

**VIEWPOINTS**

# Valve Surgery for Endocarditis in Patients Who Inject Drugs: Removing Them From the Society of Thoracic Surgeons Database Is Only Part of the Solution

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In this issue of the *Journal of the American Heart Association (JAHA)*, El-Dalati et al ask whether it is time to rethink public reporting of outcomes for valve surgery in patients with infectious endocarditis (IE) who are intravenous drug abusers (IVDA).<sup>1</sup> This is a timely and thoughtful analysis at a time when we are experiencing an opioid crisis with a concomitant increase in IVDA-related IE.<sup>2</sup> In the Society of Thoracic Surgery (STS) Adult Database between 2011 and 2018, it was reported that 34 905 patients underwent surgical valve procedures for IE, of which 33.7% of surgeries were performed in patients with IVDA.<sup>3</sup> A recent report from North Carolina found that admissions for IVDA-related IE increased 12-fold and hospital costs increased 18-fold from 1.1 to 22.2 million dollars from 2010 to 2015.<sup>4</sup>

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**See Article by El-Dalati et al.**

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The STS national database reports outcomes of coronary artery bypass graft and valve surgery using a 3-star scoring system (1=lowest performance to 3=highest performance) to rate a program's 30-day morbidity and mortality. This is used by the Centers for Medicaid and Medicare Services to determine hospital reimbursements and by social media and news publications to establish hospital rankings for quality of care. The STS scoring system is based on a series

of risk factors involving preoperative patient profiles and demographics that take into account numerous clinical factors. However, the STS scoring system was not specifically designed for patients who are IVDA undergoing valve surgery for IE. Important factors such as the type of organisms, the specific drugs that were used, the duration of addiction, whether the patient was an active user at the time of surgery, and whether the current episode of IE was because of relapses in drug addiction, are not recorded. A patient who is IVDA undergoing valve surgery for IE may undergo a successful, uncomplicated surgery, be discharged on day 8, be readmitted on postoperative day 17 with sepsis from prosthetic valve endocarditis because of a relapse of active IVDA and die on postoperative day 21 or following an unsuccessful reoperative valve procedure, all within the 30-day postoperative period. The surgeon would be credited with an operative mortality, not based on the quality of his surgical skills, but on recidivism from drug addiction. El-Dalati et al do not advocate for complete removal of these cases from the STS database, but rather that they not be included in the composite valve score that is currently utilized to determine the star rating of cardiac surgery programs. Removing these patients who are IVDA with IE from the STS national database to determine performance may allow surgeons to operate on these complex, high-risk patients without fear of lowering their star rating; however, it is only a small part of the solution

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to mitigate the economic and social costs incurred in caring for patients who are IVDA with IE who require valve surgery.

Although patients who are IVDA with IE undergoing valve surgery are younger and are less likely to have hypertension, diabetes mellitus, chronic renal failure, chronic obstructive pulmonary disease, and previous strokes, they have a higher incidence of smoking, alcoholism, HIV, and are more likely to present with acute liver abnormalities at the time of surgery.<sup>3</sup> While the operative mortality for first-time valve surgery in patients who are IVDA with IE is lower than in patients who are not IVDA, their postoperative hospital length of stay is nearly 3 times longer, their hospital charges are \$60 000 higher, and because they lack medical insurance, their mean hospital reimbursement is \$28 000 lower.<sup>5</sup> Patients who are IVDA with IE are more likely to develop recurrent IE after surgery (15% versus 3%;  $P=0.002$ ) and have significantly higher mortality (13% versus 2%;  $P=0.04$ ) following reoperative surgery.<sup>6</sup> The incidence of reoperative surgery for patients who are IVDA increased from 19% to 28% ( $P<0.001$ ) in 2017 in the Multicenter Surgical Endocarditis Collaborative database.<sup>7</sup> In a recent series of patients undergoing valve surgery for IE, the overall short- and long-term mortality in patients who are IVDA was significantly ( $P=0.02$ ) higher than for patients who are not IVDA.<sup>6</sup> One third of patients who are IVDA died of either drug overdose or recurrent IE following their initial valve surgery. In this, as in all other series, recidivism was the strongest predictor of mortality.

Why do patients who are IVDA do so poorly following discharge from valve surgery for IE? Many of these patients are homeless or have unstable housing conditions where other family members are unsupportive or are IVDA themselves. Patients who are IVDA have difficulty gaining access to outpatient drug rehabilitation programs because they lack medical insurance and transportation, have co-existing medical issues, and require IV antibiotic therapy, and may reside in areas where there is a scarcity of drug addiction treatment programs. Patients discharged with indwelling catheters to complete courses of IV antibiotics are often complicated by acute recidivism resulting in increased morbidity and mortality. Even more important is the lack of either inpatient or outpatient consultation for the treatment of drug addiction for these patients. In a study from the Boston area from 2002 to 2016, only 24% of patients who are IVDA had an addiction medicine consultation during their hospitalization and only 7.8% had an addiction-related plan at the time of discharge.<sup>8</sup>

What measures can be done to solve the economic and social issues involved with valve surgery for IE in patients who are IVDA? The answer involves

reducing the length of hospitalization and providing proper inpatient and outpatient therapy to treat IVDA and prevent recidivism. In order to properly eradicate the organisms involved with IE, it is important to treat the pathogens with a full course of IV antibiotics. This requires an indwelling IV catheter; however, discharging patients who are IVDA with these catheters results in recidivism and increases morbidity and mortality. Some institutions have adopted policies to keep patients in-house until the course of IV antibiotic therapy is completed. However, this increases the cost of hospitalization; in 1 institution, this policy increased the median length of stay from 7 to 35 days;  $P=0.008$ .<sup>5</sup> A recent study from Denmark in stable adult patients with left-sided endocarditis caused by *Streptococcus*, *Staphylococcus*, and *Enterococcus faecalis* organisms found that a course of 19 days of IV antibiotics followed by oral antibiotics to complete 4 to 6 weeks of therapy was noninferior in morbidity and mortality to those patients who completed a full course of IV antibiotics.<sup>9</sup> However, these were not patients who are IVDA, who tend to have a higher incidence of septic emboli to solid organs and joints, and who are more likely to have more virulent organisms, such as fungi, *Serratia*, and *Haemophilus*, and in whom a full course of IV antibiotics is required to completely eradicate these organisms. Further studies will be necessary to determine whether earlier transition to oral antibiotics in patients who are IVDA with IE can be safely performed.

A more sustainable approach is the use of In-House Endocarditis Heart Teams. These teams involve input from cardiac surgeons, infectious disease specialists, addiction medicine specialists, psychiatry, nursing staff, and social workers to initiate inpatient addiction programs, and facilitate discharge to those inpatient facilities that can manage IV antibiotics and specialize in drug addiction treatment. Tyerman et al, using a microsimulation model to evaluate the cost-effectiveness of an inpatient drug rehabilitation program for patients who are IVDA with IE undergoing valve surgery, found these programs to be cost effective with an incremental cost of effectiveness ratio of \$39 699 for each quality-adjusted life-year gained.<sup>10</sup> Endocarditis Heart Teams can decrease overall hospital and medical costs, initiate drug addiction therapy, and facilitate transfer to inpatient and outpatient institutions. This will decrease recidivism and ultimately decrease morbidity and mortality for these vulnerable, high-risk patients. The institution of these inpatient teams has been found to reduce readmission rates and has contributed to decreased morbidity and mortality in patients who are IVDA without endocarditis.<sup>11</sup> Endocarditis Heart Teams will require the support of hospital and government resources as well as third-party payers. They should become part

of all Evidence-Based Guidelines for the treatment of IE in patients who are IVDA.

An unintended consequence of public reporting of surgical outcomes, such as the STS database, has been the development of risk-averse behavior among cardiac surgeons. Having dealt with patients who are IVDA with IE in my own practice, I agree that the STS database should report these patients who are IVDA with IE differently from coronary artery bypass graft and non-IVDA IE cases. Another option from the one proposed by El-Dalati et al would be for the STS to properly “weight” those risk factors associated with patients who are IVDA with IE requiring valve surgery to include the presence of HIV, active use of drugs at the time of surgery, hepatic dysfunction, the presence of especially virulent organisms such as fungi and *Serratia*, and the involvement of multiple valves with and without abscess and fistula formation. This will better reflect the higher risk scores associated with patients who are IVDA with IE and could be used to calculate an observed/expected ratio that would better reflect a surgeon’s and hospital’s performance in dealing with these difficult patients. This would address some of the issues with patients who are IVDA with IE; however, addressing the issues of recidivism and proper postoperative addiction therapy with Endocarditis Heart Teams will be essential to solve the entire problem.

## ARTICLE INFORMATION

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### Disclosures

None.

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