Modifiable Risk Factors in Patients With Low Back Pain

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abstract

Low back pain is one of the most common reasons for physician visits in the United States and is a chief complaint frequently seen by orthopedic surgeons. Patients with chronic low back pain can experience recurring debilitating pain and disability, decreasing their quality of life. A commercially available software platform, Explorys (Explorys, Inc, Cleveland, Ohio), was used to mine a pooled electronic health care database consisting of the medical records of more than 26 million patients. According to the available medical history data, 1.2 million patients had a diagnosis of low back pain (4.54%). The information was used to determine the incidence of low back pain in patients with a history of nicotine dependence, obesity (body mass index, >30 kg/m^2), depressive disorders, and alcohol abuse. Relative risk was then calculated for the defined modifiable risk factors. Patients with nicotine dependence, obesity, depressive disorders, and alcohol abuse had a relative risk of 4.489, 6.007, 5.511, and 3.326 for low back pain, respectively, compared with patients without the defined risk factor. A statistically significant difference was found in the incidence of low back pain between all 4 groups with the risk factors evaluated and the general population ($P<.05$). By determining treatable patient risk factors for low back pain, physicians can monitor at-risk patients and focus on prevention and control of debilitating disease. These approaches can decrease the number of patients with isolated low back pain who are seen by orthopedic surgeons. [*Orthopedics*. 2016; 39(3):e413-e416.]

Low back pain is a common diagnosis in developed nations. Cross-sectional studies conducted in several countries have shown estimates of low back pain including a point prevalence of 19% to 39% and a reported lifetime prevalence of up to 83%.[1-8] Additionally, up to half of these patients seek medical attention for the diagnosis.[9,10] A substantial number of patients with low back pain have chronic or recurring episodes of debilitating pain that can result in diminished quality of life, missed work days, and increased medical costs to society and the individual.[11,12] Many studies have evaluated risk factors for low back pain, with varying and often conflicting results. Several studies showed an association of low back pain with smoking and increased body mass index.[13-15] Studies have also shown an association between depression and other psychiatric disorders.[16,17] However, a 2006 study by Kwon et al[12] showed that the development of low back pain was not dependent on obesity, smoking, or stress level.

Identifying modifiable risk factors for low back pain is an important way to help to avoid the morbidity and cost associated with chronic symptoms. This study used information from a pooled electronic health care database to determine the relative risk of low back pain in patients with modifiable risk factors, including nicotine

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Table

Population Data With Incidence and Relative Risk for Each Modifiable Risk Factor				
Characteristic	Population	Low Back Pain	Incidence	P	Relative Risk (95% Confidence Interval)
Overall	26,435,080	1,201,050	4.54%		
Nicotine					
Dependence	1,770,480	292,680	16.53%	<.001	4.489 (4.471-4.506)
No dependence	24,664,600	908,370	3.68%		0.223 (0.222-0.224)
Ethanol					
Abuse	351,230	51,490	14.66%	<.001	3.326 (3.299-3.354)
No abuse	26,083,850	1,149,560	4.41%		0.301 (0.298-0.303)
Body mass index, kg/m^2					
>30	3,324,560	556,740	16.75%	<.001	6.007 (5.986-6.027)
<30	23,110,520	644,310	2.79%		0.166 (0.166-0.167)
Depressive disorder					
Yes	1,741,560	336,150	19.30%	<.001	5.511 (5.491-5.531)
No	24,693,520	864,900	3.50%		0.181 (0.181-0.182)

dependence, obesity, alcohol abuse, and depressive disorders.

MATERIALS AND METHODS

A commercially available software platform, Explorys (Explorys, Inc, Cleveland, Ohio), was used to mine a pooled electronic health care database consisting of the medical records from major health care systems across the United States. The Explorys platform houses inpatient and ambulatory patient data from electronic medical record systems that are continually adding patients and updating patient information. At the time these calculations were performed, 26,435,080 patients from 13 major health care systems across the United States were included from 1998 to 2014. Because only deidentified data were

accessed, this study was deemed exempt from the institutional review board at Summa Health System. To ensure compliance with the Health Insurance Portability and Accountability Act for small groups of patients with rare diseases, the Explorys platform rounds patient numbers to the nearest 10. All patient data are converted into Systematized Nomenclature of Medicine—Clinical Terms (SNOMED-CT) format.

Patient cohorts were created with Explorys software to mine the database on January 8, 2014. A cohort was created from this database consisting of all patients who had a diagnosis of low back pain, and a control cohort was created of all patients without a diagnosis of low back pain. Additional analyses were performed with subgroups of nicotine de-

pendence, alcohol abuse, obesity (body mass index, >30 kg/m^2), and depressive disorders (dysthymia, major depressive disorder, endogenous depression, recurrent depression, bipolar disorder, atypical depressive disorder, and reactive depressive psychosis).

The Explorys platform developed its own descriptors to catalog patient information within the database. These descriptors were largely based on SNOMED, which was developed by the College of American Pathologists to uniformly categorize procedures, diagnoses, pharmacologic classes, patient findings, and other types of clinical data. Most concepts within Explorys are based on a specific SNOMED code. In contrast, most clinical databases catalog diagnoses according to the *International Classification of Diseases, Ninth Revision* (ICD-9), codes and catalog procedures according to Current Procedural Terminology (CPT) codes.

Statistical Analysis

The incidence of low back pain within the cohorts was determined, and relative risk, with 95% confidence intervals, was calculated for nicotine dependence, alcohol abuse, obesity (body mass index, >30 kg/m^2), and depressive disorders. Pearson's chi-square test for comparing proportions of categorical variables was used to determine significance, with significance set at $P<.05$.

RESULTS

At the time of data collection, 1,201,050 patients had a diagnosis of low back pain, which was 4.54% of the general population (**Table**). Subgroup analyses were performed for individual risk factors for low back pain, including nicotine dependence, alcohol abuse, obesity (body mass index>30), and depressive disorders, and relative risk was calculated (**Figure**). Patients with a diagnosis of nicotine dependence had an incidence of low back pain of 16.53% ($P<.001$), with a relative risk of 4.49 (95% confidence in-

terval, 4.47-4.51) compared with the general population. Patients with a diagnosis of alcohol abuse had an incidence of low back pain of 14.66% (*P*<.001), with a relative risk of 3.33 (95% confidence interval, 3.30-3.35) compared with the general population. Patients with a diagnosis of obesity (body mass index, >30 kg/m^2) had an incidence of low back pain of 16.75% (*P*<.001), with a relative risk of 6.01 (95% confidence interval, 5.99-6.03) compared with the general population. Patients with a diagnosis of depressive disorders (dysthymia, major depressive disorder, endogenous depression, recurrent depression, bipolar disorder, atypical depressive disorder, and reactive depressive psychosis) had an incidence of low back pain of 19.30% (*P*<.001), with a relative risk of 5.51 (95% confidence interval, 5.49-5.53) compared with the general population.

DISCUSSION

Low back pain is among the most common reasons for physician visits in the United States and is a frequent chief complaint in patients seen by both primary care physicians and orthopedic surgeons.[18,19] Chronic low back pain leads to increases in disability and sick days as well as increases in medical costs to society.

A pooled electronic medical record database allows analysis of large cohorts. The Explorys platform was used in previous studies to analyze large cohorts of patients.[20,21] The medical records of 26 million patients were available through the Explorys platform, and 1.2 million of these patients had a diagnosis of low back pain. This resulted in a prevalence of 4.54% for the study period, lower than previously reported. This may be because electronic medical records were available for a limited time for each hospital system within the Explorys platform and because the medical record only captures patients who sought treatment for the diagnosis of low back pain in the available period.

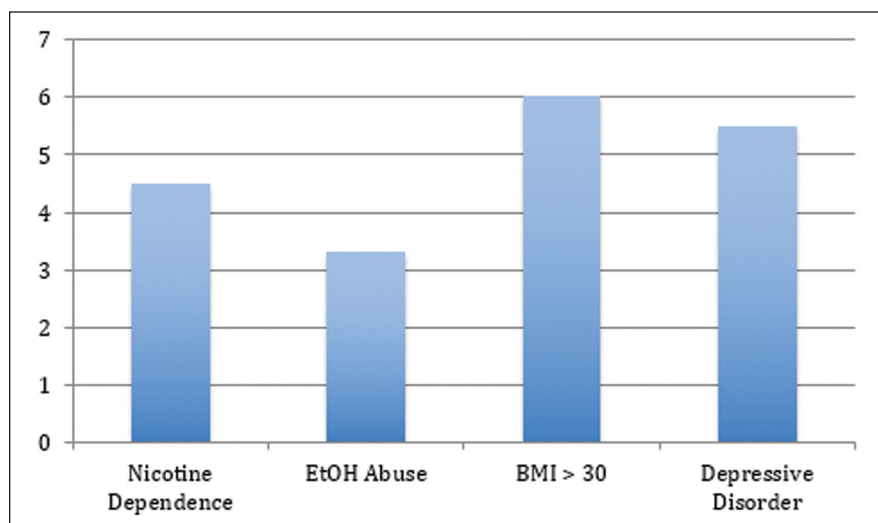Previous studies showed conflicting results for the association of low back pain

Figure: Relative risks for modifiable risk factors. Abbreviations: BMI, body mass index; EtOH, ethanol.

in patients with several modifiable risk factors, particularly obesity and smoking.[12-17] In the current study, nicotine dependence, obesity, depressive disorders, and alcohol abuse were statistically significant associated risk factors for the diagnosis of low back pain. Defining risk factors for low back pain enables physicians to monitor at-risk patients and focus on prevention of debilitating disease. Determining treatable patient risk factors for low back pain also allows physicians to minimize the morbidity associated with chronic symptoms and helps to decrease the medical cost to the patient and the health care system. Controlling these factors may also limit the number of patients with isolated low back pain who are seen by orthopedic surgeons.

Limitations

The current study and the database had several limitations. In this retrospective cohort study, the accuracy and completeness of the data within the database were dependent on the electronic medical records at each institution. The risk factors evaluated in this study had to be entered into each patient's medical record to be tested, but these factors may not have been screened for or included as a diagnosis in all patients who sought care for low back

pain. Therefore, some patients who had low back pain and the evaluated risk factors may have been missed. Also, the diagnosis of low back pain would not be identified in patients who seek care at institutions that are not included within this database. In addition, an investigator risks ambiguity and redundancy when translating ICD-9 or CPT codes to the appropriate Explorys descriptors. Further, because of limitations of the database, certain patient factors, such as increasing age, activity level, and previous injury, could not be determined.

CONCLUSION

Nicotine dependence, alcohol abuse, obesity, and depressive disorders were found to be statistically significant risk factors for the diagnosis of low back pain compared with the general population. To decrease disability and the costs associated with progression to chronic symptoms, physicians should counsel their patients on the risk of low back pain. Further research is needed to focus on whether modifying the identified risk factors can help to alleviate low back pain.

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