Outcomes of Acute Renal Failure in Clostridium difficile Infection Patients: Nationwide Inpatient Sample

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Introduction

Clostridium Difficile Infection (CDI) is one of the most common nosocomial infections and is a frequent cause of morbidity and mortality among older adult hospitalized patients.

Methods

Data was obtained from the 2017 and 2018 National Inpatient Sample (NIS), the largest all-payer inpatient database in the United States, for outcomes of acute renal failure in patients admitted with a principal diagnosis of CDI. Possible contributing factors were added to limit the confounders in the analysis. Charlson Comorbidity Index (CCI) was utilized to account for comorbidities present during the hospital stay. The primary outcome was inpatient mortality. Secondary outcomes were hospital length of stay (LOS) and cost utilization.

Results

There were 109,065 patients admitted with a principal diagnosis of CDI who were more than 18 years of age, and 35,773 patients had both CDI and acute renal failure (ARF). The mean age was 66 years, and the mean length of stay was 5.4 days.

Among patients admitted with CDI who developed ARF, there is an increased odds of mortality compared to patients without ARF irrespective of other variables and this is statistically significant (Odds Ratio (OR) 2.75, p = 0.000, 95% Confidence Interval (CI) 2.10 – 3.61). For each one-year increase in age among patients admitted with CDI, there is 3% increased odds of mortality irrespective of other variables (Odds Ratio (OR) 1.03, p = 0.000, 95% Confidence Interval (CI) 1.02 – 1.04). History of congestive heart failure (CHF) also increased odds of mortality.

Patients with CDI and ARF had statistically increased mean LOS of 1.11 days while adjusting for other variables. Mean LOS was higher in patients with CHF and older patients. Mean LOS was shorter in patients with a history of smoking, hyperlipidemia, diabetes mellitus, prior myocardial infarction, chronic kidney disease, and patients admitted on a weekend.

The total charge for hospitalizations from ARF is increased by $10,571 (95% CI 8,300 – 12,842). The mean total charge was higher in patients with CHF. Patients with higher CCI had increased odds of mortality, LOS, and total inpatient hospital charge (Table 1,2,3).

Discussion

This retrospective study suggests worse outcomes in CDI patients with ARF. This highlights that ARF should be recognized early and appropriately treated to prevent poor outcomes. Some of the other variables had an interesting impact on the outcomes which should be explored by further studies.

Table 1: Mortality

Variable (Mortality)	Odds Ratio	p-Value	95% Confidence Interval
Acute Renal Failure	2.75	0.000	2.10—3.61
Charlson Index	1.26	0.000	1.19—1.33
Coronary Artery Disease	1.05	0.769	0.77—1.42
Chronic Kidney Disease	0.58	0.002	0.41—0.82
Congestive Heart Failure	1.78	0.000	1.34—2.36
Smoking	0.63	0.003	0.46—0.85
Hyperlipidemia	0.68	0.005	0.52—0.89
Diabetes Mellitus	0.76	0.239	0.49—1.20
Obesity	0.72	0.151	0.47—1.13
Myocardial Infarction	0.54	0.019	0.32—0.90
Weekend Admission	1.00	0.982	0.76—1.33
Age	1.03	0.000	1.02—1.04
Female	0.86	0.257	0.67—1.12

Table 2: Length of Stay

Variable (Length of Stay)	Coefficient	p-Value	95% Confidence Interval
Acute Renal Failure	1.11	0.000	0.92—1.30
Charlson Index	0.30	0.000	0.26—0.35
Coronary Artery Disease	-0.06	0.520	-0.24—0.12
Chronic Kidney Disease	-0.40	0.001	-0.63—-0.17
Congestive Heart Failure	0.62	0.000	0.40—0.84
Smoking	-0.41	0.000	-0.56—-0.27
Hyperlipidemia	-0.27	0.000	-0.40—-0.13
Diabetes Mellitus	-0.51	0.000	-0.71—-0.31
Obesity	0.03	0.763	-0.17—0.23
Myocardial Infarction	-0.69	0.000	-0.96—-0.42
Weekend Admission	-0.23	0.002	-0.38—-0.08
Age	0.02	0.000	0.01—0.02
Female	-0.05	0.517	-0.19—0.10

Table 3: Total Charge

Variable (Total Charge)	Coefficient	p-Value	95% Confidence Interval
Acute Renal Failure	10,571.37	0.000	8,300.58—1,2842.16
Charlson Index	3,172.10	0.000	2,608.50—3,735.70
Coronary Artery Disease	8,54.51	0.412	-1,185.53—2,894.55
Chronic Kidney Disease	-4,583.48	0.001-	-7,358.82—-1,808.15
Congestive Heart Failure	5,161.14	0.000	2,439.22—7,883.05
Smoking	-4,079.79	0.000	-5,615.04—-2544.53
Hyperlipidemia	-608.83	0.434	-2,135.77—918.10
Diabetes Mellitus	-2,716.26	0.020	-5,008.29—-424.23
Obesity	1,685.85	0.254	-1,210.44—4582.13
Myocardial Infarction	-7,871.29	0.000	-10,829.93—-4,912.65
Weekend Admission	-4,97.01	0.579	-2,254.53—260.50
Age	-19.55	0.450	-70.34—31.23
Female	-1,120.43	0.166	-2,707.52—466.67

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