



Peer-Reviewed Original Research

Exploring the “Weekend Effect” on the Care of Patients with Left Ventricular Assist Devices

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Abstract

Background

Many studies have described differences in in-hospital outcomes and length of stay between patients treated for major cardiac conditions on weekdays versus weekends.¹ Our study aimed to explore the “weekend effect” on in-hospital care among patients with left ventricular assist devices.

Methods

Using data from the National Inpatient Sample (NIS) database, with a weighted estimate of more than 35 million admissions per year.² We identified patients 18 years or older with an ICD code signifying presence of a LVAD. Characteristics, comorbidities and clinical outcomes were compared between patients admitted on



a weekend versus patients admitted on a weekday. The outcomes of interest were in-hospital all-cause mortality and length of hospital stay (LOS).

Results

Patients admitted on weekend days were younger, otherwise both groups were similar with respect to comorbidities. Patients admitted on weekend days were more likely to have cardiogenic shock, septic shock and respiratory failure. They were also more likely to require mechanical ventilation and undergo cardiac transplantation. Patients admitted on a weekend day however had a shorter hospital median hospital stay. This remained significant after multivariate analysis (OR .81 95% CI .72-.91, $p < 0.01$).

Our data analysis from this large database demonstrates no effect of weekend admission on all-cause mortality among patients with LVADs, although patients admitted on weekend days were more likely to have shorter hospital stay.

Keywords: LVAD, weekend effect, complications

Introduction

Many studies have described differences in in-hospital outcomes and length of stay between patients treated for major cardiac conditions on weekdays versus weekends.¹ Our study aimed to explore the “weekend effect” on in-hospital care among patients with left ventricular assist devices. Our hypothesis was that given the specialized and urgent care needed in the care of these patients that outcomes will be worse among LVAD patients admitted on Weekend days.

Methods

Our analysis was done using data from the National Inpatient Sample (NIS) database, with a weighted estimate of more than 35 million admissions per year.² We identified patients 18 years or older with an ICD code signifying presence of a LVAD (V43.21). Using weighted data, we identified patients admitted on a weekday and weekend, from 2010 to 2014. Admission characteristics, comorbidities and clinical outcomes were compared between patients admitted on a weekend versus patients admitted on a weekday. The outcomes of interest were in-hospital all-cause mortality and length of hospital stay (LOS). Logistic regression analysis of weekend admissions was performed using all variables that were statistically significant in multivariate analysis, with mortality as the primary outcome.

Results

Data on about 31,850 patients were analyzed. The most common diagnoses were device complication (13.3%), congestive heart failure (12.3%) and gastrointestinal hemorrhage (12.2%). The mean age was 58.4 ± 13.4 years, 23.8% were female and 17.6% ($n=5,595$) patients were admitted on a weekend day. Patients admitted on weekend days were younger, although by 0.5 years. This difference although statistically significant, we doubt that there is no clinical significance of this difference. Otherwise both groups were similar with respect to comorbidities



(Table 1a). Patients admitted on weekend days were more likely to have cardiogenic shock, septic shock and respiratory failure. They were also more likely to require mechanical ventilation and undergo cardiac transplantation (Table 1b). Patients admitted on a weekend day however had a shorter hospital median hospital stay. This remained significant after multivariate analysis (OR .81 95% CI .72-.91, $p < .01$). Mortality was higher among patients admitted on weekend days. This was however not significant after multivariate analysis (OR 1.07, 95% CI .72-1.61; $p = .74$).

Table 1: Admission/baseline characteristics and outcomes

A Characteristics	Weekend Admission N=5,592 (%)	Weekday Admission n= 26255 (%)	P Value
Age	58.0±13.6	58.5±13.3	0.01
Indicator of sex	1336 (23.9)	6248 (23.8)	0.96
Race: Caucasian Vs. Others	3161 (62.7)	15375 (64.3)	0.35
Hypertension	3257 (58.2)	15412 (58.7)	0.75
Diabetes Mellitus	2172 (38.8)	10976 (41.8)	0.05
Chronic Kidney Disease	1972 (35.2)	9964 (38)	0.07
Obesity	722 (12.9)	3898 (14.8)	0.14
Anemia	1706 (30.5)	8171 (31.1)	0.64
Coronary Artery Disease	3205 (57.3)	14719 (56.1)	0.43
Primary diagnosis: Device Complication	670 (12)	3571 (13.6)	0.14
Primary diagnosis: CHF exacerbation	679 (12.1)	3223 (12.3)	0.89
Primary diagnosis: Gastrointestinal Hemorrhage	692 (12.4)	3182 (12.1)	0.82
Teaching Hospital	25,578(97.4)	5254 (97.4)	0.94
Rural Hospital	52 (0.2)	19(0.3)	0.21
Elevated severity of Illness (Major or extreme loss of function)	5139 (91.8)	23660 (90.1)	0.08
B Outcomes			
Cardiac arrest	167 (3)	699 (2.7)	0.53
Cardiogenic shock	446 (8)	1296 (4.9)	<0.01
Septic shock	173 (3.1)	494 (1.9)	0.01
TIA/Stroke	422 (7.5)	1664 (6.3)	0.16
Respiratory failure	837 (15)	2801 (10.7)	<0.01
Acute renal failure	1359 (24.3)	5910 (22.5)	0.19
Hemorrhage	30 (0.5)	313 (1.2)	0.04
Balloon counterpulsation	34 (0.6)	208 (0.8)	0.50
Intubation/Mechanical ventilation	658 (11.8)	2364 (9)	<0.01
Blood transfusion	1598 (28.6)	7398 (28.2)	0.81
Cardiac transplant	387 (6.9)	1140 (4.3)	<0.01
Mortality	346 (6.2)	1209 (4.6)	0.03
LOS (Days)	5(8)	6(9)	<0.01



Discussion

Our analysis of the large database showed no difference in in-hospital all-cause mortality and a shorter hospital stay for LVAD patients admitted on weekend days when compared to weekdays, after controlling for possible confounders. The findings in this study are similar to those found in studies by Kistis et al.³ and more recently by Kumar et al.⁴ showing no significant difference in the care of patients with cardiac conditions after controlling for possible confounders. A recent meta-analysis suggested that the weekend effect remains highly heterogeneous and limited.¹ Ricciardi et al. suggested that low staffing and admission to hospitals with more residents trainees impacted weekend mortality albeit modestly at best.⁵

Patients with LVADs need special care, hence may only be treated at tertiary or quaternary centers with readily available specialized care and this may have a part to play in our finding. In fact, 97.4% of LVAD patients in this study initially presented for care at a teaching hospital compared to 0.2% who presented to a rural hospital. Findings in the study could however not explain the shorter hospital stay among patients admitted on weekend days. One possibility is that some patients were admitted because of unavailable outpatient services on weekend days, not because of the severity of their illness. For example, more patients presented on the weekend for abnormality of their coagulation profile (2.6% vs 0.5%, $p < .01$). Despite this finding, this explanation remains purely speculative.

Some of the limitations of our study encompass those that are generally associated with the retrospective studies including possibility of selection, information and misclassification bias. Although multivariate analysis was performed, the possibility of confounders still exists. Given the nature of the variables available, comparison of a marker of severity of disease between both groups using well known and validated scores (i.e. APACHE or SOFA) could not be done. Also, we could not tell from the data which LVAD was placed as destination therapy or bridge to transplant. Lastly, the NIS database only provides inpatient all-cause mortality and no long term survival data.

Our data analysis from this large database demonstrates no effect of weekend admission on all-cause mortality among patients with LVADs, although patients admitted on weekend days were more likely to have shorter hospital stay. The model of care of these patients is worth studying to identify practices that have led to these findings.

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