THE PREVALENCE OF INSOMNIA AND SLEEP APNEA IN DISCHARGE ABSTRACT DATA: A CALL TO IMPROVE DATA QUALITY

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Abstract

Insomnia and sleep apnea are associated with a variety of comorbid conditions and carry a symptom burden to patients. As the prevalence of insomnia and sleep apnea continue to rise, it is imperative that appropriate tools are implemented to accurately capture their prevalence in acute care settings. A retrospective chart review was conducted on 3,074 inpatient charts in Calgary, Alberta. The estimated prevalence of insomnia was 10.36 percent, and sleep apnea was 6.56 percent in inpatient visits between January 1, 2015, and June 30, 2015. The sensitivity of insomnia and sleep apnea were low, and the specificity was high when comparing the chart review to the ICD-10. As both insomnia and sleep apnea were associated with various comorbid conditions, it would be imperative that alternate methods are identified to capture and code them. This would enable clinicians to better identify and treat them, and ultimately improve patient care.

Keywords: insomnia, sleep apnea, sleep disorders, hospital abstract discharge data, acute care, ICD-10

Introduction

Insomnia and sleep apnea are common sleep disorders that have been associated with a variety of comorbid conditions. The prevalence of sleep disorders vary and, unfortunately, methods to identify people with sleep disorders are limited in administrative. Appropriate methods to accurately identify insomnia and sleep apnea in acute care settings are imperative due to their association with other conditions and the ability of clinicians to intervene to support appropriate treatment.

Background

Insomnia is a disabling chronic health disorder that has been associated with reduced health-related quality of life and increased healthcare resource consumption. The prevalence of insomnia is increasing, with 13.4 percent of sampled Canadians meeting the required criteria of insomnia. Insomnia has been associated with a variety of health risks. These include mental health disorders such as anxiety and depression; higher risk of motor vehicle, work, and home accidents; and higher risk of hospitalization for stroke. Insomnia symptoms have been shown to be associated with emotional modulation of pain and emotional blunting and higher work absence. Due to high healthcare utilization, direct and indirect costs of insomnia, and obvious patient burden, it is important to identify insomnia as a disorder and begin rigorous treatment early. Despite the high
prevalence of insomnia in Canada, few seek treatment, and when they do, medication is normally used as the form of treatment. One study revealed that over 50 percent of those with insomnia were prescribed an anxiolytic/hypnotic, despite alternative forms of treatment, such as cognitive behavioral therapy, being the recommended first line of treatment.

The prevalence of sleep disordered breathing conditions, like sleep apnea, has also risen substantially. In Alberta, of people who were classified as sleep disorder positive from a Calgary sleep clinic, 51.1 percent were diagnosed with obstructive sleep apnea. Untreated sleep-disordered breathing has been associated with diabetes, hypertension, cardiac disease, obesity, and depression, among other health conditions. Unfortunately, no known systematic programs for monitoring the prevalence of sleep-disordered breathing in the general population exist due to the time consuming, burdensome, and expensive nature of testing. As sleep apnea is treatable, and has adverse impact on quality of life, there is a growing demand to access diagnostic studies and appropriate treatment.

The clinical manifestations of sleep disorders can cause them to be misclassified as other conditions. This is concerning since appropriate treatment is required for the improvement of symptomatic burden and outcomes. Identifying insomnia and sleep apnea may be especially pertinent in acute care settings where they may either exacerbate symptoms of other acute disorders or be misdiagnosed as other conditions. It is thus important to identify and document sleep disorders and their associated testing to ensure they are being appropriately captured and managed. Unfortunately, little is known about the prevalence of insomnia and sleep apnea in acute care settings in Canada and their association with other conditions in this setting.

Disease code accuracy is imperative to reflect the presence of underlying diseases. The International Classification of Diseases (ICD) is the international standard diagnostic classification for many health management purposes, including the monitoring of the incidence and prevalence of diseases. Although ICD codes are used for a variety of reasons, including funding, clinical, and research decisions, each code identified in ICD data has different applications. In Canada, inpatient visits are currently coded using the ICD-10 coding standards. The Hospital Morbidity Database in Canada holds discharge abstract data from acute care facilities across Canada and is frequently used to capture administrative, clinical, and demographic information on inpatient visits. Discharge abstract data may serve as a tool to appropriately capture the prevalence of insomnia and sleep apnea.

Objectives
The objectives of this study were 1) to identify the prevalence of insomnia and sleep apnea in acute care hospitals in Calgary, Alberta; 2) to identify the occurrence of these conditions with comorbid conditions; and 3) to identify the degree to which acute care hospital administrative data (as captured by ICD-10-CA coding system) captures sleep apnea and insomnia.

**Methods**

A validation study was conducted to identify the degree to which clinical coding captured insomnia and sleep apnea in hospital abstract discharge data compared with a chart review data set. This project was part of a larger study aimed at creating a dually coded database (ICD-10-CA, ICD-11, and chart review); as such, full methodological details are published elsewhere.33

**Setting**

Three acute care hospitals in Calgary, Alberta, Canada, were chosen as the study sites. In Canada, charts from all acute care admissions are coded following the ICD, 10th version (ICD-10-CA) by nationally certified clinical coding specialists. Calgary is a large urban center that, at the time of study conceptualization, had three primary acute care sites located in different parts of the city. The study location and sites were chosen to allow us to capture a range of types and lengths of admissions.

**Data Collection**

A retrospective chart review was conducted with the intent to identify 50 health conditions derived from the Charlson and Elixhauser lists of conditions as used in prior work.34 Definitions for insomnia and sleep apnea originated from definitions derived for the larger study and are presented in Table 1.

Chart review took place from August 2016 to June 2017; 3,074 charts were randomly selected from the three sites for chart review. Patients were included if they had an Alberta personal health number, were between 18 and 105 years of age, and had an inpatient visit between January 1 and June 30, 2015. Obstetric visits were excluded because of too few chronic conditions.

Six nurses who were trained by the research coordinator conducted the chart review. Inter-rater reliability testing was done until 80 percent agreement was achieved. Chart review data were extracted into a secure data collection platform called REDCap (7.6.9-©2018 Vanderbilt University). The same set of charts had been previously coded by coding specialists using ICD-10-CA.

**Data Analysis**

The ICD-10-CA coded data was compared to the chart review as the reference standard. Chi-square tests and contingency tables were used to analyze and represent the data. Sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were calculated for both
insomnia and sleep apnea, comparing the chart review (gold standard) to the ICD-10 codes listed in Table 1.

Results

Out of the 3,074 charts that were reviewed, those with complete demographic and comorbidity data, 3,051 (99.3 percent), were selected. Three hundred sixteen (10.36 percent) were identified as having insomnia, and 200 (6.56 percent) were identified as having sleep apnea. Table 2 presents patient baseline characteristics by insomnia and sleep apnea. Sleep apnea was associated with female sex, congestive heart failure, atrial fibrillation, pulmonary circulation disorders, hypertension, chronic pulmonary disease, peptic ulcer disease, renal disease, diabetes, obesity, and alcohol abuse. Insomnia was associated with female sex, peptic ulcer disease, liver disease, fluid and electrolyte disorders, weight loss, drug abuse, psychoses, and depression. Eighty-five percent of people with sleep apnea had three or more conditions, compared to only 61.7 percent of those without sleep apnea. This difference was less pronounced in those with insomnia, which found 74.4 percent of people with insomnia had three or more conditions, compared to 61.9 percent in those without. Table 3 presents 2X2 contingency tables for sleep apnea and insomnia. The ICD-10-CA data did not capture any cases of insomnia in the administrative data. Table 4 presents sensitivity, specificity, PPV, and NPV for sleep apnea and insomnia. When comparing the ICD-10 data to the chart review, sleep apnea had a sensitivity of 18.5 percent, a specificity of 99.8 percent, a PPV of 88.1 percent, and a NPV of 94.6 percent. With ICD-10-CA data not capturing any cases of insomnia in the administrative data, the resulting sensitivity, specificity and NPV were 0 percent, 100 percent, and 89.6 percent, respectively.

Discussion

The data from the chart review revealed the prevalence of insomnia was 10.36 percent, and sleep apnea was 6.56 percent. The sensitivity of insomnia and sleep apnea (Table 4) were low, and the specificity was high when comparing the chart review to ICD-10-CA data, revealing that the ICD-10-CA data captured few cases of insomnia and sleep apnea as compared to the chart review (Table 3). For example, the ICD-10-CA codes captured 42 cases of sleep apnea, while the chart review captured 200. In the hopes of identifying all cases of insomnia and sleep apnea, broad inclusion criteria were used for this chart review (Table 1). This being said, the chart review prevalence of insomnia in acute care settings (10.3 percent) still remained lower than the reported prevalence of 2000 sampled Canadians who met the full criteria for insomnia (13.4 percent). Consistent with the literature, insomnia was associated with depression\(^1\), and sleep apnea was associated with congestive heart failure, hypertension, chronic obstructive pulmonary disease, obesity, and diabetes mellitus.\(^{36,37,38,39}\) The chart review data also revealed an association between both sleep apnea and insomnia and various other conditions (Table 2). Patients with sleep apnea were also more likely to have three or more comorbid conditions, which may be a proxy for complicated cases.
The prevalence rates and comorbid conditions identified in our chart review are specific to the definitions that were derived for this study. A variety of definitions for sleep disorders are used\textsuperscript{40,41} that would have impact on prevalence rates. For example, many studies are conducted using self-reporting assessments of insomnia. Many of the presenting symptoms of insomnia (e.g., restlessness, sleepless nights) are also seen with mental health disorders (e.g., depression), chronic pain, or emotional blunting. This emphasizes the importance of using definitions that report primary versus secondary insomnia.\textsuperscript{42} It is possible that patients assume their sleep-deprived symptoms are due to insomnia rather than a potentially undiagnosed mental health disorder or chronic illness. This would, in turn, create more false positive results and overestimate prevalence rates. It would thus be imperative that when reporting prevalence rates across studies, consistent definitions be used.

ICD-10-CA coded data was only able to capture a small percentage of the prevalence findings from the chart review (Table 3). Other studies have also found that health administrative data for diagnoses, diagnostic procedures, or interventions failed to accurately identify patients with sleep disorders.\textsuperscript{43,44} The Canadian Coding Standards for version 2015 ICD-10-CA only captures comorbidities that meet the criteria for significance (e.g., requiring additional treatment, increasing the length of stay, or significantly affecting received treatment).\textsuperscript{45} Insomnia and sleep apnea are also not mandatory to capture, unlike other conditions in Canada such as diabetes.\textsuperscript{46} These criteria could explain the discrepancies between the chart review and ICD-10-CA data. Clinical documentation has also been cited as a limiting factor for the quality of coded data.\textsuperscript{47} As such, poor documentation quality associated with capturing sleep disorders could also explain these discrepancies.

The prevalence of insomnia and sleep apnea in inpatient data and their association with various health conditions make these conditions important to be appropriately identified and documented during hospital admissions. Clear and accurate documentation and coding capture would enable clinicians to connect patients with appropriate assessment and management of their sleep disorders\textsuperscript{48,49,50} and, in turn, potentially improve outcomes related to other associated medical conditions and symptom burden. This would be especially pertinent in the inpatient setting, where it is possible that sleep apnea and insomnia are impacting exacerbations of other conditions that have led to their admission. Care on discharge can also be improved by ensuring appropriate continuity of information.\textsuperscript{51} Appropriate documentation and tracking would ensure collaboration and continuity of care on discharge and ensure other clinicians (e.g., family physician) have the means and information to set up appropriate follow-up and management. It would also be important to ensure administrators have appropriate access to quality data when making program and funding decisions, as well as researchers when reporting the prevalence of sleep apnea and insomnia. Indeed, it is essential that alternate ways of identifying sleep apnea and insomnia in health information systems are incorporated into acute care settings.
Electronic structured data has been shown to be an efficient and accurate means of extracting data on a variety of health conditions and could have future impact on accurately capturing sleep disorders. Electronic medical records could facilitate coding, which could potentially help identify accurate prevalence rates and appropriately allocate funding for the management of high-prevalence diseases. This would also enable clinicians to readily identify and treat cases. An electronic medical record-based system also has the potential to improve data quality, as it could automate coding when sleep disorders are identified by a clinician, reducing the time spent searching different documents for these diagnoses. As healthcare systems move toward electronic medical records, electronic structured data may be an alternate way to accurately capture sleep disorders. However, for this to be an effective solution, it would be imperative that electronic medical records are structured in a way that ensures sleep disorder data is easy and/or mandatory to enter and easily identifiable once entered. The data should then be accessible to all clinicians involved in the patient's care, coding professionals, and researchers. It may also be helpful to assess the need for routine screening, documentation, and diagnosis of sleep disorders during acute care admissions.

Limitations and Future Work

A limitation of our study was the potential for overestimating the prevalence of sleep disorders due to the broad definitions used to identify them in this study. This being said, the definitions were created through an iterative process with the expertise of clinicians. We are confident that the definition used was adequately robust and necessary for the purpose of understanding the potential prevalence of sleep disorders and serves as an appropriate starting point to identify the prevalence of these conditions. Underestimation is also possible in this study, as sleep disorders could only be captured as accurately as what was documented. Details in documentation were also often not specific (e.g., sleep apnea documented with no specification to type, such as obstructive sleep apnea or central sleep apnea). This being said, chart review is a high-quality tool that can be used to assess coding quality and suggest improvements for future ICD versions.

Methods need to be developed to enable clear and consistent documentation of insomnia and sleep apnea and to accurately capture these important conditions in administrative data. Future work should focus on the impact to patient outcomes of inappropriately capturing these conditions and to identify means to improve data quality and appropriately capture sleep disorders.

Conclusion

The estimated prevalence of insomnia was 10.36 percent, and sleep apnea was 6.56 percent in inpatient visit data between January 1 and June 30, 2015. The sensitivity of insomnia and sleep apnea were low, and the specificity was high when comparing the chart review to ICD-10-CA data. As both insomnia and sleep apnea were associated with various comorbid conditions, it would be imperative that alternate methods are identified to capture and code sleep disorders. We found that ICD-10-CA...
data was not an effective means to capture sleep disorder data. It would be important for future work to focus on structuring electronic medical records in ways that comprehensively capture sleep disorder data with a goal of making sleep disorder data easily accessible by clinicians, coding professionals, and researchers. This would enable clinicians to better identify and treat sleep disorders, and ultimately improve patient care.

Author Biographies

Danielle E. Fox, RN, MN, (danielle.fox@ucalgary.ca) is a PhD student in the Department of Community Health Sciences at The University of Calgary in Calgary Alberta.

Natalie Wiebe, RN, BN, (wieben@ucalgary.ca) is a Master of Science student in the Department of Community Health Sciences at The University of Calgary in Calgary Alberta.

Danielle A. Southern, MSc, (dasouthe@ucalgary.ca) is a senior research associate in the Centre for Health Informatics at The University of Calgary in Calgary, Alberta.

Hude Quan, PhD, (hquan@ucalgary.ca) is a professor in the Department of Community Health Sciences and director of the Centre for Health Informatics at The University of Calgary in Calgary, Alberta.

Ellena Kim, RN, BN, (elkim@ucalgary.ca) is a research analyst in the Centre for Health Informatics at The University of Calgary in Calgary, Alberta.

Chris King, RN, BN, (chrisking_00@hotmail.com) is a research analyst in the Centre for Health Informatics at The University of Calgary in Calgary, Alberta.

Olga Grosu, RN, BN, (ogrou955@mtroyal.ca) is a research analyst in the Centre for Health Informatics at The University of Calgary in Calgary, Alberta.

Cathy A. Eastwood, RN, PhD, (caeastwo@ucalgary.ca) is an adjunct assistant professor and community health sciences and operations manager in the Centre for Health Informatics at The University of Calgary in Calgary, Alberta.

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There are no comments yet.