Validation of a 10-year Mortality Index for Community-Dwelling Older Adults

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Background: Studies suggest that the benefits of both breast and colorectal cancer screenings typically are not seen for up to 10 years after screening, leading guidelines to recommend targeting cancer screening to patients with an extended life expectancy. Although a 10-year mortality index could help identify patients most likely to benefit from cancer screening, few mortality indexes have been validated beyond 5 years. Thus, we validated a previously published 4-year mortality index for 10-year mortality.

Methods: The original prognostic index was developed and validated for 4-year mortality in 19710 older adults enrolled in the 1998 Health and Retirement Study (HRS), a nationally representative cohort of community-dwelling US residents. The twelve independent risk factors comprising the index were demographic factors (age and gender), comorbidities (diabetes, heart disease, lung disease and cancer), behavioral factors (body mass index and smoking) and functional limitations (bathing, managing finances, walking and pushing large objects). Cox regression was performed with these predictors, using survival through 2008 (10 year mortality) as the outcome. Model calibration was determined by comparing observed 10-year mortality rates and index point scores for the original development (Eastern, Midwestern and Western US) and validation (Southeastern US) cohorts. Model discrimination was determined using the Harrell’s c-statistic.

Results: Our index was highly predictive of 10-year mortality in both the development and validation cohorts. The 34% of respondents in the validation cohort with risk scores of 0-3 had an observed 10-year mortality risk of 7%, while the 11% of respondents with scores of 8-9 points had an observed risk of 55%, and the 5% with scores of 13 or more points had an observed risk of 92%. The quartiles of risk within this cohort similarly ranged from 5.8% 10-year mortality risk for the lowest quartile to 70.5% risk for the highest quartile. The 10-year index demonstrated excellent discrimination with Harrell’s c-statistic of 0.784.

Conclusions: Our index, using self-reported demographic, behavioral, functional and comorbidity factors, accurately predicts 10-year mortality as well as 4-year mortality for community-dwelling adults over 50 years of age. Use of this and similar prognostic indices may help clinicians identify patients at increased mortality risk, who are unlikely to benefit from further preventive interventions such as cancer screening.
Prospective comparison of clinical prognostic scores for major bleeding in elderly patients with venous thromboembolism

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Background: The Outpatient Bleeding Risk Index (OBRI) and the Kuijer, RIETE, and Kearon scores are clinical prognostic scores for bleeding in patients (pts) receiving anticoagulants for venous thromboembolism (VTE) and other diseases. To date, the prognostic performance of these scores was never examined in elderly pts with VTE. We prospectively compared the performance of these scores in predicting the risk of major bleeding and in identifying pts at high-risk of bleeding in a multicenter cohort of elderly pts with VTE.

Methods: We studied 634 in- and out-pts aged ≥65 years with acute symptomatic, objectively confirmed VTE diagnosed at 9 Swiss hospitals (11/2009-03/2011). The outcome was major bleeding (defined as fatal bleeding, symptomatic bleeding in a critical organ, bleeding with a reduction of hemoglobin ≥20 g/L, or leading to the transfusion ≥2 units of packed red blood cells) within 3 months after the index VTE. We classified pts into 3 categories of bleeding risk (low, moderate, and high) according to each score. We dichotomized pts as high vs. low or moderate risk in all 4 scores. We calculated the area under the receiver operating characteristic (ROC) curve, positive predictive value (PPV), and positive likelihood ratio (pLHR) for each score.

Results: Overall, 28 of 634 pts (4.4%, 95% confidence interval [CI]: 3.0-6.3%) developed a major bleeding within 3 months. The rate of major bleeding varied from 1.9% to 2.2% among low-risk and from 3.8% to 8.0% among high-risk pts. The discriminative power of the scores to predict major bleeding was poor to moderate, with areas under the ROC curve ranging from 0.50 to 0.61 (p-value for equality: 0.19; Table). PPVs and pLHRs to predict major bleeding were generally low.

Conclusions: Existing bleeding risk scores do not have sufficient power to discriminate between elderly pts with VTE who are at high-risk of major bleeding and those who are not. Novel, more accurate risk stratification methods must be developed to predict bleeding risk in elderly pts receiving anticoagulants for VTE.
Population-Based Prevalence of Health-Related Internet Use in Seniors and its Impact on Health

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Background: Older adults are the fastest growing age group in the US. Despite the increasing trend of using the internet for obtaining health information, data on population-based prevalence of health-related internet (HRI) use in seniors are not readily available. The goal of this project is to determine the population-based prevalence of HRI usage in seniors, and to assess its predictors and impact on overall health status in seniors.

Methods: In 2009, five questions were used in the National Health Interview Survey (NHIS) to collect information on HRI usage in the US population. The survey participants were asked if they accessed the Internet to look up health information, to learn about health topics in chat groups, to refill prescriptions, to schedule appointments, or to communicate with their provider. In our study, a positive answer to any of these 5 questions qualified a respondent to be assigned to the ‘HRI user’ group. The prevalence of HRI usage was stratified by age groups (60-64, 65-69, 70-74, and 75+ years old), gender, race and different chronic conditions. Further, two logistic regression models were performed to analyze the predictors of HRI use and its impact on overall health status. Independent variables included gender, race, income, education, marital status, and presence of any chronic health condition.

Results: There were a total of 7,543 seniors with age 60+ in 2009 Sample Adult file. The final dataset included 6,076 subjects after excluding the missing frequencies of other variables. In this population, a decreasing trend of HRI use was observed with age. The population-based prevalence of HRI usage was 54% in 60-64, 46% in 65-69, 35% in 70-74, and 18% in 75+ age groups. Except for Asians, women were more active HRI users than men in all racial groups. The highest usage was reported from the White females in 60-64 age group (62%), and the lowest was reported from the African American males in 75+ age group (1.2%). In all HRI users, the most prevalent chronic condition was hypertension (54%) followed by arthritis (48%). Only 4% reported to have stroke and 3% had emphysema. Younger age groups (‘60-64’ OR 5.3, p<.0001; ‘65-69’ OR 3.8, p<.0001), females (OR 1.2, p=0.02), higher education (>12 years’ OR 9.5, p<.0001), and presence of a chronic condition (OR 1.4, p=0.008) predicted HRI use. After adjusting for socio-demographic variables (age, gender, race, marital status, education, income level, presence of chronic conditions, physical activity, body mass index, smoking, and drinking), the seniors who were HRI users in the last 12 months were 1.4 times (CI 1.1-1.7, P=0.007) more likely to report that they had better health compared to the last year.

Conclusions: About half of seniors are using internet for health related purposes in their sixties and internet use among older adults will likely continue to rise in the coming years. Socio-demographic factors and the nature of chronic condition may also have affected the HRI usage behavior. Furthermore, because the older adults who were HRI users were more likely to report overall improvement in health status compared to a previous year, the internet appears to be a potentially powerful means for assisting seniors with their health concerns.
Dementia is Independently Associated with a Higher 30-Day Hospital Readmission Rate

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Background: Individuals with dementia have high healthcare utilization and are at increased risk for hospitalization, but it is unknown if their 30-day readmission rates are higher than in people without dementia. Dementia is frequently co-morbid with the discharge diagnoses targeted by CMS for improvement in 30-day readmission rates, and as our population ages, understanding the role of dementia will be increasingly important. Our objective was to investigate the association between a diagnosis of dementia and the risk of hospital readmission within 30 days of discharge in a cohort of Medicare beneficiaries.

Methods: We performed a retrospective cohort study to examine Medicare Fee for Service beneficiaries who were admitted to any Rhode Island hospital between January 2009 and December 2009. Index and subsequent hospital admissions were identified through Medicare hospital claims data. A diagnosis of dementia was identified by either 1) an ICD-9 code for dementia from Medicare Part A or Part B claims or 2) documentation of 2 or more prescriptions for medications used to treat dementia from Medicare Part D pharmacy claims. The odds of 30-day readmission were calculated using conditional logistic regression, controlling for age, gender, race, antipsychotic use, number of comorbidities, dual eligible status, length of stay of index admission, number of admissions in the previous year, and hospital of index admission.

Results: From a cohort of 25,839 hospitalized patients, we identified 3,908 patients with dementia. Patients with a dementia diagnosis were older (mean age (SD), 81.0 (11.7) vs. 72.4 (14.5) years; p<0.0001), were more likely to be female (62.4% vs. 55.0%; p <0.0001), and had more comorbid illnesses (≥3 comorbidities; 28.1% vs. 25.3%; p<0.001) than those without a dementia diagnosis. Nearly 20% of the cohort (N=5,133) was readmitted within 30 days of the index hospitalization. Compared to Medicare beneficiaries without a dementia diagnosis, those with dementia were more likely to be readmitted within 30 days, even after adjusting for potential confounders (adjusted odds ratio, 1.18; 95% CI, 1.08 - 1.29).

Conclusions: Medicare Fee for Service beneficiaries with a dementia diagnosis are at increased risk for 30-day hospital readmission. Much of the recent research aimed at decreasing 30-day readmission rates excludes patients with cognitive impairment or focuses on self-management and patient activation, which may not be as effective in patients with dementia. Given the high healthcare costs and negative health outcomes associated with acute hospitalization in people with dementia, our findings have important implications for quality improvement efforts to decrease readmission rates in elderly, hospitalized patients.
Investigating Older Adult Multimorbidity: A Latent Class Factor Model of Chronic Diseases and Geriatric Conditions

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**Background:** The traditional disease model is limited as an approach to multimorbidity in older adults. Their health status may be more fully conceptualized and described in terms of their combinations of chronic diseases and geriatric conditions. Latent class factor analysis enables the examination of the structure of underlying patterns of diseases and conditions. We hypothesized that (1) geriatric conditions constitute a critical component in the complex health status of older adults and (2) latent classes of chronic diseases and geriatric conditions predict disability and mortality in older adults.

**Methods:** We analyzed the 2004-2008 waves of the Health and Retirement Study, a nationally-representative longitudinal health interview survey. Our study sample included adults $\geq 65$ years old (n=11,113, representing 37.1 million). Independent variables included 4 geriatric conditions (dementia, DEM; falls, FALL; incontinence, UI; sensory impairment, SI) and 5 chronic diseases (diabetes, DM; hypertension, HTN; heart disease, HEART; stroke, CVA; musculoskeletal conditions, MSK). Outcome variables included new dependency in activities of daily living (ADL) and instrumental activities of daily living (IADL) and mortality. We employed latent class factor modeling to examine classes of older adult health status, using the Akaike information criterion, the Bayesian information criterion, the likelihood ratio test for goodness of fit, and misclassification error to select the model that best fit the data.

**Results:** Using latent class factor analysis, older adult morbidity proved to sort best by two factors: first, cardiovascular disease (low and high burden groups), and, second, geriatric conditions (low, intermediate, and high burden groups). Jointly, these two factors resulted in six classes, as depicted in the profile plot (Figure). These classes were characterized by distinctive 2-year and 4-year outcomes (Table).

**Conclusions:** Confirming our hypotheses, latent class factor modeling demonstrated the importance of geriatric conditions to the complex health status of older adults. Further, the classes of diseases and conditions predicted disability and mortality at two- and four-years. This approach provides new insight into multimorbidity in the older adult population and can be a tool to more completely characterize complexity in clinical settings.