The Effect of Depression in Chronic Hemodialysis Patients on Inpatient Hospitalization Outcomes

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Key Words

Depression · End-stage renal disease · Hospitalization · Costs · Mortality

Abstract

Background/Aims: Depression is common in patients with end-stage renal disease (ESRD) on hemodialysis (HD). Although, depression is associated with mortality, the effect of depression on in-hospital outcomes has not been studied as yet. **Methods:** We analyzed the National Inpatient Sample for trends and outcomes of hospitalizations with depression in patients with ESRD. **Results:** The proportion of ESRD hospitalizations with depression doubled from 2005 to 2013 (5.01–11.78%). Hospitalized patients on HD with depression were younger (60.47 vs. 62.70 years, $p < 0.0001$), female (56.93 vs. 47.81%, $p < 0.0001$), white (44.92 vs. 34.01%, $p < 0.0001$), and had higher proportion of comorbidities. However, there was a statistically significant lower risk of mortality in HD patients within the top 5 reasons for admissions. **Conclusion:** There were significant differences in demographics and comorbidities for hospitalized HD patients

with depression. Depression was associated with an increased rate of adverse effects in discharged patients, and decreased in-hospital mortality.

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Introduction

Depression is a highly common comorbidity in patients with end-stage renal disease (ESRD) on hemodialysis (HD), with prevalence up to 46% [1, 2]. Depression in ESRD patients is associated with a range of adverse outcomes, including increased fatigue, lower performance status, decreased physical activity, and decreased quality of life [3–6]. Depression rates among ESRD patients may exceed those of patients with cancer, congestive heart failure (CHF), and other severe chronic conditions [7, 8].

There has been mixed evidence regarding the effect of depression on mortality in ESRD patients. Some studies

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have not found that depression is not correlated with mortality, while other studies have found an increased risk of all-cause mortality [2, 9]. Few studies have examined the effect of depression on hospitalization outcomes in ESRD patients. The effect of depression in ESRD patients has been associated with increased hospitalization risk and increased length of stay (LOS) [10]. However, these studies were based on explicit screening for depression in dialysis centers and do not reflect national trends and differences in in-hospital outcomes for ESRD patients with depression.

To address this knowledge gap, we explored temporal trends of depression in hospitalized patients on HD using the National (Nationwide) Inpatient Sample (NIS). We evaluated differences between HD patients with and without depression, and examined the effect of depression on in-patient hospitalization outcomes such as LOS, costs, adverse discharge disposition (discharge to specialized care and against medical advice), and in-hospital mortality.

Methods

Study Data Source

This is a retrospective cohort study with data extracted from the NIS of the Healthcare Cost and Utilization Project (HCUP) from the Agency for Healthcare Research and Quality. The NIS database contains a 20% sample of all discharges in the HCUP, amounting to more than 7 million hospitalizations each year [11]. Each hospitalization is associated with a weight variable, which allowed for inflation to national estimates with high fidelity.

Study Population

We queried the NIS database using the International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) diagnosis codes. ICD-9-CM codes for ESRD were introduced in 2005, so we selected hospitalizations of patients age 18 or older that happened between 2005 and 2013. For a list of ICD-9-CM codes used, please refer to table 1. Hospitalizations were excluded if they were coded for acute kidney injury, peritoneal dialysis, or renal transplant, primary ESRD, and primary depression (fig. 1).

Study Variables

For each hospitalization, we extracted patient demographic data, concurrent diagnoses, and procedures (cardiac catheterization and mechanical ventilation) as well as hospital-level data (hospital size, location, and region). Additionally, we characterized the comorbidity burden with the Charlson Comorbidity Index (CCI) for all eligible hospitalizations [12, 13]. Endpoints of interest included temporal trends in hospitalizations with secondary depression, LOS, costs, discharge to specialized care, and in-hospital mortality.

Statistical Analysis

We compared baseline characteristics for 2 groups of secondary ESRD patients with and without secondary depression. Chi-square tests were used for categorical variables, Student's *t* tests

were used for normally distributed continuous variables, and Wilcoxon rank sum was used for non-normally distributed continuous variables.

The proportion of hospitalizations, average LOS, and average cost for patients with secondary ESRD with and without secondary depression was calculated for each year in the study period. Temporal trends in patient hospitalizations with depression were then stratified by age, race, and gender.

Since ESRD patients are admitted with a wide and complex range of diagnoses, we wanted to elucidate whether outcomes associated with common primary diagnoses were disproportionately impacted by secondary depression. We subdivided the hospitalized ESRD patients on the basis of the top 5 primary ICD-9-CM diagnosis codes associated with secondary ESRD (implant complications, hypertension (HTN), CHF, septicemia, and diabetes mellitus (DM)) and performed unadjusted univariate logistic regression followed by adjusted multivariate logistic regression. Temporal trends in hospitalization were evaluated using 2 sequential logistic regression models (model 1: changes in age, sex, race, and CCI; model 2: model 1 plus changes in comorbidity burden and procedures). The impact of depression on in-hospital mortality and discharges to specialized care facilities was evaluated using multivariate logistic regression to adjust for age, gender, race, hospital location, primary payer type, hospital bed size, zip code income, and CCI.

All analyses were performed using SAS 9.4 (SAS Institute Inc., Cary, N.C., USA) and R version 3.3.0 (R Foundation for Statistical Computing, Vienna, Austria). We considered the two-tailed *p* value of <0.05 as statistically significant.

Results

Temporal Trends in Hospitalizations

Between the years 2005 and 2013, 4,948,902 patients on HD were hospitalized. Of these admissions, 464,951 (9.3%) also had depression as a concurrent diagnosis. There was a substantial increase in rates of depression among hospitalized HD patients; it more than doubled from 5.01% in 2005 to 11.78% in 2013 (fig. 2). When stratified by age, race, and gender, there was no appreciable difference in the overall rate of increase among each group respectively (fig. 3). However, the proportion of hospitalizations complicated by depression in hospitalized HD patients was the highest in the younger age groups (18–34 and 35–49 years), white race, and females throughout the study period.

The top 5 clinical reasons for admission in patients on HD with depression were for implant complications, HTN, CHF, septicemia, and DM. Irrespective of the reason for admission, there was a significant increase in the number of admissions for HD patients with depression every year even after adjustment was made for patient characteristics (table 2). This remained significant even after adjustment was made for patient demographics, co-

Table 1. List of ICD-9 and Clinical Classification Software (CCS) codes used

Study variable	ICD-9 code	Description
Depression	2962, 2963, 3004, 311	Major depressive disorder – single and recurrent episode, dysthymic disorder, depressive disorder – not elsewhere classified
ESRD	585.6	ESRD
Dialysis procedures	39.95	HD
Dialysis diagnosis	V45.11, V45.12, V56.0, V56.1	HD
<i>Exclusions</i>		
Acute kidney injury	584.5, 584.6, 584.7, 584.8, 584.9	Acute kidney failure with lesion of tubular necrosis, acute kidney failure with lesion of renal cortical necrosis, acute kidney failure with lesion of renal medullary (papillary) necrosis, acute kidney failure with other specified pathological lesion in kidney, acute kidney failure, unspecified
Peritoneal dialysis procedures	549.8, V56.2, V56.8, 996.68, V56.32	Peritoneal dialysis, fitting and adjustment of peritoneal dialysis catheter, encounter for other dialysis, infection and inflammatory reaction due to peritoneal dialysis catheter, encounter for adequacy testing for peritoneal dialysis
Renal transplant	V42.0, 996.81, 556.9, 556.1	Kidney transplant status (kidney replaced by transplant), kidney transplant (immune or non-immune cause), other kidney transplantation, renal autotransplantation
Complications	CCS code	Description
Implant complications	237	Complication of device; implant or graft
HTN	99	HTN with complications and secondary HTN
CHF	108	CHF; nonhypertensive
DM	50	DM with complications
Septicemia	2	Septicemia (except in labor)

morbidities, and procedures for cardiac catheterization and mechanical ventilation. The largest increase in odds was seen for septicemia hospitalizations (adjusted OR (aOR) 1.13, 95% CI 1.08–1.12, $p < 0.0001$).

Baseline Characteristics

Hospitalized patients on HD with depression were younger (median age 60.47 vs. 62.70 years, $p < 0.0001$), female (56.93 vs. 47.81%, $p < 0.0001$), white (44.92 vs. 34.01%, $p < 0.0001$), and had higher burden of comorbidity as measured by the CCI (32.67 vs. 27.58% with ≥ 5). Patients with depression had a higher proportion of multiple comorbidities, including obesity (13.07 vs. 8.79%, $p < 0.0001$), chronic obstructive pulmonary disease (19.52 vs. 15.74%, $p < 0.0001$), hypothyroidism (17.36 vs.

11.03%, $p < 0.0001$) and hyperlipidemia (33.79 vs. 23.71%, $p < 0.0001$). While there were statistical differences in hospital characteristics and insurance type, these were likely due to the large sample size (table 3).

Outcomes by Admission Diagnosis

There was a statistically significant lower risk of mortality in HD patients admitted with depression compared to those without depression in admissions for implant complications (aOR 0.73, 95% CI 0.63–0.85, $p \leq 0.0001$), CHF (aOR 0.68, 95% CI 0.55–0.84, $p = 0.0005$), septicemia (aOR 0.63, 95% CI 0.57–0.70, $p \leq 0.0001$), and DM (aOR 0.63, 95% CI 0.46–0.86, $p = 0.0035$) after adjustment for patient and hospital characteristics (table 4a). However, there was no difference in adjusted mortality in admissions for HTN.

Fig. 1. Study flowchart. AKI = Acute kidney injury; ESRD = end stage renal disease.

On discharge, hospitalizations with depression and HD were more likely to have an adverse discharge disposition (45.71 vs. 38.31%, $p < 0.0001$). The odds of adverse discharge disposition were significantly higher in HD patients with depression for admissions of implant complications (aOR 1.66, 95% CI 1.57–1.76, $p < 0.0001$), HTN (aOR 1.81, 95% CI 1.70–2.00, $p < 0.0001$), CHF (aOR 1.66, 95% CI 1.54–1.78, $p < 0.0001$), septicemia (aOR 1.30, 95% CI 1.21–1.40, $p < 0.0001$), and DM (aOR 1.42, 95% CI 1.31–1.53, $p < 0.0001$; table 4b). Hospitalization cost between HD patients with and without depression while statistically significant were similar (median USD 9,123, interquartile range (IQR) 5,470.4–15,921 vs. 9,166, IQR 5,363.6–16,350, $p \leq 0.0001$). Median LOS was not statistically different (3.80, IQR 1.95–7.06 vs. 3.69, IQR 1.82–6.97 days, $p = 0.36$); however, there was an overall decrease in LOS in both groups from 2005 to 2013.

Discussion

Our study demonstrates a significant increase in rates of depression in hospitalized HD patients, and that the rates differed by subgroups. We find several key differences in patient characteristics between those with de-

Fig. 2. Temporal trends in hospitalizations of HD patients with depression. Hospitalizations in patients with depression and HD are increasing from 2005 to 2013.

pression and those without, including younger age, more females, more whites, and higher proportion of several comorbidities. Additionally, admissions for patients on HD with depression were longer, but not more costly. Finally, the adjusted odds of mortality were lower and the

Fig. 3. Temporal trends in hospitalizations of HD patients with depression stratified by age (**a**), gender (**b**) and race (**c**). **a** While hospitalizations for depression and HD increased in all age groups, age group ≥ 65 had the lowest proportion throughout. **b** Females

had high proportion of hospitalizations with depression and HD than males. The trend was similar. **c** Whites had the highest proportion of hospitalizations with depression and HD. The trends were similar.

Table 2. Sequential adjusted models to explain temporal trends of hospitalizations in HD patients with depression stratified by top 5 clinical reasons for admission

Procedures	Unadjusted OR/year (95% CI)	p value	aOR/year (95% CI) ¹	p value	aOR/year (95% CI)	p value
Implant complications	1.15 (1.13–1.16)	<0.0001	1.13 (1.12–1.15)	<0.0001	1.11 (1.10–1.13) ²	<0.0001
HTN	1.10 (1.08–1.11)	<0.0001	1.09 (1.08–1.11)	<0.0001	1.07 (1.05–1.09) ³	<0.0001
CHF	1.12 (1.10–1.13)	<0.0001	1.11 (1.09–1.13)	<0.0001	1.09 (1.07–1.11) ⁴	<0.0001
Septicemia	1.17 (1.15–1.19)	<0.0001	1.15 (1.13–1.17)	<0.0001	1.13 (1.11–1.15) ⁵	<0.0001
DM	1.14 (1.12–1.15)	<0.0001	1.12 (1.10–1.14)	<0.0001	1.10 (1.08–1.12) ⁶	<0.0001

¹ Adjusted for changes in age, gender, and race.

² Adjusted for changes in age, gender, race, changes in CCI and comorbidities (HIV, septicemia, alcohol abuse, anemia, diabetes, CHF, HTN, liver disease, obesity) and procedures (cardiac procedures, endovascular procedures, and mechanical ventilation).

³ Adjusted for changes in age, gender, race, changes in CCI and comorbidities (HIV, alcohol abuse, septicemia, anemia, DM, CHF, liver disease, obesity, hyperlipidemia, acute myocardial infarction, stroke) and cardiac procedures.

⁴ Adjusted for changes in age, gender, race, changes in CCI and comorbidities (HIV, alcohol abuse, anemia, diabetes mellitus, hypertension, liver disease, obesity, chronic obstructive pulmonary

disease, hypothyroidism) and procedures (cardiac and mechanical ventilation).

⁵ Adjusted for changes in age, gender, race, changes in CCI and comorbidities (HIV, alcohol abuse, septicemia, DM, CHF, HTN, liver disease, obesity, metastatic cancer, chronic obstructive pulmonary disease) and procedures (cardiac procedures and mechanical ventilation).

⁶ Adjusted for changes in age, gender, race, changes in CCI and comorbidities (HIV, alcohol abuse, septicemia, anemia, CHF, HTN, liver disease, stroke, and peripheral vascular disease) and mechanical ventilation.

Table 3. Baseline characteristics of study population stratified by depression in secondary ESRD population

	ESRD population		p value
	without depression (n = 4,483,951)	With depression (n = 464,951)	
<i>Patient characteristics</i>			
Age, years, median (IQR)	62.70 (51.6–73.33)	60.47 (49.54–70.58)	<0.0001
18–34	238,413 (5.32)	30,659 (6.6)	
35–49	678,340 (15.13)	81,076 (17.44)	
50–64	1,451,560 (32.37)	165,618 (35.62)	
≥65	2,115,637 (47.18)	187,598 (40.35)	
Gender, %			<0.0001
Male	2,339,924 (52.18)	200,218 (43.06)	
Female	2,143,778 (47.81)	264,698 (56.93)	
Race, %			<0.0001
White	1,524,945 (34.01)	208,839 (44.92)	
Black	1,472,924 (32.85)	120,994 (26.02)	
Hispanic	635,105 (14.16)	62,517 (13.45)	
Others	295,312 (6.6)	22,893 (4.92)	
Missing	555,665 (12.4)	49,709 (10.7)	
CCI, %			<0.0001
2	807,327 (18)	68,753 (14.8)	
3	1,188,521 (26.51)	110,238 (23.71)	
4	1,251,304 (27.91)	134,058 (28.83)	
≥5	1,236,799 (27.58)	151,902 (32.67)	
Concurrent diagnosis, %			
Acquired immunodeficiency syndrome	108,816 (2.43)	11,168 (2.4)	0.3
Alcohol abuse	68,879 (1.54)	10,276 (2.21)	<0.0001
CHF	1,595,653 (35.6)	167,308 (36.98)	<0.0001
Chronic obstructive pulmonary disease	705,818 (15.74)	90,742 (19.52)	<0.0001
DM	2,538,085 (56.6)	286,257 (61.57)	<0.0001
Septicemia	684,329 (15.26)	58,397 (12.56)	<0.0001
HTN	4,174,023 (93.09)	434,159 (93.38)	<0.0001
Liver disease	302,047 (6.74)	32,913 (7.08)	<0.0001
Peripheral vascular disease	73,913 (16.32)	87,608 (18.84)	<0.0001
Mechanical ventilation	237,919 (5.31)	16,314 (3.51)	<0.0001
Anemia deficiency	2,247,808 (50.13)	278,211 (9.4)	<0.0001
Obesity	394,172 (8.79)	60,779 (13.07)	<0.0001
Cardiac procedures	202,198 (4.51)	16,217 (3.5)	<0.0001
Endovascular procedures	201,060 (4.48)	18,503 (3.98)	<0.0001
Hypothyroidism	494,652 (11.03)	80,707 (17.36)	<0.0001
Metastatic cancer	42,384 (0.95)	3,453 (0.74)	<0.0001
Acute myocardial infarction	198,558 (4.43)	15,125 (3.25)	<0.0001
Stroke	132,922 (2.96)	12,778 (2.75)	<0.0001
Hyperlipidemia	1,063,040 (23.71)	157,090 (33.79)	<0.0001
Median household income category for patient’s zip code ^a , n (%)			<0.0001
0–25 percentile	1,709,343 (38.13)	161,551 (34.75)	
26–50 percentile	1,084,234 (24.18)	117,453 (25.26)	
51–75 percentile	902,489 (20.13)	103,471 (22.25)	
76–100 percentile	673,841 (15.03)	72,711 (15.64)	
<i>Hospital characteristics, %</i>			
Hospital bed size ^b			<0.0001
Small	361,731 (8.07)	39,699 (8.54)	
Medium	1,049,033 (23.4)	108,660 (23.37)	
Large	3,044,510 (67.9)	313,718 (67.47)	
Hospital location ^c			<0.0001
Rural	283,076 (6.31)	33,015 (7.1)	
Urban non teaching	1,876,744 (41.85)	191,904 (41.27)	
Urban teaching	2,295,454 (51.19)	237,158 (51.01)	

Table 3. (continued)

	ESRD population		p value
	without depression (n = 4,483,951)	With depression (n = 464,951)	
Hospital region			<0.0001
Northeast	821,347 (18.32)	76,371 (16.43)	
Midwest or north central	904,865 (20.18)	117,091 (25.18)	
South	1,864,608 (41.58)	173,664 (37.35)	
West	856,140 (19.09)	93,242 (20.05)	
Disposition			<0.0001
Home	2,497,136 (55.69)	232,645 (50.04)	
Discharge against medical advice	81,159 (1.81)	8,092 (1.74)	
Discharge to specialized care	1,717,769 (38.31)	212,540 (45.71)	
Died	183,161 (4.08)	11,213 (2.41)	
Primary payer			<0.0001
Medicare/Medicaid	3,924,002 (87.51)	411,536 (88.51)	
Private	424,052 (9.46)	42,110 (9.06)	
Uninsured/self pay	128,792 (2.87)	10,150 (2.18)	

Frequencies (%) in the columns may not sum to 100% since there might be missing data. AIDS = Acquired immunodeficiency syndrome.

^a This represents a quartile classification of the estimated median household income of residents in the patient's zip code. These values are derived from zip code-demographic data obtained from Claritas. The quartiles are identified by values of 1–4, indicating the poorest to wealthiest populations.

^b Bed size categories are based on hospital beds, and are specific to the hospital's location and teaching status. Bed size assesses the number of short-term acute beds in a hospital. Hospital information was obtained from the AHA Annual Survey of Hospitals.

^c The hospital's teaching status was obtained from the AHA Annual Survey of Hospitals. A hospital is considered to be a teaching hospital if it has an AMA-approved residency program, is a member of the Council of Teaching Hospitals or has a ratio of full-time equivalent interns and residents to beds of 0.25 or higher. Non-metropolitan hospitals were not split according to teaching status, because rural teaching hospitals were rare. The metropolitan categorization is a simplified adaptation of the 2003 version of the Urban Influence Codes and includes both large and small metropolitan areas.

Table 4. Adjusted estimates of (a) mortality and (b) discharge to specialized care for HD patients with depression stratified by top 5 clinical reasons for admissions

Procedures	Unadjusted OR (95% CI)	p value	Adjusted OR (95% CI) ¹	p value
<i>Mortality for HD patients</i>				
Implant complications	0.72 (0.62–0.84)	<0.0001	0.73 (0.63–0.85)	<0.0001
HTN	0.84 (0.66–1.07)	0.1636	0.90 (0.70–1.14)	0.361
CHF	0.64 (0.51–0.79)	<0.0001	0.68 (0.55–0.84)	0.0005
Septicemia	0.60 (0.55–0.66)	<0.0001	0.63 (0.57–0.70)	<0.0001
DM	0.53 (0.39–0.71)	<0.0001	0.63 (0.46–0.86)	0.0035
<i>Discharge to specialized care for HD patients</i>				
Implant complications	1.58 (1.49–1.67)	<0.0001	1.66 (1.57–1.76)	<0.0001
HTN	1.69 (1.57–1.82)	<0.0001	1.84 (1.70–2.00)	<0.0001
CHF	1.57 (1.46–1.68)	<0.0001	1.66 (1.54–1.78)	<0.0001
Septicemia	1.21 (1.13–1.29)	<0.0001	1.30 (1.21–1.40)	<0.0001
DM	1.16 (1.02–1.25)	<0.0001	1.42 (1.31–1.53)	<0.0001

¹ Adjusted for changes in age, gender, race, hospital location, primary payer type, hospital bed size, hospital location, zip code income, CCI.

adjusted odds of adverse discharge were higher in ESRD hospitalizations with depression compared to those without depression.

We recognize that the rates of documented depression in the NIS are lower by several fold compared with other cohorts [14]. The reasons for this are likely multifactorial. It is well established that it is more difficult to diagnose depression in ESRD patients [15]. Additionally, published studies have explicitly screened for depression and therefore will generate higher proportion of patients with depression, as compared to the NIS where there is no standardized measure or reporting of depression. Undercoding of depression may also differentially affect different populations of patients.

One possible explanation of the doubling of admissions for ESRD and depression may be because an increased screening and an increased coding were performed for depression. Incentives through the Physician Quality Reporting System recommending Patient Health Questionnaire-2 screening likely contributed to increased diagnosis of depression by primary care and other providers. Overall secondary ICD-9-CM diagnosis coding may have also increased during this time period. However, given that the rates of depression have increased in the general population, we suspect that the increasing proportion of HD patients with depression is likely due to a combination of the above factors and a true increase in prevalence [16]. Furthermore, when we examined the odds of increase per year by different reasons for admissions, even after adjustment there was a significant increase of 7–13%. Therefore, temporal changes in comorbidities and procedures do not fully explain this increasing trend.

We have found that depression is on the rise among the younger female population and that the rates of depression are lower in patients >65, which is consistent with prior studies [17–19]. It is possible that younger patients on HD have true higher rates of depression, or that depression is being underdiagnosed or undercoded in older populations and warrants further study. Our data also demonstrate that there was a lower proportion of black patients with depression. This is in contrast to a study conducted by Weisbord et al. [20], which found that whites and African Americans had the same rate of prevalence of depression in maintenance HD patients – 27% in both groups. Another study in incident dialysis patients did demonstrate a higher rate of depression in whites [21].

Depressed patients were significantly more likely to have an adverse discharge to specialized care facilities.

Previous studies have shown that rates of depression are higher in long-term care facilities, and it is possible that more patients with depression were coming from these facilities [22].

Interestingly, our data showed that a diagnosis of depression was associated with decreased in-hospital mortality. In multiple prior studies, depression has been associated with increased risk of in-hospital mortality following CABG [23, 24]. However, decreased in-hospital mortality for patients with depression has also been previously described in hospitalizations for breast cancer and soon after a major spine surgery [25, 26]. In previous studies, it has been hypothesized that sicker patients would be less likely to have depression coded in their secondary ICD-9-CM diagnoses, which may signify that patients with hospitalizations that are coded with depression may be less acutely ill [27]. This may also explain the higher need for procedures that we see in HD admissions without depression. Lower in-hospital mortality in patients with depression may also reflect differences in overall care. We speculate that those patients who were screened for depression could have had more comprehensive and attentive care by their health care providers than those who were never identified, leading to earlier identification and treatment of both acute and chronic comorbidities. The hospitalization rate may be different for patients with depression, so while our data reports in-hospital mortality, it may not reflect the overall yearly mortality for these patients. Unfortunately, we do not have sufficient data to comment on overall mortality (including out-of-hospital mortality), but our findings are intriguing and should be followed up by future studies with more granular patient-level data.

We recognize several limitations to our study. As the NIS is an administrative database, we recognize that there could be a potential bias in undercoding. However, given that undercoding may make our 2 populations look more similar, the fact that we have found several significant differences in the groups is encouraging. We also do not have sufficient granular data to examine factors that may affect mortality such as vintage of dialysis and access type. In addition, the unit of analysis was the number of hospitalizations, and thus, we were unable to account for patients with multiple hospitalizations within a calendar year. However, the NIS is a database representing national data, which allows for generalizability to the national HD cohort. Given these limitations and surprising findings, we believe further studies with patient-level data are warranted including both in-hospital and out-of-hospital outcomes.

Conclusions

Depression is highly prevalent in ESRD patients on HD and has been increasing over the past 8 years. Depression was associated with an increased rate of adverse discharges, no difference in LOS, decreased hospital costs, and decreased in-hospital mortality. These results call for further studies to evaluate the effect of depression in HD patients on hospitalization outcomes.

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Disclosure Statement

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