Measuring the Prevalence and Incidence of Low Back Pain Disorders Among American Workers in the Aerospace and Defense Industry

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Objective: To determine the prevalence and incidence of low back pain (LBP) among workers in the aerospace and defense industry and in a specific company. Methods: Claims and demographic data from the Truven Health MarketScan normative database representing more than 1 million workers were drawn from a group of 18 US benchmark companies and compared with one particular company, Lockheed Martin Corporation. Results: The prevalence of LBP in the MarketScan normative group was 15.6% in the final study year (2012), whereas the incidence of new cases was 7.2% and 7.3% in years 2011 and 2012, respectively. Compared with the normative group, the company’s prevalence and incidence rates were lower. Women and older workers were more likely to experience LBP compared with men and younger workers. Conclusions: The analysis was used to inform the company’s leadership about the health burden of the condition and evaluate alternative treatment options to prevent the incidences and reduce the prevalence of clinical back pain among workers.

Low back pain (LBP) can have significant effects on an individual’s daily functioning. In addition to limiting one’s ability to fully engage in a range of physical activities, it may interfere with sleep and produce mental and emotional suffering, which may contribute to depression, anxiety, and irritability. In addition, studies have shown that LBP negatively affects one’s productivity in the workplace. Chronic LBP is defined as pain that lasts more than 7 to 12 weeks, which is beyond the usual period of healing, or pain that is frequently recurring. Nationally, more than 10% of visits to primary care physicians are related to LBP, accounting for approximately $86 billion in annual health care spending (in 2005 dollars), and an additional indirect cost burden due to lost productivity is estimated at approximately $20 billion per year. Low back pain is the main reason why people limit their physical activity, the second leading symptomatic cause for physician visits, the third most common cause for surgical procedures, and the fifth most common reason for hospitalizations. From 1997 to 2005, spending for LBP treatment increased more rapidly than overall health expenditures in spite of evidence that the incidence of LBP had not increased. Disabilities resulting from LBP have grown at a rate that exceeds population growth and the growth rate of virtually all other health problems. Furthermore, although jobs involving heavy lifting and physical labor—factors traditionally believed to “cause” LBP—have decreased steadily in the United States, the number of people diagnosed with LBP has not decreased. Low back pain is of particular interest for employers because it is associated with approximately 19% to 26% of all workers’ compensation claims. Approximately 2% of the US workforce is compensated for back injuries. Studies of individuals filing workers’ compensation claims have shown the following associated factors: obesity, smoking, prior back- or knee-related symptoms, history of depression or alcohol abuse, metabolic syndrome, age, sex, and working in a labor-based or blue-collar job. Other research has suggested that high stress levels, job dissatisfaction, and poor social relations may be risk factors for LBP. It has been reported that the addition of benzodiazepines to opioid treatment of LBP significantly increases workers’ compensation costs. Because of the high prevalence of LBP injuries and their tendency to develop chronicity, LBP represents a major concern among employers wishing to manage the health and safety of their workers.

Many businesses—including Lockheed Martin Corporation (hereinafter referred to as “the company”)—are taking steps to address the personal and financial burden imposed by LBP in decrements to health, productivity loss, and increased health care costs. Preventing the advance of LBP cases from less severe to more severe is a key to controlling medical and productivity losses. To address the problem of LBP for its employee population, the company adopted a multiphase strategy that involves the following: (1) comparing the prevalence and incidence of LBP for workers in similar industries to those of the company, (2) comparing the prevalence and incidence of LBP for company employees to a national sample, (3) weighing alternative treatments for LBP and considering the costs associated with these treatments, and (4) developing targeted interventions for treatment of LBP and applying treatment guidelines for use by company providers, health plans, and disease/care management vendors.

This article addresses steps 1 and 2 of the above strategy. We report on an analysis of the company’s prevalence and incidence of LBP compared with data derived from a large employer-based normative database consisting of other companies in aerospace, high technology, space and defense, aeronautics, and telecommunication industries.

STUDY OBJECTIVE

The aim of this study was to determine the prevalence and incidence of LBP among employees of the company compared with other employers in similar industries (ie, high technology, space and defense, aeronautics, communications, and automotive).

SETTING

Lockheed Martin Corporation, a multinational corporation headquartered in Bethesda, Maryland, is organized around four core businesses in the United States—(1) aeronautics, (2) electronic...
systems, (3) information technology, and (4) space systems. The company has more than 100,000 workers across the United States. It transitioned to a single, self-insured health plan in 2010 and established a centralized health and wellness department to integrate multiple facets of prevention and treatment services for its employees and their dependents. The industrial health and safety organization is separate from the health function. Nevertheless, both organizations properly share data and coordinate injury and safety services, especially those involving ergonomic concerns. To prevent LBP, the company regularly administers health risk appraisals, provides lifestyle coaching, performs workplace ergonomic evaluations, and encourages enrollment in health promotion and disease management programs via incentives and other means.

METHODS
Prior studies describe methods that can be applied when using insurance claims data when conducting epidemiological research to estimate the prevalence and incidence of common medical conditions found among employed populations. These studies informed the approach used in the current investigation. In the following, we review the previously developed methods as applied to the study of LBP.

Administrative eligibility and insurance claims data used in the current analyses were extracted from the Truven Health MarketScan Commercial Claims and Encounters Database for the period of January 1, 2010, through December 31, 2012, for incurred claims paid through June 30, 2013. The database included health plan eligibility, inpatient, outpatient, and prescription drug data.

The company’s data on prevalence and incidence of LBP were compared with data compiled from a benchmark normative group consisting of 18 US companies that are similar in size and industry. Both company and Marketscan normative databases contain the health care experience of privately insured individuals covered under various health plans including preferred provider organizations, point of service plans, indemnity fee-for-service plans, and health maintenance organizations.

As noted above, methods for calculating the company’s disease prevalence and incidence were based on a prior analysis of MarketScan data focused on estimating the prevalence and incidence of coronary heart disease in an employed population using insurance claims.

To establish prevalence rates, we used a method labeled “prevalence 3 or P3.” This method requires two claims for specific diagnoses to be present in either a current study year, or any previous year, including combinations of claims from two different years (eg, one claim in 2010 and one claim in 2011). This approach provided a conservative estimate of a disease’s prevalence and limited the possibility of a false-positive diagnosis of any given condition such as LBP. Prevalence was established for the year in which a second claim occurred.

Again referencing methods employed in previous research, incidence for LBP was calculated using the “incidence 1 or II” calculation. Specifically, incidence of the condition was reported when a claim was made for LBP in a current study year or any previous year, including combinations of claims from two different years (eg, one claim in 2010 and one claim in 2011). This approach provided a conservative estimate of a disease’s prevalence and limited the possibility of a false-positive diagnosis of any given condition such as LBP. Prevalence was established for the year in which a second claim occurred.

RESULTS
Study Sample
Approximately 1.1 to 1.2 million workers from the benchmark normative group of 18 US companies in aerospace, high technology, space, defense, and telecommunications industries who met the study inclusion criteria were observed in the MarketScan database in each of the study years (2010 to 2012). The normative group’s mean age was 44.5 years (2010), 44.9 years (2011), and 45.2 years (2012), and approximately 30% were women. The company had approximately 72,000 to 82,000 workers in each of the study years (2010 to 2012). The company employees’ mean age was 47 years, and approximately 27% were women.

Prevalence of Low Back Pain for US Workers and the Company
Table 1 shows the prevalence of LBP in the MarketScan normative group. The prevalence of LBP for the overall population was 7.8%, 12.2%, and 15.6% in years 2010, 2011, and 2012, respectively. The prevalence of LBP was significantly higher for women each year than for men (8.9% for women compared with 7.4% for men in 2010, 13.9% for women compared with 11.5% for men in 2011, and 17.8% for women compared with 14.7% for men in 2012 (P < 0.001)).

Table 2 displays the prevalence of LBP in the company. The prevalence was 5.3%, 8.6%, and 11.1% in years 2010, 2011, and 2012, respectively. Similar to the normative population, the prevalence of LBP was higher for women each year than for men (6.4% for women compared with 4.9% for men in 2010, 10.4% for women compared with 8.0% for men in 2011, and 13.1% for women compared with 10.3% for men in 2012 (P < 0.001)).

Incidences of LBP in the company were significantly lower than the prevalence in the MarketScan normative group across all study years (P < 0.001).

Incidence of Low Back Pain for US Workers and the Company
Table 4 shows the incidence of LBP in the MarketScan normative group compared with the company. For MarketScan employers, the incidence of LBP remained fairly stable at 7.2% and 7.3% in years 2011 and 2012, respectively. For the company, incidence declined slightly from 2011 to 2012 from 5.2% to 5.0%. The company’s incidence rate was significantly lower than that of the MarketScan normative group in both years (P < 0.001).

Table 5 presents the incidence of LBP for women and men by age group for individuals in the company and in MarketScan data. As shown, the incidence of LBP for women was significantly higher for each year and for each age category than for men (overall, 8.4% for women in 2011 compared with 6.7% for men, and 8.5% for women in 2012 compared with 6.9% for men (P < 0.001)).

Also shown in Table 5 is the incidence of LBP categorized by 10-year age groups. As expected, the incidence of LBP increased as workers aged, with the lowest incidence in the US benchmark found...
Our estimate of a 15.6% cumulative prevalence rate was 7.2% and 7.3% in 2010 and 2012, respectively, compared with 5.2% in 2011. The condition in the normative group was 15.6% compared with 7.2% to 7.3% among employed US workers. Nevertheless, both Dionne et al and this study found that the prevalence of back pain, and in particular severe back pain, increased with age.

Andersson reported point prevalence estimates for LBP ranging from 12.0% to 30.2%. In the same article, Andersson estimated an incidence rate of 10% to 15%. Consistent with the studies cited above, the Andersson studies included people of all age groups ranging from 21 to 90 years, and their study did not restrict the analysis to employed individuals. Furthermore, their estimates were derived from worldwide studies. Nevertheless, both Dionne et al and this study found that the prevalence of back pain, and in particular severe back pain, increased with age.

Andersson estimated an incidence rate of 10% to 15%. Consistent with the studies cited above, the Andersson studies included people of all ages, those who were employed and unemployed, and those with multiple diseases conditions. Our estimates of an incidence rate of 7.2% to 7.3% among employed US workers seem reasonable given that the populations captured in the MarketScan database consist of white-collar employees at large multinational companies who have good health insurance benefits and generally are involved in nonmanual labor.

We estimated the prevalence and incidence of a disease in a useful strategy for employers who wish to analyze routinely collected data to establish the magnitude of a given health problem within its employee population and to set performance benchmarks against which the effectiveness of interventions can be measured. In the current analysis, we estimated the prevalence of LBP by assuming that once an individual is diagnosed with a given condition, the condition persists over time. In general, 70% of patients with LBP experience relapse soon after the first appearance of the diagnosis. Our estimate of a 15.6% cumulative prevalence rate is lower than the value reported by Dionne et al, which was about 20%. Nevertheless, Dionne et al analyzed data across all adult age groups ranging from 21 to 90 years, and their study did not restrict the analysis to employed individuals. Furthermore, their estimates were derived from worldwide studies. Nevertheless, both Dionne et al and this study found that the prevalence of back pain, and in particular severe back pain, increased with age.
Research suggests that these sex differences may be attributable to greater somatization of illnesses by women who tend to experience and communicate psychological distress in the form of physical symptoms and to then seek medical treatment more often than men.

Other explanations include increased prevalence and incidence of pain due to osteoporosis, menstruation, or other chronic conditions specific to women across varying age groups.

Variances in LBP Rates and Treatment

Although it was not the focus of this article, our analysis can be considered within a framework of appropriate treatment of LBP that is consistent with evidence-based guidelines and an important context for interpreting the results. A prime purpose of epidemiologic studies is to discover significant differences in prevalence and incidence rates by comparing organization specific to normative populations (known as benchmarking in industry), which may lead to identifying modifiable underlying determinants of a condition and uncover focused improvement opportunities.

For LBP, there exists a wide variation in treatments often unrelated to outcomes. During the period of 1999 to 2010, there was a significant increase in treatments that were noncompliant with guidelines, including increased use of advanced imaging, more referrals to specialists, and increased use of narcotics. Conversely, during this period there was a decrease in use of first-line medications, such as nonsteroidal anti-inflammatory drugs, but no change in referrals to physical therapy.

Mafi et al highlighted several possible causes for practice variation in the treatment of LBP—(1) a historical admonition that physicians fail to treat patients’ pain adequately; (2) greater availability of imaging centers, thereby facilitating easy access; (3) reduced time that primary care physicians have for more detailed, systematic, and consistent evaluation and treatment of patients with back pain; (4) lack of effective tools for shared decision making that facilitates patients’ understanding of the key recommendations within the guidelines; (5) patient demand for quick answers and resolution of symptoms; (6) perception that specialists are experts and hence more qualified to treat these patients and provide the best

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*Active employees, aged 18 to 64 years, ≥230 days enrollment in both current and prior year (≥160 days in 2012).
care; (7) a general and growing fear of malpractice liability for “missing something” by many physicians; and (8) price insensitivity of both physicians and patients for health care services. Predisposing factors also remain fairly uncharacterized, partly because there are no comprehensive tracking systems to systematize them.40

Low Back Pain Treatment Guidelines

To overcome some of the barriers listed above, corporate medical directors can establish treatment protocols for their patient populations that adhere to guidelines for diagnosis and treatment of LBP established by the American College of Occupational and Environmental Medicine.41 These include the following: (1) focused history taking, (2) obtaining an accurate baseline of functional deficits, (3) delaying imaging for nonspecific cases of back pain, (4) offering specific and practical instructions for self-care and use of nonnarcotic medications, and (5) considering alternative treatments such as spinal manipulation, acupuncture, acupressure, and massage therapy. For complicated and protracted cases of LBP, focused imaging, steroid injections, and surgical pressure, and massage therapy. For complicated and protracted cases of LBP, focused imaging, steroid injections, and surgical intervention are recommended but only after the prior-listed treatments have been tried. Allen and colleagues42 found that treatment of LBP that was not congruent with established guidelines was associated with added costs, whereas the opposite was true when treatment followed guidelines.

Adopting a Holistic Approach Focused on Employee Health and Safety

An integrated approach to the care of LBP patients is recommended. This involves coordination among internal corporate resources and vendors responsible for health, disease, and case management; health insurance plans; and health care providers. As shown by our research, special attention should be given to prevention of LBP for women and older workers. Employers can prevent and manage LBP cases by designing and implementing evidence-based health and disease management programs focused on LBP risk factors, thereby reducing the incidence and burden of LBP. These programs should be sufficiently comprehensive to encompass both individual and organizational interventions. Individual factors addressed by intervention programs may include obesity, low levels of physical fitness, sleep deprivation, drug and alcohol abuse, high stress, depression, or biometric values outside of normal ranges. Organizational issues to be considered as part of interventions directed at LBP may include assessing the ergonomics of work stations, monitoring jobs that have high demand and low control, identifying supervisor-worker discordance, noting labor-management disputes, identifying problems in scheduling including long and erratic work hours, and addressing lax safety policies.

Importantly, large companies can leverage their health care data warehouses to measure interventions aimed at limiting inappropriate, wasteful, and potentially harmful treatments for LBP (including unnecessary surgeries, imaging studies, and medical treatments that do not adhere to evidence-based guidelines). Corporations also can work with health insurance companies and health care providers to ensure adherence to the above guidelines for the prevention and treatment of LBP. For decision making on resource allocations, population impact numbers can be calculated once prevalence and incidence rates are reasonably determined for employees.43

LIMITATIONS

Our analysis of the prevalence and incidence of LBP in an employed population has limitations. First, companies included the US benchmark sample were intentionally drawn from a larger database, but we limited the sample to those that were similar to the company in size or industry; thus, our results cannot be generalized to all employees in the United States or other countries.

Second, our analyses were largely descriptive in nature and did not control for potential confounding variables such as demographics, comorbidities, regional location, access to providers, health benefit plan type, and other influences when comparing the company’s data to the normative group. Nevertheless, the databases studied were very large, and potential confounders were likely randomly distributed for both the company and normative populations. We note that demographic differences in age and sex between the large normative database and the one drawn for the company may have influenced the prevalence and incidence rates reported. Although the overall population demographics across databases were similar, the age of individuals with the condition at the company was higher by almost 3 years.

CONCLUSIONS AND IMPLICATIONS FOR ACTION

This study of LBP in a large company and other like corporations can guide important intervention and budget decisions directed at monitoring alternative health and disease management programs aimed at preventing LBP. Establishing valid benchmark data on the prevalence and incidence of the condition allows the company to track progress in preventing the incidence of LBP. A further step is monitoring the care of patients with the condition with the aim of limiting unnecessary surgeries, imaging studies, and medical treatments that are performed counter to treatment guidelines.

Organizations can apply similar analytic methods to establish baselines and track improvements following introduction of health promotion and disease management programs focused on preventing and treating high-cost conditions with considerable variability in treatment. The data used in this analysis were de-identified and, as presented here, can be analyzed further to measure utilization and costs for high-impact conditions like LBP. After de-identification, medical claims data also can be linked to health assessments administered to employees whereby workers self-report behavioral and psychosocial risk factors that may predispose them to illness and disability. Linking varied data sources allows employers to predict the incidence of a given condition. This, in turn, allows companies to target programs to maximize impacts at certain business locations or in labor categories where problems are most pronounced, customize interventions within locations, fine-tune benefit plan designs, enhance smart health care consumerism, and establish productive employer–employee partnerships in health and disease management. In addition, medical claims can be linked to workers’ compensation, absenteeism, and disability data to ensure that workers are using benefits appropriately, there is no duplication of care and services, and a coordinated approach is taken in providing treatment for workers regardless of the corporate benefits department responsible for the care.

The results of this study are being used to calculate population impact numbers to guide future prevention and treatment improvements as well as to reliably track progress of those changes. This information also can alter algorithms applied for case management of patients with LBP by vendors and at on-site clinics.

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Although the company reported lower prevalence and incidence rates of LBP compared with benchmarks, this condition remains among the top five diagnostic categories in terms of medical and pharmacy costs, employee absenteeism, and reduced presenteeism. Applying advanced epidemiologic methods to claims data will help focus future efforts on ways to reduce the large illness and cost burden imposed by LBP.

REFERENCES


