



Original Article

Comparing psychological burden of orthopaedic diseases against medical conditions: Investigation on hospital course of hip, knee, and spine surgery patients



Bassel G. Diebo^{a,*}, Denis Cherkalin^b, Cyrus M. Jalai^c, Neil V. Shah^a, Greg W. Poorman^c, George A. Beyer^b, Frank A. Segreto^{a,c}, Virginie Lafage^d, Qais Naziri^a, Jared M. Newman^a, William P. Urban^a, Thomas J. Errico^c, Frank J. Schwab^d, Carl B. Paulino^a, Peter G. Passias^c

^a Department of Orthopaedic Surgery and Rehabilitation Medicine, State University of New York, Downstate Medical Center, 450 Clarkson Ave., MSC 30, Brooklyn, NY, United States

^b State University of New York, Downstate College of Medicine, 450 Clarkson Ave., Brooklyn, NY, United States

^c Division of Spinal Surgery, NYU Hospital for Joint Diseases, 301 E. 17th St., New York, NY, United States

^d Spine Service, Hospital for Special Surgery, 525 E. 71st St., 4th Floor, New, York, NY, United States

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ABSTRACT

Retrospective review of National Inpatient Sample (2000–2012) revealed that 31.28% of musculoskeletal (MSK) patients were found to have in-hospital psychological burdens (PBs). Adult spinal deformity (ASD), degenerative disc disease (DDD) and lung cancer patients had highest PB-prevalence. MSK patients with PB were more often young, white females with increased Deyo index compared to no-PB patients. Patients who underwent spinal revision procedures had higher PB rates than with primary procedures; a converse trend was observed for total hip/knee arthroplasty. Psychological disorders were identified as significant predictors of increased total-hospital charges. Augmenting counseling with psychological screening/support is recommended to complement MSK management.

1. Introduction

Due to pain and decreased functionality, living with musculoskeletal (MSK) disorders can detrimentally effect a patient's quality of life.^{1–4} While these effects are certainly physical, the association between pain, disability and poor mental health is well established in the literature.⁵ The National Mental Health Survey in Australia showed that 29% of people with disabilities reported an anxiety disorder within the previous year, compared to 12% in the general population.⁶ Carroll et al.⁷ reported that spinal pain is one of the most important predictors of early-onset depression in the general population. Shamji et al.⁸ reported that among 150 patients with neuropathic pain diagnoses, 63% screened positive for depressive symptoms, while 23% screened positive for anxiety symptoms. Patients' depression scores were also correlated with pain intensity. Katon et al.⁹ reported that in a cohort of 37 patients with chronic pain, 32.4% were concurrently diagnosed with major depressive disorder (MDD), 43.2% had a previous episode of MDD, and 40.5% had alcohol abuse.

Tending to patients requires employing a comprehensive approach

to care, identifying and treating all aspects of the burden of their disease. The overlap between pain/disability and poor mental health makes delineating these conditions of utmost importance within the context of treating patients with musculoskeletal pathologies or injuries. However, little is known about the psychological burden associated with orthopaedic conditions, especially when compared to other the established understanding of psychological burdens associated with chronic medical conditions. The objective of this study was to investigate the psychological burden (PB) in patients with orthopaedic conditions via a retrospective review of data of inpatient admissions for common orthopaedic procedures related to the hip, knee, and spine.

2. Materials and methods

2.1. Data source

A retrospective review of the National (Nationwide) Inpatient Sample (NIS) dataset from 2000 to 2012 was performed. The Health Care Cost and Utilization Project (HCUP) provides support for the NIS.

* Corresponding author at: State University of New York, Downstate Medical Center, 450 Clarkson Ave., Box 30, Brooklyn, NY 11203, United States.
E-mail address: dr.basseldiebo@gmail.com (B.G. Diebo).

Further support comes from federal, state, and industry partnerships. The NIS database is the most robust available all-payer data for inpatient care in the United States. NIS obtains data for eight million hospital stays from 1000 hospitals each year. Data is collected and coded in the inpatient setting for any diagnosis assigned to a patient during their hospital stay. This data is comprised of a 20% stratified random sample of all community hospitals in the country. This study was exempted by our Institution Review Board (IRB) due to the de-identified nature of the data.

2.2. Patient population

The International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes were utilized to identify adult patients (> 18 years old) who were admitted for the following principal diagnoses and underwent the subsequent procedures:

- Patients with primary osteoarthritis of the knee (715.15) underwent total hip replacement (THA: primary, 81.51; or revision, 00.70, 00.71, 00.72, 81.53).
- Patients with primary osteoarthritis of the knee (715.16) underwent total knee replacement (TKA: primary, 81.41, 81.54; or revision, 81.55).
- Patients with adult spinal deformity (ASD), defined as idiopathic scoliosis (737.30, 737.32), or degenerative disc disease (737.10, 737.20, 722.52, 722.51, 724.02, 721.3, 738.4, 722.10, 756.12, 722.73, 721.42, 724.01, 721.2, 722.72, 721.41, 722.11, 724.03, 756.11) who underwent ≥ 4 -level spinal fusion (81.63, 81.64).
- Patients with degenerative disc disease (DDD) who underwent 2–3-level spinal fusion (81.62).

Patients were excluded if they had osteomyelitis, traumatic fracture, pathologic fracture, or any type of cancer. Patients admitted for cardiac diseases (Cardiac), diabetes mellitus (DM), and lung cancers (LC) were used as controls. Patients' groups were isolated from each other in order to avoid confounding effects of overlapping comorbidities. Psychological burden (PB) of the disease was defined as the percentage of patients who were coded for at least one psychological disorder during their hospital stay. ICD-9-CM codes reported in the Diagnostic and Statistical Manual of Mental Disorders: 5th Edition (DSM-V) were used to identify patients with the following psychological disorders: depression (296.99, 296.20, 296.21, 296.22, 296.23, 296.24, 296.25, 296.26, 296.30, 296.31, 296.32, 296.33, 296.34, 296.35, 296.36, 300.4, 293.93, 311), anxiety (300.29, 300.23, 300.01, 300.22, 300.02, 293.84, 300.09, 300.00), obsessive-compulsive (300.3), stress (313.89, 309.0, 309.24, 309.28, 309.3, 307.4, 309.81, 308.3, 309.89, 309.9), somatic symptom (300.81, 300.82), sexual dysfunction (302.72, 302.9, 607.84), substance-related and addictive (303.0, 303.9, 305.0, 305.9, 304.00, 305.5, 304.10, 305.40, 304.20, 305.60, 304.30, 305.20, 304.50, 305.30, 305.90, 304.50, 304.80, 304.90, 305.10, 305.70, 304.40, 304.60), delirium (293.0, 293.1, 780.09), and personality (301.0, 301.10, 301.11, 301.12, 301.20, 301.22, 301.3, 301.4, 301.50, 301.59, 301.6, 301.7, 301.81, 301.82, 301.83, 301.89, 301.9) disorders.

2.3. Data collection

The demographics studied were age, gender, race, type of insurance (Medicare, Medicaid, Private Insurance, Self-Pay, No Charge, Other), and Deyo Index (Deyo Index, also known as the Deyo/Charlson-Comorbidity Index, which is a modified version of the Charlson-Comorbidity Index that is used to categorize comorbidities of patients based on ICD diagnosis codes).¹⁰ Length of stay, total hospital charges, and mortality rates were also collected.

2.4. Statistical analysis

2.4.1. General analysis

Seven patient groups were identified (ASD, DDD, THA, TKA, Cardiac, DM, and LC). Demographics were compared between the groups using ANOVA for age, Deyo Index, total charges, and length of stay. Chi-Square analysis was used to characterize the variation in race, gender, and primary payer for the varying patient groups. Chi-Square analysis with Bonferroni correction was also used to determine the difference in relative frequency of psychological burden incidence across the groups.

2.4.2. Musculoskeletal diseases analysis

Demographic analysis was conducted using univariate independent-sample *t*-tests to compare those that were coded with concomitant PB versus those who were not coded with concomitant PB within the ASD, DDD, THA, and TKA groups. Additionally, variation in psychological illness between patients that received primary or revision surgeries for ASD, DDD, THA, and TKA conditions was analyzed using Chi-Square analysis. Lastly, a logistic regression model controlling for age, gender, and Deyo Index was employed in order to identify any independent predictors of increased total charges and increased length of stay among patients coded for ASD, DDD, THA, and TKA conditions. Increased total charges and length of stay were defined as the values that were ≥ 60 th percentile of the overall dataset for each parameter. The threshold for statistical significance was set to $p < 0.05$. All analyses were performed using SPSS Statistics 24 (IBM Corp., Armonk, NY, USA).

3. Results

3.1. General analysis

3.1.1. Patient population

5,001,416 patients met the inclusion criteria. Demographics varied significantly between the groups. Cardiac patients were the oldest, while DDD were the youngest (73.8 vs. 55.2 years, $p < 0.001$). Lung cancer patients had the highest Deyo score, and the lowest Deyo score was found in DDD patients (5.51 vs. 0.26, $p < 0.001$). The majority of MSK patients were females (68.2% of ASD, 61.4% for THA, and 63.9% for TKA), significantly different from the frequency of female gender among medical comorbidities (47.6% for DM, 47.6% for LC; $p < 0.001$). MSK patients were less likely to be African American (4.1% of ASD, 5.6% of THA) vs. (26% of DM, 18% of Cardiac; $p < 0.001$). In all patient categories except DDD, patients were more likely to be insured through Medicare than any other type of insurance. DDD patients were more likely to have private insurance, while cardiac, LC, and DM patients were less likely to be insured with private insurance ($p < 0.001$). ASD patients had the highest total charges (\$151,534) and second longest hospital stay (5.67 days) after LC patients (7.24 days) (all $p < 0.001$; [Table 1](#)).

3.1.2. Psychological disorders

ASD, DDD, and LC patients had the highest prevalence of any psychological disorders when compared to all other conditions listed in [Table 2](#) (37.5%, 36.5%, and 35.7%, respectively, $p < 0.001$). The THA group had a significantly higher prevalence of psychologically impaired (any psychological illness) patients when compared to the Cardiac group (27% vs. 26%, $p < 0.001$). TKA patients had the lowest prevalence of any psychological illness (24.1%) ([Table 2](#)). In details, the LC group had the highest percentage of patients with substance abuse disorder (23.2%), followed by DDD (18.6%); TKA patients (6.3%) had the lowest prevalence. ASD and DDD showed the highest percentage of patients with depressive disorders (16% and 13.6%, respectively), followed by TKA (10.2%), and last by Cardiac (6.9%). Similarly, the ASD group had the highest percentage of patients with sleep and anxiety disorders (7.1%, and 6.7%, respectively), with TKA (5.3%) and DDD

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