Association of Psychiatric Diagnostic Conditions with Hospital Care Outcomes of Patients with Orthopedic Injuries

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ABSTRACT

Context: Psychiatric comorbidity is common in orthopedic injury, but the effects on hospital care outcomes have been identified only generally.

Objective: To quantify psychiatric comorbidity and its outcome effects in a large, multicenter population of inpatients with orthopedic injuries.

Design: Retrospective analysis of patient discharge data from 507 California hospitals from 2001 to 2010. Study sample included orthopedic diagnoses using International Classification of Diseases codes for major pelvic and lower extremity injuries in patients older than age 17 years. From the injury data, we extracted psychiatric diagnoses, alcoholism, substance abuse, and sociodemographic characteristics.

Main Outcome Measures: Length of stay, surgical complications, and inpatient deaths.

Results: The entire injury admissions represented about 1.9% of all hospital admissions and were predominantly older than age 64 years, white, and women with conventional health care insurance. The most common comorbidity in the patients with injury was psychiatric illness (24.7%). The most common psychiatric diagnoses in orthopedic injury admissions were dementia (14.3%) and depression (6.9%) without association. Compared with the injury admissions with no psychiatric diagnosis, admissions with psychiatric diagnosis had higher odds of a hospital stay of 7 or more days, surgical treatment complications, and inhospital death.

Conclusion: Psychiatric comorbidity adversely affects several hospital outcomes in patients with orthopedic injuries: Length of stay, surgical complications, and inpatient mortality. In low-income populations, the adverse psychiatric effects are incrementally worse. The adverse effects of psychiatric comorbidity, particularly dementia and depression, on hospital outcomes should stimulate improved psychiatric care of many patients at risk of poor clinical outcomes.

INTRODUCTION

Orthopedic injuries frequently require acute hospitalization for urgent care. Many patients are admitted with clinically significant comorbidities, which affect outcomes of hospital care.[1] Psychiatric comorbidity is a frequent confounding factor in effective care.[1-10] Some investigators have found adverse effects on orthopedic outcomes owing to concurrent psychiatric diagnoses.[1,2,5,11,12] Also, other studies have shown ethnic, racial, and socioeconomic disparities in care of orthopedic conditions.[13-17] However, multicenter studies have not yet validated and explained some outcome observations in these injured patients. Also, several specific psychiatric diagnoses have not yet been correlated with outcomes of acute orthopedic hospital care.

The purpose of this study is to report characteristics of hospitalized orthopedic injury/fracture patients in California, and to investigate the association of psychiatric diagnoses with length of hospital stay (LOS), surgical treatment complications and inhospital mortality in a large population of hospitalized patients with orthopedic injuries.

METHODS

A cross-sectional analysis was conducted of patient discharge data from 507 California hospitals in a database maintained by the Office of Statewide Health Planning and Development. The database includes patient diagnoses, types of procedures, hospital characteristics, patient demographics, LOS, complications, comorbidity, costs, route of discharge, and self-reported race/ethnicity. For the present study, we used discharge data between 2001 and 2010. We included orthopedic diagnoses, using the International Classification of Disease, Ninth Edition (ICD-9) codes for major pelvic and lower extremity injuries that required hospital care in patients older than age 17 years. From the injury data we also extracted psychiatric diagnoses, alcoholism, and substance abuse, as well as age (< 65 years as the reference vs ≥ 65 years), sex, race/ethnicity (white vs black/African American, Hispanic, and Asian/other), insurance (private/Medicare vs Medi-Cal/other), number of comorbidities, LOS (< 7 days vs ≥ 7 days), complications (yes vs no), and inhospital death (yes vs no).

All analyses were obtained and analyzed using analytics software (Statistical Analysis Software [SAS] Version 9.3, SAS Institute. Cary, NC). We used frequency (count and percentage) to depict the overall characteristics of the sample for the categorical variables (age, sex, race/ethnicity, insurance status, LOS, and comorbidity). We conducted bivariate analysis using the χ^2 test to determine the statistical difference in the outcome variables (LOS, surgical complications, and

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inpatient deaths) by the main independent variable (psychiatric diagnoses), alcohol abuse, and substance abuse, and the other independent variables (age, sex, race/ethnicity, insurance status, and number of comorbidities). In addition, we performed multiple logistic regressions to test the independent association between study predictor variables and the outcomes variables while controlling for the other variables in the model (ie, age, sex, race/ethnicity, insurance status, and number of comorbidities). Adjusted odds ratios (ORs) and 95% confidence intervals (CIs) are presented, and statistical significance was considered at p value ≤ 0.05.

RESULTS

The entire injury admission population was about 1.9% of all hospital admissions (Figure 1). Table 1 presents the demographic characteristics of the hospital admissions with orthopedic injuries. These patients were predominantly older than age 64 years, white women with a conventional health care insurance profile. These characteristics were similar to the characteristics of general admissions except that injury admissions were predominantly older (data not shown).

As indicated in Table 2, overall, the most common comorbidity in the patients with orthopedic injury was a psychiatric illness (24.7%). The specific psychiatric diagnoses in the general admissions and injury admissions with psychiatric diagnoses are shown in Table 2. The most common psychiatric diagnoses in injury admissions were dementias (14.3%) followed by depression (6.9%). Besides psychiatric diagnoses, diabetes mellitus was equally the most frequent comorbidity in both the general admissions and orthopedic injury admissions (data not shown). A small percentage of the injury admissions with psychiatric diagnoses had a diagnosis of alcoholism (2.0%) or substance abuse (0.9%).

The correlations between psychiatric diagnosis and other study variables in the injury population and hospital outcomes are shown in Table 3. Psychiatric illness was correlated with prolonged hospital stay of the patients with injury, surgical treatment complications, and inhospital death (p < 0.001).

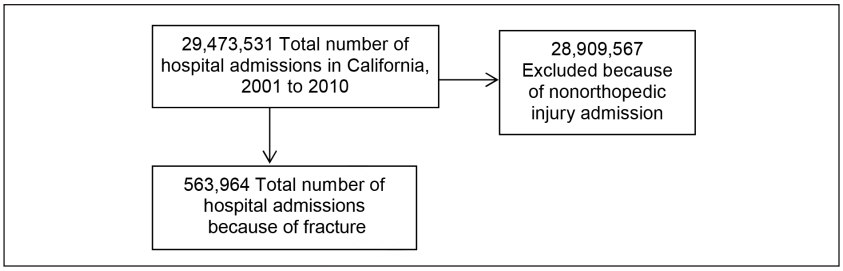

Figure 1. Flow diagram of selected cases.

Table 1. Characteristics of hospitalized patients with orthopedic injury by psychiatric diagnosis (study sample)

Characteristic[a]	Total injury admissions (N = 563,964), no. (%)	Psychiatric diagnosis (n = 139,450), no. (%)	No psychiatric diagnosis (n = 424,514), no. (%)	p value
Substance abuse				
Yes	3117 (0.6)	1195 (0.9)	1922 (0.5)	< 0.001
No	560,847 (99.4)	138,255 (99.1)	422,592 (99.5)	
Alcoholism				
Yes	18,011 (3.2)	2769 (2.0)	15,242 (3.6)	< 0.001
No	545,953 (96.8)	136,681 (98.0)	409,272 (96.4)	
Age, years				
< 65	211,526 (37.5)	25,170 (18.1)	186,356 (43.9)	< 0.001
≥ 65	352,438 (62.5)	114,280 (81.9)	238,158 (56.1)	
Sex				
Male	179,050 (36.7)	32,538 (25.8)	146,512 (40.5)	< 0.001
Female	308,648 (63.3)	93,462 (74.2)	215,186 (59.5)	
Race/ethnicity				
White	332,433 (78.0)	98,426 (85.4)	234,007 (75.2)	< 0.001
Black	17,445 (4.1)	3567 (3.1)	13,878 (4.5)	
Hispanic	55,621 (13.0)	8580 (7.4)	47,041 (15.1)	
Asian/other	20,984 (4.9)	4676 (4.1)	16,308 (5.2)	
Insurance				
Private/Medicare	452,004 (80.2)	126,801 (90.9)	325,203 (76.6)	< 0.001
Medi-Cal/other	111,881 (19.8)	12,632 (9.1)	99,249 (23.4)	
No. of comorbidities				
0	331,144 (58.7)	66,780 (47.9)	264,364 (62.3)	< 0.001
1	142,377 (25.3)	42,831 (30.7)	99,546 (23.4)	
2	59,734 (10.6)	19,768 (14.2)	39,966 (9.4)	
3	22,179 (3.9)	7330 (5.2)	14,849 (3.5)	
≥ 4	8530 (1.5)	2741 (2.0)	5789 (1.4)	
Length of hospital stay				
< 7 days	402,022 (71.3)	92,739 (66.5)	309,283 (72.9)	< 0.001
≥ 7 days	161,942 (28.7)	46,711 (33.5)	115,231 (27.1)	
Complications				
Yes	58,338 (10.3)	17,809 (12.8)	40,529 (9.6)	< 0.001
No	505,626 (89.7)	121,641 (87.2)	383,985 (90.4)	
Inhospital death				
Yes	13,093 (2.3)	4100 (2.9)	8993 (2.1)	< 0.001
No	550,871 (97.7)	135,350 (97.1)	415,521 (97.9)	

[a] Demographic variables, such as age, sex, race/ethnicity were masked by The California Office of Statewide Health Planning and Development (OSHPD), therefore, some columns may not add up to total N.

Table 2. Psychiatric diagnoses in general admissions and fracture admissions[a]

Psychiatric diagnosis	General admissions (n = 29,473,531), no. (%)	p value
Anxiety	1,280,222 (4.3)	< 0.001
Dementia	1,602,866 (5.4)	< 0.001
Depression	1,571,119 (5.3)	< 0.001
Episodic mood	1,286,681 (4.4)	< 0.001
Schizophrenia	769,528 (2.6)	< 0.001
Alcoholism	615,214 (2.1)	< 0.001
Substance abuse	446,406 (1.5)	< 0.001

[a] Some admitted patients had multiple psychiatric diagnoses. For example, for all orthopedic injury admissions with a psychiatric diagnosis, 2.0% had a diagnosis of alcoholism and 0.9% had a diagnosis of substance abuse.

Table 4 presents the independent predictors of LOS, surgical treatment complications, and inhospital death of hospitalized patients with orthopedic injury. Compared with the injury admissions with no psychiatric diagnosis, admissions with psychiatric diagnosis had higher odds of 7 or more days of hospital stay (OR = 1.27; CI = 1.25-1.29), higher odds of having surgical treatment complications (OR = 1.18; CI = 1.15-1.20), and higher odds of inhospital death (OR = 1.15; CI = 1.10-1.20). These results were statistically significant.

Of the other variables in Table 4, injury admissions with substance abuse, alcoholism, age 65 years or older, and comorbid conditions as well as those from an ethnic minority group had higher odds of staying in the hospital 7 or more days compared with their counterparts without these characteristics. On the other hand, female sex and having private/Medicare insurance lowered the odds of a lengthy hospital stay compared with their reference groups.

With respect to surgical treatment complications, injury admissions with substance abuse, alcoholism, and comorbid conditions had higher odds of complications, whereas age 65 years or older, female sex, belonging to an ethic minority group, and having private/Medicare insurance lowered the chance of treatment complications for these groups compared with their reference groups. As for inhospital deaths, alcoholism, age 65 years or older, and comorbid conditions increased the odds of mortality, whereas substance abuse, female sex, belonging

Table 3. Associations of psychiatric diagnoses and other study variables with length of hospital stay, surgical treatment complications, and inhospital death in hospitalized patients with orthopedic injury, number (percentage)

	Length of hospital stay			Surgical treatment complications			Inhospital death		
Variable	< 7 Days	≥ 7 Days	p value	Yes	No	p value	Yes	No	p value
Psychiatric diagnosis									
Yes	92,739 (23.1)	46,711 (28.8)	< 0.001	17,809 (30.5)	121,641 (24.1)	< 0.001	4100 (31.3)	135,350 (24.6)	< 0.001
No	309,283 (76.9)	115,231 (71.2)		40,529 (69.5)	383,985 (75.9)		8993 (68.7)	415,521 (75.4)	
Substance abuse									
Yes	1659 (0.4)	1458 (0.9)	< 0.001	542 (0.9)	2575 (0.5)	< 0.001	38 (0.3)	3079 (0.6)	< 0.001
No	400,363 (99.6)	160,484 (99.1)		57,796 (99.1)	503,051 (99.5)		13,055 (99.7)	547,792 (99.4)	
Alcoholism									
Yes	11,969 (3.0)	6042 (3.7)	< 0.001	2005 (3.4)	16,006 (3.2)	0.004	272 (2.1)	17,739 (3.2)	< 0.001
No	390,053 (97.0)	155,900 (96.3)		56,333 (96.6)	489,620 (96.8)		12,821 (97.9)	533,132 (96.8)	
Age, years									
< 65	157,588 (39.2)	53,938 (33.3)	< 0.001	17,179 (29.5)	194,347 (38.4)	< 0.001	2321 (17.7)	209,205 (38.0)	< 0.001
≥ 65	244,434 (60.8)	108,004 (66.7)		41,159 (70.5)	311,279 (61.6)		10,772 (82.3)	341,666 (62.0)	
Sex									
Male	124,056 (35.5)	54,994 (39.8)	< 0.001	20,815 (41.2)	158,235 (36.2)	< 0.001	4978 (44.1)	174,072 (36.5)	< 0.001
Female	225,329 (64.5)	83,319 (60.2)		29,743 (58.8)	278,905 (63.8)		6317 (55.9)	302,331 (63.5)	
Race/ethnicity									
White	240,792 (78.9)	91,641 (75.6)	< 0.001	35,709 (79.6)	296,724 (77.8)	< 0.001	8194 (83.2)	324,239 (77.8)	< 0.001
Black	11,539 (3.8)	5906 (4.9)		1766 (3.9)	15,679 (4.1)		282 (2.9)	17,163 (4.1)	
Hispanic	38,961 (12.8)	16,660 (13.7)		5142 (11.5)	50,479 (13.2)		930 (9.4)	54,691 (13.1)	
Asian/other	13,932 (4.5)	7052 (5.8)		2244 (5.0)	18,740 (4.9)		449 (4.5)	20,535 (4.9)	
Insurance									
Private/Medicare	328,265 (81.2)	125,739 (77.7)	< 0.001	48,424 (83.0)	403,580 (79.8)	< 0.001	11,231 (85.8)	440,773 (80.0)	< 0.001
Medi-Cal/other	75,697 (18.8)	36,184 (22.3)		9908 (17.0)	101,973 (20.2)		1856 (14.2)	110,025 (20.0)	
No. of comorbidities									
0	260,688 (64.8)	70,456 (43.5)	< 0.001	9398 (16.1)	321,746 (63.6)	< 0.001	1929 (14.7)	329,215 (59.7)	< 0.001
1	94,527 (23.5)	47,850 (29.6)		20,663 (35.4)	121,714 (24.1)		3758 (28.7)	138,619 (25.2)	
2	33,421 (8.3)	26,313 (16.2)		14,740 (25.3)	44,994 (8.9)		3588 (27.4)	56,146 (10.2)	
3	10,290 (2.6)	11,889 (7.3)		8664 (14.9)	13,515 (2.7)		2440 (18.6)	19,739 (3.6)	
≥ 4	3096 (0.8)	5434 (3.4)		4873 (8.3)	3657 (0.7)		1378 (10.5)	7152 (1.3)	

to an ethic minority group, and having private/Medicare insurance lowered the chance of inhospital death for these groups compared with their reference groups.

Table 5 displays the separate analysis for each psychiatric diagnosis and their association with LOS, surgical treatment complications, and inhospital deaths. The largest percentage of prolonged hospital stays and surgical treatment complications belonged to patients with schizophrenia (45.2% and 14.7%, respectively), and the largest percentage of inhospital deaths belonged to the dementia group (3.9%) followed by the depression group (2.2%).

DISCUSSION

These data are consistent with recent study findings regarding the psychiatric effects on acute hospital care of patients with orthopedic injury.[2,6] However, this study extends the understanding of psychiatric effects to a much larger group of patients because it includes all orthopedic injury admissions across a large spectrum of hospitals and localities across the entire state of California. The data show that there is an important burden of psychiatric illness in hospitalized patients with orthopedic injuries and that psychiatric comorbidity is correlated with higher prevalence of surgical complications, longer hospital LOS, and higher inhospital mortality. Among the psychiatric comorbidities, dementia and depression each accounted for a greater percentage of prolonged hospital stays, surgical complications, and inhospital deaths compared with other psychiatric diagnoses.

Focused rehabilitation is the pertinent clinical implication growing from these observations. However, this term is complex, multifactorial, and not fully defined and is beyond the scope of this study, needing to be addressed in future studies.

In addition, our further look at the data showed adverse correlations between hospital care of patients with orthopedic injuries with psychiatric illness and their category of health insurance. This finding agrees with recent information in the care of patients with hip fracture in which low-income status was independently correlated with adverse care parameters.[16] In the current study, low-income patients with psychiatric illness remain in acute hospital care twice as long as the conventionally insured patients (data not shown). Patients in lower socioeconomic groups experience more surgical complications when they have a psychiatric illness, and they also have longer LOS than in the general patient population. Poor hospital surgical outcomes not only affect patient well-being but also increase the cost of care.[18] Surgical complications and prolonged LOS have both been reported to increase the cost of medical care.[19-22]

There are many reports of the adverse outcomes in orthopedic inpatients owing to psychiatric comorbidities.[1,6-11] There are also reports of improved outcomes from systematic, multidisciplinary care of orthopedic inpatients.[18,23] There appears to be an unexplained failure of improved medical management of these patients with respect to psychiatric comorbidities.

Table 4. Independent predictors of length of hospital stay, surgical treatment complications, and inhospital death in hospitalized patients with orthopedic injury

	Length of hospital stay ≥ 7 days		Surgical treatment complications		Inhospital death	
Variable	Odds ratio (95% CI)	p value	Odds ratio (95% CI)	p value	Odds ratio (95% CI)	p value
Psychiatric diagnosis						
Yes	1.27 (1.25-1.29)	< 0.001	1.18 (1.15-1.20)	< 0.001	1.15 (1.10-1.20)	< 0.001
No	Reference		Reference		Reference	
Substance abuse						
Yes	2.00 (1.83-2.17)	< 0.001	1.79 (1.59-2.01)	< 0.001	0.61 (0.42-0.90)	0.0127
No	Reference		Reference		Reference	
Alcoholism						
Yes	1.33 (1.28-1.39)	< 0.001	1.44 (1.35-1.54)	< 0.001	1.04 (0.89-1.22)	0.5976
No	Reference		Reference		Reference	
Age, years						
< 65	Reference	< 0.001	Reference	< 0.001	Reference	< 0.001
≥ 65	1.26 (1.24-1.29)		0.82 (0.79-0.84)		2.09 (1.94-2.24)	
Sex						
Male	Reference	< 0.001	Reference	< 0.001	Reference	< 0.001
Female	0.83 (0.82-0.84)		0.84 (0.82-0.86)		0.68 (0.65-0.71)	
Race/ethnicity						
White	Reference		Reference		Reference	
Black	1.31 (1.26-1.35)	< 0.001	0.89 (0.84-0.94)	< 0.001	0.74 (0.66-0.84)	< 0.001
Hispanic	1.06 (1.04-1.08)	< 0.001	0.79 (0.76-0.82)	< 0.001	0.72 (0.66-0.77)	< 0.001
Asian/other	1.26 (1.23-1.30)	< 0.001	0.91 (0.86-0.95)	< 0.001	0.77 (0.69-0.85)	< 0.001
Insurance						
Private/Medicare	0.59 (0.58-0.61)	< 0.001	0.81 (0.78-0.84)	< 0.001	0.65 (0.60-0.70)	< 0.001
Medi-Cal/other	Reference		Reference		Reference	
No. of comorbidities	1.64 (1.63-1.65)	< 0.001	2.60 (2.58-2.63)	< 0.001	2.16 (2.13-2.20)	< 0.001

CI = confidence interval.

Table 5. Associations of different psychiatric diagnoses with length of hospital stay, surgical treatment complications, and inhospital death in hospitalized orthopedic injury patients

	Length of hospital stay			Surgical treatment complications			Inhospital death		
Diagnosis	< 7	≥ 7	p value	Yes	No	p value	Yes	No	p value
Psychiatric diagnosis, no. (%)									
Yes	92,739 (66.5)	46,711 (33.5)	< 0.001	17,809 (12.8)	121,641 (87.2)	< 0.001	4100 (2.9)	135,350 (97.1)	< 0.001
No	309,283 (72.9)	115,231 (27.1)		40,529 (9.5)	383,985 (90.5)		8993 (2.1)	415,521 (97.9)	
Anxiety, no. (%)									
Yes	15,588 (66.4)	7882 (33.6)	< 0.001	3059 (13.0)	20,411 (87.0)	< 0.001	424 (1.8)	23,046 (98.2)	< 0.001
No	386,434 (71.5)	154,060 (28.5)		55,279 (10.2)	485,215 (89.8)		12,669 (2.3)	527,825 (95.8)	
Dementias, no. (%)									
Yes	54,260 (67.4)	26,249 (32.6)	< 0.001	10,264 (12.8)	70,245 (87.2)	< 0.001	3142 (3.9)	77,367 (96.1)	< 0.001
No	347,762 (71.9)	135,693 (28.1)		48,074 (9.9)	435,381 (90.1)		9951 (2.1)	473,504 (97.9)	
Depression, no. (%)									
Yes	25,910 (67.0)	12,747 (33.0)	< 0.001	4757 (12.3)	33,900 (87.7)	< 0.001	831 (2.2)	37,826 (97.8)	0.020
No	376,112 (71.6)	149,195 (28.4)		53.581 (10.2)	471,726 (89.8)		12,262 (2.3)	513,045 (97.7)	
Episodic mood, no. (%)									
Yes	6854 (60.6)	4448 (39.4)	< 0.001	1641 (14.5)	9661 (85.5)	< 0.001	171 (1.5)	11,131 (98.5)	< 0.001
No	395,168 (71.5)	157,494 (28.5)		56,697 (10.3)	495,965 (89.7)		12,922 (2.3)	539,740 (97.7)	
Schizophrenia, no. (%)									
Yes	3149 (54.8)	2594 (45.2)	< 0.001	846 (14.7)	4897 (85.3)	< 0.001	101 (1.8)	5642 (98.2)	0.004
No	398,873 (71.5)	159,348 (28.5)		57,492 (10.3)	500,729 (89.7)		12,992 (2.3)	545,229 (97.7)	

Our study has some limitations. The methods in this study depended on the accuracy of diagnostic coding of the patient data used. Therefore, conclusions may be inaccurate and/or misleading if the data were found to be corrupted in the original collection process.[24,25] This criticism is somewhat mitigated by the large number of heterogeneous sources of data and the large numbers of patients studied. In addition, the data that were reviewed did not state the criteria that were used to establish the various psychiatric diagnoses. This possible variation in diagnostic criteria from case to case could have either increased or decreased the prevalence of the psychiatric diagnoses. Finally, the data reflected the probability that some patients suffered from multiple diagnoses in either injury diagnoses or psychiatric diagnoses or both. This clinical situation explained differences in some of the total population numbers but did not affect the overall conclusions.

CONCLUSION

Psychiatric illness is common in hospitalized patients with orthopedic injury (24.7%), particularly in elderly, white women. Psychiatric comorbidity, particularly dementia and depression, adversely affects hospital outcomes in LOS, surgical complications in patients with fracture, and inpatient mortality in these patients with orthopedic injuries. In low-income populations, the adverse psychiatric effects are incrementally worse for LOS, surgical complications, and inpatient mortality. Future studies may show that improved psychiatric care of these patients may improve hospital outcomes, especially in low-income populations. ❖

Disclosure Statement

The author(s) have no conflicts of interest to disclose.

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Crushing the Soul

In depression … faith in deliverance, in ultimate restoration, is absent. The pain is unrelenting, and what makes the condition intolerable is the foreknowledge that no remedy will come—not in a day, an hour, or a minute … . It is hopelessness even more than pain that crushes the soul.

— William Styron, 1925-2006, American novelist and essayist