–16} has been shown to reduce morbidity and mortality in patients with non-DU-IE.^{17–19} Despite strong recommendations for the inception of a team-based approach, the breadth of expertise that should be incorporated into this team is inadequately conceptualized in current endocarditis guidelines. Incorporating addiction medicine specialists into the MDT would likely inform the decision to operate in cases of DU-IE while simultaneously addressing the root cause.

MISSED OPPORTUNITIES

There is extensive evidence for the effectiveness of opioid agonist medications in reducing morbidity and mortality and illicit opioid use, and increasing treatment retention for opioid use disorders (OUD).^{20–22} Hospitalization is a reachable moment to initiate and coordinate treatment for substance use disorders (SUD).^{23–26} Optimal inpatient treatment includes evidence-based treatment including medication, psychosocial support, and harm reduction strategies such as naloxone distribution, safer injection practices, and relapse prevention planning.^{27–30}

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Yet most hospitals do not offer evidence-based SUD treatments.^{29, 31, 32} Withholding these therapies affects patients on two fronts: it stymies the path toward recovery and hinders the prospect of surgery, as many surgeons request proof of sustained remission from a SUD or engagement with SUD treatment prior to non-emergent valve replacement. Additionally, with the recent, precipitous decrease in valve surgery rates for all IE cases following public reporting of aortic valve replacement (AVR) outcomes, patients with DU-IE may have even less access to surgery than before.³³ And yet for persons who inject drugs (PWID), it is these interventions—addiction treatment and surgical management—that may reduce mortality following a first episode of IE.³⁴

To improve the acute management of DU-IE and prevent its recurrence, guidelines should advocate for care by a team equipped to address the surgical, medical, and social complexities intrinsic to endocarditis. We believe that such a team can deliver thoughtful and resourced care for patients with DU-IE that ensures consistent, reproducible quality at the state and national levels. Here, we describe our experience incorporating addiction medicine services into the multidisciplinary management of DU-IE and share reflections from that process for other hospitals and health systems looking to improve care for people with DU-IE.

TEAMWORK

As hospitalizations for DU-IE have sharply risen in the last decade at our institution,³⁵ we have observed wide variations in management leading to clinical inefficiencies, poor communication between providers, missed opportunities to optimize IE care, and secondary moral injury among healthcare professionals.³⁶ Missing from our institution's care for patients with DU-IE was a forum to convene multidisciplinary experts that could offer equitable, consistent, patient-centered, and evidence-based care. Frustrated with these recurring experiences, a collaboration formed between the divisions of cardiothoracic surgery and hospital medicine to spearhead the formation of a multidisciplinary group to facilitate the care of patients with both DU-IE and non-DU-IE. We knew we would need to go beyond the core members of the traditional endocarditis team¹⁶—cardiothoracic surgery, cardiology, infectious disease—and recruit experts capable of expanding the

focus of DU-IE care. To that end, we created the Multidisciplinary Infectious ENDocarditis (MEND) team, which includes the aforementioned specialties as well as representatives from addiction medicine, hospital medicine, nursing, social work, case management, ethics, patient advocates, psychiatry, and palliative care (Table 1). We aim to bring together diverse perspectives to understand IE treatment options while anticipating patient needs and reducing disparities. As one of our first acts as a group, we addressed issues around care communication and created a charter and mission statement approved by all team members with the aim of improving patient outcomes and minimizing time to surgery when deemed necessary. We then developed a standardized management strategy with the goal of streamlining IE diagnosis and treatment.

We meet every two weeks for one hour to review current IE patients, and generally review no more than five new cases per session. For emergent cases, core members convene sooner to address IE cases that require urgent surgical decisions. Primary teams refer all patients with IE to infectious disease, who determine indications for surgical intervention based on American Association for Thoracic Surgery (AATS) consensus guidelines and their clinical judgment.³⁷ Infectious disease then places a consult to the MEND team when MDT discussion is deemed necessary. Both DU-IE and non-DU-IE cases can be referred, but those with guideline-based surgical indications are prioritized. Given the high volume of IE cases at our institution, IE cases judged by the infectious disease consult team to have more straightforward medical management may not be referred. We structure the meeting using a standard checklist whereby we systematically review the patient's care from the primary team, infectious disease, cardiology, addiction medicine, and cardiothoracic surgery perspectives (Table 2). Decisions regarding valve surgery are aided by input from our inpatient addiction medicine team who discuss options for patients' ongoing SUD treatment following discharge and provide post-hospitalization SUD treatment referrals and treatment linkages. Depending on the case, the conference moderator, a hospitalist who also works on the inpatient addiction medicine consult service, invites additional commentary from psychiatry, palliative care, ethics, case management, and social work. By sharing the same information and knowledge about each patient, the goal is to limit the intrinsic biases and stigma that patients with DU-IE often face and provide a coordinated, mutually agreed upon care plan for each patient.

Experience from the first year is encouraging. Patients with DU-IE with surgical indications are more likely to benefit from our care model as these patients more readily receive interdisciplinary consideration for cardiac valve surgery. Anecdotal, providers who have participated at MEND conferences feel that our institution has embraced a more comprehensive and systematic approach to DU-IE and, as such, they readily consult MEND for treatment recommendations. As our

Table 1 Multidisciplinary Endocarditis (MEND) Team Members

Core members	Rotating members
<ul style="list-style-type: none"> • Cardiothoracic surgery • Hospital medicine • Infectious disease • Cardiology • Addiction medicine 	<ul style="list-style-type: none"> • Nursing • Patient advocate • Psychiatry • Palliative care • Ethics • Social work • Case management • Additional specialists as needed (neurology, neurosurgery, etc.)

Table 2 Multidisciplinary Endocarditis Team Checklist

Primary team	Addiction medicine	Infectious disease team	Cardiology	Cardiothoracic surgery
<ul style="list-style-type: none"> ○ One liner—name, age, gender, comorbidities ○ Pathogen ○ Valve(s) involved ○ Native valve or prosthetic valve ○ Complications? <ul style="list-style-type: none"> ○ Heart failure? ○ Arrhythmia? ○ Septic embolus to brain, lungs, kidneys, etc.)? ○ Duration of current treatment of infective endocarditis ○ Substance use disorder? If so, addiction medicine will go into detail ○ Prior history of infective endocarditis <ul style="list-style-type: none"> ○ How was it treated? ○ Patient preferences ○ Quality of life considerations ○ Contextual features/concerns 	<ul style="list-style-type: none"> ○ Addiction history ○ Prior SUD treatment ○ Current SUD treatment ○ Living environment ○ Employment ○ Social support ○ SUD risk factors ○ SUD protective factors ○ Provider setup to continue SUD treatment on discharge? 	<ul style="list-style-type: none"> ○ Relevant ongoing or prior infections ○ Current source of infection (portal of entry)? ○ Date of first positive blood culture and most recent positive blood culture ○ Pathogen susceptibilities ○ Prior and current antimicrobials ○ Likelihood of clinical cure with current antimicrobial therapy ○ Recommendation regarding surgery as part of the curative treatment plan ○ Plan for ID follow-up after discharge 	<ul style="list-style-type: none"> ○ Evidence of complicated infection? <ul style="list-style-type: none"> ○ IE-associated valvular dysfunction ○ Intracardiac abscess ○ Intracardiac fistula ○ Heart block ○ Vegetation characteristics on ECHO <ul style="list-style-type: none"> ○ Size ○ Mobility ○ Location ○ Risk of embolization ○ TEE performed? ○ Additional cardiac imaging that is needed to risk-stratify? 	<ul style="list-style-type: none"> ○ Operative risk assessment ○ If septic emboli to brain present, discussion of hemorrhagic transformation risk ○ If deemed operative candidate <ul style="list-style-type: none"> ○ Valve repair vs replacement ○ Considerations re: valve type if replacement ○ Timing of surgery ○ Plan for cardiology and/or CT surgery follow-up after discharge

To all team members: Have all members of the team discussed the care plan and addressed concerns? What are the key concerns for the management of this patient and what are the recommended next steps?

SUD substance use disorder, ID infectious disease, ECHO echocardiography, TEE transesophageal echocardiography

program's pilot phase nears completion, we will embark on a formalized study of outcomes, including patient mortality and length of stay, and query provider satisfaction, with particular focus on areas where MEND can improve.

Case examples highlight some of MEND's strengths and opportunities. One example is a 31-year-old man with intravenous opioid use disorder and intermittent inhalational methamphetamine use who presented with septic shock and decompensated heart failure secondary to tricuspid and mitral valve endocarditis. After stabilizing the patient, MEND met to discuss treatment options. The addiction medicine team shared that the patient wanted to disrupt his use, had started SUD treatment, and had numerous protective factors including strong family support following discharge. MEND felt that the patient would have the best chance of recovery with double valve replacement, which happened shortly thereafter. He was discharged home and completed follow-up appointments with cardiothoracic surgery and a new primary care physician. He remains on buprenorphine-naloxone without readmission since discharge. We present this case as an early win for MEND, though not every case has been a success. One MEND patient who underwent valve replacement was readmitted with prosthetic valve endocarditis after return to substance use, despite comprehensive endocarditis and addictions care,²⁸ including buprenorphine initiation, recovery-oriented behavioral treatment in hospital, peer support, and post-hospital linkage to buprenorphine, primary care, and addictions care after discharge.

While promising, MEND has several important limitations. First, the current focus of our MDT is to optimize

the inpatient management of DU-IE, but as a recent perspective piece shows, focusing on the hospital to community transition is necessary to ensure vital components of treatment are not overlooked.³⁸ We acknowledge that we can improve outpatient continuity of care for patients with DU-IE. We currently offer post-discharge follow-up with our MEND core specialties, but these remain separate visits that can be difficult to coordinate for patients. While the addiction medicine consult service provides linkage to community addictions treatment, additional work includes expanding our partnership and processes with existing transitional care teams.³⁹ In the future, we envision an outpatient multidisciplinary approach with members from MEND that will integrate the comprehensive continuity of care that is necessary for DU-IE into one common visit.

Next, MEND team members do not receive dedicated funding support for this clinical and programmatic activity, which happens in addition to the clinical, educational, and academic responsibilities each member had before the team was formed. There is also no funding for ancillary staff to support or administer this program. Sustainability and spread of such a model will require longer-term investment to develop and staff MEND leadership and ancillary staff. The MEND model is in its early stages of existence so we are currently unable to evaluate its cost-effectiveness; however, we predict that the clinical benefits associated with an IE team in prior observational studies—reduction in mortality, length of stay, and antibiotic duration^{17, 40}—will translate to institutional and regional cost savings. While MEND holds important potential for other institutions, its transferability depends on the

presence and engagement of numerous stakeholders, including addiction medicine, which may not be available,⁴¹ and cardiac surgery, which may not be willing to consider operating on patients with SUD at all hospitals.¹¹

Future work should assess MEND's effect on equitable distribution of surgery, patient health outcomes, length of stay, healthcare utilization, and mortality. Further, as evidence for the value of hospital-based addictions care grows, it warrants asking if subsequent endocarditis guidelines should recommend this resource at all hospitals managing DU-IE.

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Declarations:

Conflict of Interest: The authors declare that they do not have a conflict of interest.

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