The Spectrum of Insomnia-Associated Comorbidities in an Electronic Medical Records Cohort / AMIA 2016 Annual Symposium, November 12 - 16, 2016, Chicago, IL.

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Objective: Identify comorbidities enriched in patients with the diagnosis of insomnia, by interrogating an electronic medical records (EMR) database.

Materials and Methods: We studied individuals with diagnosis codes or medication prescriptions for insomnia in a population of 314,292 patients from two urban tertiary-care hospitals between 1992 and 2010. We extracted structured EMR variables (e.g., demographics, billing codes, and medications) and unstructured variables related to insomnia or comorbidities from narrative notes. We developed a case-control methodology to match insomnia patients to non-insomnia controls, and calculated the enrichment of comorbidities specifically in insomnia patients. For each case with insomnia diagnosis codes, we applied 1:1 matching to identify a control (non-insomnia) patient with no insomnia diagnosis codes. Controls were matched for gender and age because all patients in our database had properly documented genders and dates of birth. Additional matching criteria included the total number of facts in the EMR associated with each case or control (including the number of laboratory measurements, prescriptions, diagnosis / procedure codes, and notes). Our rationale was that patients with similar numbers of medical facts are likely to utilize health-care resources equivalently. In addition to the absence of insomnia diagnosis codes, we achieved further confirmation by selecting controls only if no sleep medications were found in the patients’ medical profiles. Only patients 18 years of age or older were eligible to be selected as cases or controls. We calculated the case-to-control enrichment (i.e., insomnia-to-non-insomnia ratio) by dividing the ascertained values for insomnia cases by the corresponding values for non-insomnia controls in the 12 months prior to the first diagnosis code or medication prescription for insomnia. The case-to-control ratio was calculated for each comorbidity and reflected the enrichment level of the comorbidity in insomnia relative to non-insomnia controls. We compared categorical variables using the chi-square test. Differences in means of continuous variables were compared using the t-test or Wilcoxon rank sum test, as appropriate. All statistical tests were 2-sided tests with Bonferroni correction for multiple comparisons of 59 covariates. We also assessed clinical variables associated with insomnia by penalized logistic regression and we used the bootstrap procedure to calculate confidence intervals. We further separately examined enrichment of comorbidities in insomnia patients in the inpatient versus outpatient setting, to better understand the potentially different practice patterns.

Results: In patients with insomnia-related diagnosis codes or medications, concepts related to insomnia were highly enriched in narrative notes. We find highly significant enrichment of several comorbidities in insomnia patients, including all 10 of the conditions that contribute to patients with “multiple chronic conditions”. The top-ranked comorbidities by logistic regression were also highly ranked in our enrichment analysis. Narrative mentions of insomnia-related concepts were enriched in notes from outpatient but not inpatient encounters.

Conclusion: Our results highlight the importance of analyzing narrative notes to understand the scope of conditions such as insomnia that are challenging to study using structured variables alone. By systematically identifying common comorbidities that co-exist with insomnia, this report can clarify the medical impact of insomnia.
Figure 1. Enrichment of comorbidities in 7,604 insomnia patients and 7,144 matched non-insomnia patients, S = Structured; U = Unstructured. The values used to calculate enrichment in insomnia reflect the average count per patient of structured or unstructured variables in the 12 months prior to the first insomnia diagnosis code.

Figure 2. Enrichment of top 10 comorbidities in insomnia patients: inpatient versus outpatient, S = Structured; U = Unstructured. A. Inpatients only. B. Outpatients only.