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The LabTNS-CPSS toolkit for updating comorbidity scores refined by chronic conditions

Authors: Jean Nikiema (a), Azadeh Bayani (a), Michèle Bally (b)

Introduction

The Charlson and Elixhauser Comorbidity Indices (CCI, ECI) are commonly used for risk adjustments and mortality prediction for many clinical conditions [1,2]. Combining these indices into a single measure that accounts for shared comorbidities was found to be valid for predicting 30-day mortality in a Quebec population-based study [3] Although this work has a rigorous methodology, it has limitations that we aimed to address. First, the ICD-10-CA codes used to define the combined index date back to those proposed by [4] and are no longer contemporary in terms of included medical conditions, comorbidity sub-types, or component codes. Most importantly, this and all previous works on comorbidity indices assume that diagnoses reflect the current health status thereby ignoring the fact that the CCI and ECI are sensitive to the strategy for coding chronic disease. Health records may not reflect that chronic diseases persist over time and must be carried forward across encounters before computing a comorbidity score. We address these two issues by proposing the LabTNS-CPSS toolkit.

Methods

For updating the comorbidity indices we assessed components of the CCI and ECI proposed by Quan (2005) [4] and used in Simard (2018) [3] We updated each comorbidity index using the Canadian Institute for Health Information ICD-10-CA 2022 version. Wherever applicable, ICD-10-CA codes were mapped to all their most granular level to create a list of codes for each comorbidity comprised in the CCI and ECI. We then combined comorbidity categories based on their definition and common ICD codes. Any disagreements in coding or category definitions and assignments were resolved through discussions. For incorporating the chronicity of comorbidities in our new indices, we used the categorization of ICD-10-CM code into (1-Chronic, 0-Non Chronic, and 9-Unknow) provided by the Agency for Healthcare Research and Quality (AHRQ) [5] then created a mapping between the American version of ICD-10 (ICD-10-CM), ICD-10-CA and ICD-11 using SNOMED CT as a support. We further refined the chronic condition indicator by specifying a new category (2-incurable code). We operationalized the LabTNS-CPSS chronic condition indicator by selecting ICD codes categorized as 1 or 2 and assigning them to all consecutive healthcare encounters (if 2-incurable) or for encounters in the following year (if 1-chronic).

Results

We have developed an R package computing the LabTNS-CPSS Charlson and Elixhauser adaptations and their combination. The LabTNS-CPSS Combined Comorbidity Index is composed of 35 categories versus 17 for CCI and 31 for ECI. Compared with the code lists in [3] and [4] the LabTNS-CPSS adaptation has increased the mean number of individual codes by 52 for the ECI and 18 for the CCI.

The LabTNS-CPSS R toolkit is intended for use by researchers and public health practitioners in Canada. Because the CCI, ECI, and combined ECI-CCI score adaptations may be computed for each encounter that captures ICD codes they can assess longitudinal changes in comorbidity burden over time.

Discussion/Conclusions

The LabTNS-CPSS adaptation of the ECI-CCI Combined Comorbidity Index needs to undergo an assessment of its performance for predicting outcomes such as readmissions and length-of-stay.

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a: Université de Montréal, Canada
b: CHUM/CPSS, Canada