Comparison of Comorbidity Collection Methods

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BACKGROUND: Multiple valid comorbidity indices exist to quantify the presence and role of comorbidities in cancer patient survival. Our goal was to compare chart-based Adult Comorbidity Evaluation-27 index (ACE-27) and claims-based Charlson Comorbidity Index (CCI) methods of identifying comorbid ailments and their prognostic abilities.

STUDY DESIGN: We conducted a prospective cohort study of 6,138 newly diagnosed cancer patients at 12 different institutions. Participating registrars were trained to collect comorbidities from the abstracted chart using the ACE-27 method. The ACE-27 assessment was compared with comorbidities captured through hospital discharge face sheets using ICD coding. The prognostic accomplishments of each comorbidity method were examined using follow-up data assessed at 24 months after data abstraction.

RESULTS: Distribution of the ACE-27 scores was: "none" for 1,453 (24%) of the patients; "mild" for 2,388 (39%); "moderate" for 1,344 (22%), and "severe" for 950 (15%) of the patients. Deyo's adaption of the CCI identified 4,265 (69%) patients with a CCI score of 0, and the remaining 31% had CCI scores of 1 (n = 1,341 [22%]), 2 (n = 365 [6%]), or 3 or more (n = 167 [3%]). Of the 4,265 patients with a CCI score of zero, 394 (9%) were coded with severe comorbidities based on ACE-27 method. A higher comorbidity score was significantly associated with higher risk of death for both comorbidity indices. The multivariable Cox model, including both comorbidity indices, had the best performance (Nagelkerke's R^2 = 0.37) and the best discrimination (C index = 0.827).

CONCLUSIONS: The number, type, and overall severity of comorbid ailments identified by chart- and claims-based approaches in newly diagnosed cancer patients were notably different. Both indices were prognostically significant and able to provide unique prognostic information. (J Am Coll Surg 2014;219:245−255. © 2014 by the American College of Surgeons)

When first diagnosed with cancer, many cancer patients have additional, non-neoplastic diseases, illnesses, and conditions, which are referred to as comorbidities.[1,2] For the patient with significant comorbidities, the aggressiveness of cancer and treatment intensity must be weighed against the presence of pre-existing comorbidities. In the growing climate of individualized and personalized medicine and concern about preserving quality of life after treatment of cancer patients, the prognostic and therapeutic consequences of comorbidities are widely recognized by patients and health care professionals.

Multiple valid comorbidity indices exist to quantify the presence and role of comorbidities in survival. The various comorbidity instruments can be grouped into the following distinct categories according to the source of the comorbid health information: the patient is the primary source of the comorbid health information[3-5]; medical record review[6-10]; comorbid health information is obtained through a review of the medical record; or a claims-based approach,[11-13] in which the sources of comorbidity data are the primary and secondary diagnosis code fields using ICD-9-CM codes for hospitalization or outpatient visit. Although the patient-based approach allows for the collection of more information on the functional impact of comorbid ailments than the other methods, there are concerns about inaccuracy and under-reporting with this approach. Medical record review, also known as the chart-based approach, improves the quality of the data abstraction relative to the

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claims-based approach, but requires additional staff and staff education. Our previous research findings[9,10,14,15] suggest that cancer registrars can be trained to review the medical record and identify the cogent comorbid conditions in a time-efficient and valid manner. The claims-based approach requires all accredited cancer registries to collect comorbid health information using ICD-9-CM codes from the hospital discharge face sheet at the time of initial cancer hospitalization. The advantage of the claims-based approach is its simplicity and straightforward nature; however, it is systematically less accurate and less complete than the chart-based approach.[10,16-20]

The goal of this research project was to compare the chart-based Adult Comorbidity Evaluation-27 Index (ACE-27) and the claims-based Charlson Comorbidity Index (CCI) methods of identifying comorbid ailments and prognostic ability.

METHODS

Registrar training and abstraction of comorbidity information

The on-line training program (http://otooutcomes.wustl.edu/research/topics/cancer/Pages/Cancer-Comorbidities.aspx) for coding comorbidities using the chart-based ACE-27[21] comorbidity method was successfully completed by 39 cancer registrars from 13 different hospitals or health care systems in 7 states. The ACE-27 comorbidity index includes a variety of individual comorbid ailments grouped under the following body systems: cardiovascular, respiratory, gastrointestinal, renal, endocrine, neurologic, psychiatric, rheumatologic, immunologic, malignancy, substance abuse, and obesity. There are 4 severity grades for each comorbid condition, except obesity: no comorbidity (grade 0), mild (grade 1), moderate (grade 2), and severe (grade 3). Obesity has only 2 severity grades: "grade 0" if BMI is <38 kg/m^2, and "grade 2," if the BMI is ≥ 38 kg/m^2. Because cancer patients can have more than 1 comorbid ailment, an overall comorbidity severity score is determined based on the grade of the highest-ranked single ailment or if 2 comorbid ailments of different body systems are graded as moderate (grade 2) then the overall score is severe (grade 3).

All new cancer cases diagnosed and/or receiving part of the first course of treatment at a given institution are defined as analytic cases for the specific institution.[9] Participating cancer registrars completed the online ACE-27 form (http://cancercomorbidity.wustl.edu/ElectronicACE27.aspx) for all new analytic cases abstracted in the first 6 months after training. The online ACE-27 form offers the advantage of automatically calculating the overall comorbidity score based on the individual comorbid ailments identified (by check box option) from the cancer registrars. Accession and sequence numbers were used to identify each case.

The registrars collected claims-based comorbid health information using the American College of Surgeons Commission on Cancer guidelines.[22] Participating cancer registrars abstracted comorbid ailments from the patient's hospital discharge attestation or "face sheet." A maximum of 10 comorbid conditions were abstracted. Deyo's adaption[23] of CCI[7] was used to calculate an overall score using the ICD-9 codes obtained by the registrars. There were 6,138 adult cases abstracted from registrars at 12 registries between May 2007 and March 2011. The number of cases from each registry ranged from 124 to 1,770 cases. One registry submitted only 48 cases online and, due to staff changes, did not continue with the comorbidity data collection part of the study. For this reason, cases from this registry were excluded from analysis. Data elements provided from each registry included demographic, clinical, and tumor characteristics, as well as comorbid ailments collected from the medical record as part of routine chart abstraction using the ACE-27 and from the hospital discharge face sheet.

To allow for comparison of the prognostic accomplishments between the chart-based and claims-based approaches, each registry provided follow-up cancer and survival status information 2 years after the last reported case was included in the study. Date of cancer diagnosis was defined as "zero-time" for study entry and survival analysis. For patients who died, the date of death was considered date of last follow-up.

All data were de-identified. Accession and sequence numbers were used to merge the information from the cancer registry with the comorbidity information entered online from registrars of the same registry. This study was approved by Washington University Human Research Protection Office.

Statistical analysis

Standard descriptive statistics were used to describe the distribution of demographic and clinical characteristics, presence of comorbid ailments, and overall severity score for all new analytic adult cancer cases submitted from cancer registries. Frequency distributions of ICD-9 claims-based comorbidity information were compared with the ACE-27–defined comorbidity information. The κ statistic[24] was used to quantify the agreement between the 2 methods. Acknowledging that κ is a prevalence-dependent statistic,[25] we calculated Yule's Y.[26] The prognostic performance of each comorbidity coding method was evaluated using the Kaplan-Meier product limit method and Cox proportional hazards