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Verity N. Ramirez
Maine Medical Center

Et al.

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Authors

Verity N. Ramirez, Jenny L. Carwile, Kristina Rokas, Wendy Craig, and Kinna Thakarar

RESEARCH LETTER

Injection drug use and care charges for infective endocarditis

Verity N. Ramirez, MD,[1] Jenny L. Carwile, ScD, MPH,[1] Kristina Rokas, PharmD,[2] Wendy Craig, PhD,[3] Kinna Thakarar, DO, MPH[4]

[1]Department of Internal Medicine, Maine Medical Center, Portland, ME, [2]Maine Medical Center, Portland, ME, [3]Maine Medical Center Research Institute, Scarborough, ME, [4]Department of Infectious Disease, Maine Medical Center, Portland, ME

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Rates of infective endocarditis (IE), an infection that can result from injection-drug use (IDU), have risen alongside the opioid epidemic.[1-3] While previous studies have characterized hospitalizations for injection drug use-related IE,[3,4] comparing hospitalization characteristics between people who inject drugs (PWID) and non-PWID may explain different outcomes between IE patients. It could also be used to inform the development of cost-effective optimal care models, which may differ between PWID[5,6] and non-PWID. Here, we compare inpatient hospitalization characteristics, including care charges, between PWID and non-PWID with IE at a large academic medical center.

METHODS

We performed a cross-sectional analysis of adult patients (≥ 18 years old) diagnosed with IE and admitted to a Maine Medical Center (Portland, ME) between January 1, 2013 and January 1, 2016. IE was defined by Duke's criteria as definite or possible endocarditis on transesophageal echocardiograms. Patients were classified as PWID if IDU or clinical suspicion of IDU was documented in the electronic medical record (EMR). Only the first admission for IE during the study period was included.

For each admission, we retrospectively obtained data from the hospital's billing department, including total hospital charges (e.g., surgery, anesthesia, stay in the intensive care unit, antibiotics), amount paid by insurance, and outstanding hospital charges. For insured patients, insurance paid 100% of total charges. We obtained EMR data on patient demographics, insurance status, length of stay (LOS), in-hospital mortality, and cardiac surgery during the hospitalization.

Correspondence: Kinna Thakarar, DO, MPH
Maine Medical Center, Department of Infectious Disease
22 Bramhall St, Portland, ME 04102
KThakarar@mmc.org

We summarized variables as mean [standard deviation (SD)], median (range), or frequency. We compared characteristics between PWID and non-PWID using Mann-Whitney U tests, Student's t-tests, chi-square tests, or Fisher's exact tests. We used SPSS, version 25 (Armonk, NY) for all analyses. The Maine Medical Center Institutional Review Board approved this study.

RESULTS

We identified 42 cases of IE among PWID (39%) and 65 among non-PWID (61%). PWID were younger (mean [SD]: 34.8 [9.1] vs. 63.1 [15.7] years; P < .001), less likely to have a primary care provider (71.4% vs. 89.2%, P = .04), and had a different insurance payer distribution (P < .001) than non-PWID (Table 1). PWID had a longer LOS (median: 18.4 vs 11.9 days) and were more likely to complete their intravenous antibiotics in the hospital (35.7% vs. 4.6%) compared to non-PWID.

Median total hospital charges were $149,131 (range: $16,282-$630,151) for PWID and $80,903 (range: $16,902-$736,328) for non-PWID (P = .08; Figure 1). Among patients with IE, total charges per day paid by insurance did not vary between PWID [median: $6,924 (range: $3,778-25,803)] and non-PWID [median: $7,212 (range: $259-97,147)] (P = .99). Among insured IE patients, total hospital charges paid by insurance were significantly higher for PWID [median: $174,573 (range: $16,282-$630,151)] than non-PWID [median: $80,903

(range: $16,902-$736,328)] (P = .03). Of the 11 uninsured PWID, five received a hospital write-off of their bill, totaling $414,886 (median: $53,621 per patient). Six uninsured PWID and two uninsured non-PWID had non-covered hospital charges (median: $105,401 and $83,678 per patient, respectively).

DISCUSSION

Among patients hospitalized for IE, median total hospital charges and charges paid by insurance were approximately twice as high for PWID as non-PWID. Higher charges among PWID resulted from their longer LOS, which may be due to more frequent completion of antibiotic treatment before hospital discharge. At our institution and others, a common practice is to not discharge PWID with a peripherally inserted central catheter (PICC) line due to concerns related to risk of line misuse and subsequent infection.[7,8] Similarities in daily hospital charges and cardiac surgery requirements between PWID and non-PWID suggest that intensity of care did not differ by IDU. Outpatient antibiotic management, which was not included, represents an additional cost.

Over a three-year period at a single hospital, median charges for IE hospitalization among PWID exceeded those for non-PWID by $63,228. Despite our study's limitations (i.e., potential misclassification of PWID and inclusion of a single hospital), these data suggest that IDU-associated IE creates an additional financial burden to hospitals, payers, and the patient. Future research should investigate optimal models of care (e.g., medical respite, patient-directed discharges) for administering antibiotics to PWID with infections. Finally, improving access to medication for addiction treatment and harm reduction strategies may prevent serious bacterial complications associated with IDU.

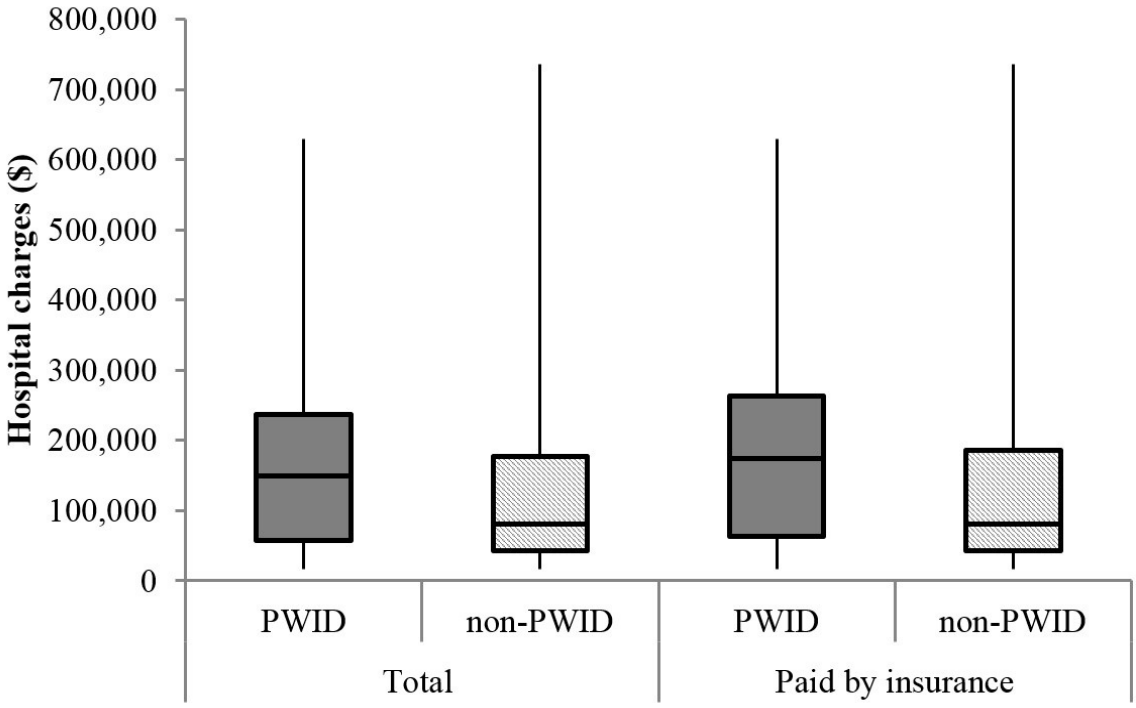

Figure 1. Box plots for hospital charges associated with infective endocarditis among people who inject drugs (PWID) and non-PWID.
Box =25th and 75th percentiles; bars = min and max values.
*Among patients with insurance (n=31 PWID; n=63 non-PWID)
†Mann-Whitney U test, p=0.08
‡Mann-Whitney U test, p=0.03
Abbreviations: PWID, people who inject drugs

Table 1. Characteristics of 107 infective endocarditis patients, by injection drug use.

	Injection drug use, N (%)		
	Yes	**No**	**p-value**
N (%)	42 (39.3)	65 (60.7)	
Age (years), mean (SD)	34.8 (9.1)	63.1 (15.7)	<0.001*
Male	27 (64.3)	47 (72.3)	0.51
Race			
Caucasian	41 (97.6)	62 (95.4)	
Black	0 (0.0)	1 (1.5)	
Unknown	1 (2.4)	2 (3.1)	
Had primary care provider	30 (71.4)	58 (89.2)	0.04
Length of stay (days), median (range)	18.4 (2.2-86.7)	11.9 (0.2-101.4)	0.02
Cardiac surgery during admission	14 (33.3)	17 (26.2)	0.56
Discharged with IV antibiotics via PICC	17 (40.5)	51 (78.4)	<0.001
Discharge Disposition†			<0.001
Home with PICC	12 (28.6)	30 (46.2)	
Care Facility with PICC	3 (7.1)	16 (24.6)	
Deceased/CMO	4 (9.5)	10 (15.4)	
Left early (i.e. against medical advice) without PICC	5 (11.9)	0 (0.0)	
Completed antibiotics in hospital	15 (35.7)	3 (4.6)	
Unknown	3 (7.1)	6 (9.2)	
Insurance payer			<0.001
Private only	1 (2.4)	18 (27.7)	
Medicaid only	25 (59.5)	13 (20.0)	
Medicare only	4 (9.5)	19 (29.2)	
>1 Insurance	1 (2.4)	13 (20.0)	
Uninsured	11 (26.2)	2 (3.1)	

Abbreviations: CMO, comfort measures only; PICC, peripherally inserted central catheter

*p-values calculated using t-test, Fisher's exact test, Mann-Whitney U test, and Chi square test with continuity correction as appropriate.

†Percentages do not sum to 100% due to rounding.

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Conflicts of Interest: None

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