

# Validation of a Comorbidity Education Program

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**Abstract:** The objective of this research was to validate the effectiveness of an education program designed to teach cancer registrars to code comorbidity information. Five different tumor registries across the United States participated in the validation project. The *Adult Comorbidity Evaluation (ACE-27)* was used to determine the presence of comorbidity and its severity. A trained research assistant traveled three times to each of the five hospitals participating in the Nationwide Comorbidity Network for an initial 3-day training session in the use of the ACE-27 and two subsequent assessment visits. Quantitative comparison indicated substantial to perfect agreement (kappa values range from 0.68 to 1.0) and clear validity between comorbidity done by the cancer registrars and the research assistant (sensitivity and specificity scores ranged from 80% to 100%). Questionnaire responses indicated that registrars found comorbidity coding to be relatively simple and not time consuming. Study results confirm that the Comorbidity Education Program is an efficient and effective way to teach comorbidity coding to cancer registrars. The authors believe comorbidity coding can and should be included in cancer registries.

**Keywords:** comorbidity, severity of illness index, coding prognosis, tumor registries, oncology

## Introduction

The present TNM system of cancer classification is based primarily on tumor morphology and does not consider important patient-based features and prognostic factors, such as cancer-related symptom type and severity, functional capacity, and severity of coexisting diseases, illnesses, or conditions.<sup>1-8</sup> These last features are generally referred to as comorbidity. Many patients with cancer have comorbidity. Comorbidity impacts on at least two different aspects of medical care: it affects the physician's ability to diagnose and treat a patient's disease and symptoms, and it affects a patient's prognosis and functional capacity.<sup>9</sup>

In 1993, the authors developed a Comorbidity Education Program at Barnes-Jewish Hospital for cancer registrars. The education program was administered to 5 certified tumor registrars at Barnes-Jewish Hospital in the fall of 1994. The program consisted of an introduction to comorbidity coding,

a training videotape, the comorbidity instrument, documentation book, and clinical examples. The cancer registrars then coded comorbidity using the medical records of 77 newly diagnosed cancer patients. Their performance was assessed for validity and reliability using sensitivity, specificity, and weighted kappa statistic. A structured interview was also administered to determine difficulty and time consumption. A complete description of the program and demonstration of its effect have been published elsewhere.<sup>10</sup>

The objective of this research project was to validate the effectiveness of this comorbidity education program. Five oncology data centers, representing a broad cross-section (i.e., small rural community and large urban centers) across the United States, participated in this project.

## Methods

### Comorbidity Measurement

The *Adult Comorbidity Evaluation*

(ACE-27) is a new 27-item comorbidity index for use with cancer patients. The ACE-27 was developed through a series of modifications of the *Kaplan-Feinstein Index (KFI)*.<sup>11</sup> The investigators modified the KFI for two important reasons. First, since the original comorbidity instrument was developed from the study of a cohort of patients with diabetes (index disease), this condition was not listed as a comorbid ailment. Second, the investigators felt that the KFI did not include several important conditions (e.g., AIDS, dementia). Modifications and additions to the KFI were made through discussions with clinical experts and a review of the literature.

The ACE-27 grades specific diseases and conditions into one of three groups, Grade 1, Grade 2, or Grade 3, according to the severity of organ decompensation and prognostic impact. Once the patient's individual diseases or comorbid conditions are classified, an Overall Comorbidity Score, *None, Mild, Moderate, or Severe*, is assigned based on the highest-ranked single ailment. In the cases where 2 or more Grade 2 ailments occur in different organ systems or dis-

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ease groupings, the Overall Comorbidity Score should be designated as *Severe*. A portion from the *Adult Comorbidity Evaluation-27* displaying comorbid ailments for the cardiovascular and respiratory systems is shown in Table 1. In separate research<sup>12</sup>, the *ACE-27* was shown to be able to define statistically significant and clinically relevant unique prognostic subgroups from a cohort of 190 newly diagnosed patients with cancer. The *ACE-27* was also found to predict long-term survival for patients with lung disease.<sup>13</sup>

### Comorbidity Education Program

In June of 1999, a trained research assistant (RA) traveled to each of the 5

hospitals participating in the Nationwide Comorbidity Network. (Table 2) Her objective was to train the cancer registrars to code comorbidity using the *Comorbidity Education Program*. The RA worked on the comorbidity project 1 year prior to the start of the program and received detailed training in the coding of comorbidity from medical records for 1 month prior to the start of the project. A total of 9 cancer registrars with varying degrees of experience participated in the program (Table 3). [Two cancer registrars resigned from their positions, for unrelated reasons, prior to the completion of the research project.]

Prior to the start of the education program, the centers recorded, for 1 week, the number of new cases and the time spent abstracting each case. This information was obtained to determine the amount of time required to abstract a medical record without coding comorbidity and was later compared to the time required to abstract a medical record with comorbidity coding.

Prior to the start of the education program, the research team at Barnes-Jewish Hospital prepared anonymous standard medical records. The records were selected from a large cohort of cancer patients treated at Barnes-Jewish Hospital and are representative of the

Table 1. Examples from *Adult Comorbidity Evaluation (ACE-27)*

Cogent comorbid ailment	Severe Decompensation	Moderate Decompensation	Mild Decompensation
<b>Cardiovascular System</b>			
Myocardial Infarct	<ul style="list-style-type: none"> <li>MI ≤ 6 months</li> </ul>	<ul style="list-style-type: none"> <li>MI &gt; 6 months ago</li> </ul>	<ul style="list-style-type: none"> <li>Old MI by ECG only, age undetermined</li> </ul>
Angina / Coronary Artery Disease	<ul style="list-style-type: none"> <li>Unstable angina</li> </ul>	<ul style="list-style-type: none"> <li>Chronic exertional angina</li> <li>Recent (≤ 6 months) Coronary Artery Bypass Graft (CABG) or Percutaneous Transluminal Coronary Angioplasty (PTCA)</li> <li>Recent (≤ 6 months) coronary stent</li> </ul>	<ul style="list-style-type: none"> <li>ECG or stress test evidence or catheterization evidence of coronary disease without symptoms</li> <li>Angina pectoris not requiring hospitalization</li> <li>CABG or PTCA (&gt;6 mos.)</li> <li>Coronary stent (&gt;6 mos.)</li> </ul>
Congestive Heart Failure (CHF)	<ul style="list-style-type: none"> <li>Hospitalized for CHF within past 6 months</li> <li>Ejection fraction &lt; 20%</li> </ul>	<ul style="list-style-type: none"> <li>Hospitalized for CHF &gt;6 months prior</li> <li>CHF with dyspnea which limits activities</li> </ul>	<ul style="list-style-type: none"> <li>CHF with dyspnea which has responded to treatment</li> <li>Exertional dyspnea</li> <li>Paroxysmal Nocturnal Dyspnea (PND)</li> </ul>
Arrhythmias	<ul style="list-style-type: none"> <li>Ventricular arrhythmia ≤ 6 months</li> </ul>	<ul style="list-style-type: none"> <li>Ventricular arrhythmia &gt; 6 months ago</li> <li>Chronic atrial fibrillation or flutter</li> <li>Pacemaker</li> </ul>	<ul style="list-style-type: none"> <li>Sick Sinus Syndrome</li> </ul>
Hypertension	<ul style="list-style-type: none"> <li>DBP&gt;130 mm Hg</li> <li>Severe malignant papilledema or other eye changes</li> <li>Encephalopathy</li> </ul>	<ul style="list-style-type: none"> <li>DBP 115-129 mm Hg</li> <li>Secondary cardiovascular symptoms: vertigo, epistaxis, headaches</li> </ul>	<ul style="list-style-type: none"> <li>DBP 90-114 mm Hg</li> <li>DBP &lt;90 mm Hg while taking anti-hypertensive medications</li> </ul>
Venous Disease	<ul style="list-style-type: none"> <li>Recent PE (≤ 6 mos.)</li> <li>Use of venous filter for PE's</li> </ul>	<ul style="list-style-type: none"> <li>DVT controlled with Coumadin or heparin</li> <li>Old PE &gt; 6 months</li> </ul>	<ul style="list-style-type: none"> <li>Old DVT no longer treated with Coumadin or Heparin</li> </ul>
Peripheral Arterial Disease	<ul style="list-style-type: none"> <li>Bypass or amputation for gangrene or arterial insufficiency &lt; 6 months ago</li> <li>Untreated thoracic or abdominal aneurysm (&gt;6 cm)</li> </ul>	<ul style="list-style-type: none"> <li>Bypass or amputation for gangrene or arterial insufficiency &gt; 6 months</li> <li>Chronic insufficiency</li> </ul>	<ul style="list-style-type: none"> <li>Intermittent claudication</li> <li>Untreated thoracic or abdominal aneurysm (&lt; 6 cm)</li> <li>s/p abdominal or thoracic aortic aneurysm repair</li> </ul>
<b>Respiratory System</b>			
	<ul style="list-style-type: none"> <li>Marked pulmonary insufficiency</li> <li>Restrictive Lung Disease or COPD with dyspnea at rest despite treatment</li> <li>Chronic supplemental O<sub>2</sub>:</li> <li>CO<sub>2</sub> retention (pCO<sub>2</sub> &gt; 50 torr)</li> <li>Baseline pO<sub>2</sub>: &lt; 50 torr</li> <li>FEV1 (&lt; 50%)</li> </ul>	<ul style="list-style-type: none"> <li>Restrictive Lung Disease or COPD (chronic bronchitis, emphysema, or asthma) with dyspnea which limits activities</li> <li>FEV1 (51%-65%)</li> </ul>	<ul style="list-style-type: none"> <li>Restrictive Lung Disease or COPD (chronic bronchitis, emphysema, or asthma) with dyspnea which has responded to treatment</li> <li>FEV1 (66%-80%)</li> </ul>

types of comorbid conditions cancer registrars are likely to encounter. Comorbidity scores were assigned by the research team at Barnes-Jewish Hospital and are referred to as the "gold standard."

The RA spent 3 days at each site. Day 1 began with an introduction to the program and viewing of the educational videotape. For the next 4-5 hours, the RA reviewed the *Comorbidity Coding Book* in detail. The description of comorbidity, general guidelines, ambiguous terminology, examples of comorbidities, and the impact of comorbidity on cancer statistics were provided. The cancer registrars were shown the *Adult Comorbidity Evaluation (ACE-27)* and educated about the aim of the instrument and its development. The majority of the time was dedicated to assigning levels of decompensation to various comorbid medical conditions. During this session, the cancer registrars learned the criteria for determining the severity of each comorbid condition. In the final session of Day 1, the cancer registrars were given the first group of 10 standard medical records from a total collection of 40 to code comorbidity. Each cancer registrar presented a comorbidity assessment for these 10

Name Hospital Location	COC designation*	# of Registrars	Estimated cases/year
Washington Hospital Center Washington, DC	Teaching Hospital Cancer Program	3	1,950
North Kansas City Hospital Kansas City, MO	No COC designation	1	882
Queen of the Valley Hospital Napa, CA	Community Hospital Cancer Program	1	540
Dakota Clinic Fargo, ND	Community Hospital Cancer Program	3	805
Hannibal Regional Hospital Hannibal, MO	Community Hospital Cancer Program	1	216

\*American College of Surgeons, Commission on Cancer

records to the RA and explained the reasons for the particular comorbidity rating. The RA discussed the coding classification with the individual and any problems, misunderstandings, or alternative interpretations were then shared with the group.

On Day 2, the RA reviewed the previous day's activities and reminded students of certain coding techniques. The cancer registrars were then given 20 more standard medical records to code comorbidity. The RA assessed the

results and provided feedback in the areas of difficulty. On Day 3, the last 10 standard medical records and 15 medical records from the cancer registrars' own institutions were coded and evaluated. Once again, the RA assessed the accuracy of the comorbidity rating. The RA also provided support as needed to ensure that the cancer registrars felt confident in the coding of medical comorbidity. Cancer registrars who did not feel confident with their coding or who did not achieve suitable performance scores received additional attention from the RA. All comments, clarifications, and specific instructions identified during these training sessions but not already contained within the *Comorbidity Coding Book* and *ACE-27* were addressed and added to the coding book, as appropriate.

### **One and Six-Month Reassessment**

To ensure continued accuracy of comorbidity coding, the RA traveled to each site one month and six months after the initial training session. She reviewed a random selection of medical records blinded to the comorbidity scores assigned by the cancer registrars. After the RA completed the review, all differences in the comorbidity scores were discussed with each individual and with the group as a whole.

**Table 3. Description of Cancer Registrars**

Cancer Registrar	Certification	Educational Background and Experience Abstracting Medical Records
1	RHIT* (1998)	1 year abstraction experience in tumor registry
2	RHIT (1967)	1 year abstraction experience in tumor registry
3	RHIT (1983)	AS 3 years abstraction experience in tumor registry
4	RHIT (1986) RHIA† (1992)	BS Medical Record Administration RRA (1992) BS Community Health Education (1986) 6 years abstraction experience in tumor registry
5	CTR‡ (1999)	BS Health Education 2 years abstraction experience in tumor registry
6	RHIT (1996) CTR (1999)	BS Home Economics / Early Childhood AS Allied Health 2 years abstraction experience in tumor registry
7	RHIT (1968) CTR (1997)	3 years of college (pre-med) 3 1/2 years abstraction experience in tumor registry
8	RHIT (1990) CTR (1994)	AA Medical Record Science 8 years abstraction experience in tumor registry
9	RHIT (1979) CTR (1991)	AA 9 years abstraction experience in tumor registry

\* RHIT = Registered Health Information Technician  
 † RHIA = Registered Health Information Administrator  
 ‡ CTR = Certified Tumor Registrar

**Table 4. Reliability Assessment of Cancer Registrars' Performance**

Cancer Registrar	Day 3 of Training Session		One-Month Assessment		Six-Month Assessment	
	Kappa*	% Agreement	Kappa	% Agreement	Kappa	% Agreement
1	0.92	8/10 (80%)	1.0	16/16 (100%)	1.0	16/16 (100%)
2	0.96	9/10 (90%)	0.83	13/14 (93%)	**	**
3	0.96	9/10 (90%)	0.97	15/16 (94%)	0.94	14/16 (88%)
4	1.0	10/10 (100%)	0.88	15/16 (94%)	0.95	14/16 (88%)
5	0.87	7/10 (70%)	0.81	19/23 (83%)	0.68	13/16 (81%)
6	0.96	10/10 (100%)	1.0	13/13 (100%)	**	**
7	0.96	9/10 (90%)	0.86	14/16 (88%)	0.97	15/16 (94%)
8	0.96	9/10 (90%)	0.94	19/22 (86%)	1.0	16/16 (100%)
9	0.96	9/10 (90%)	0.94	14/16 (88%)	0.97	15/16 (94%)

\* Kappa Values (Degree of Agreement): 0.81 - 1.00 (Almost Perfect Agreement); 0.61 - 0.80 (Substantial Agreement)  
 \*\* Missing values from Registrars 2 and 6 are a result of their resignation prior to the Six-Month Assessment

**Quantitative Assessment of Cancer Registrars' Performance**

Percent agreement and weighted kappa were used to rate the reliability of the registrars' comorbidity coding. Percent agreement measures how often the registrar and the RA agreed on the comorbidity score. Weighted kappa statistic is a measure of the degree of agreement between the registrar and the RA beyond what would be expected by chance. Kappa values can be interpreted as follows: 0.41-0.60 *Moderate* agreement, 0.61-0.80 *Substantial* agreement, and 0.81-1.00 *Almost Perfect* agreement.<sup>14</sup> If the weighted kappa statistic was less than 0.80, the cancer registrar received additional training and supervision.

Sensitivity and specificity calculations were used to rate the degree of validity between the registrars and the RA. Sensitivity was defined in this project as the proportion of correctly identified individuals with an overall comorbidity score of *Severe*. Specificity was defined as the proportion of correctly identified individuals with an overall comorbidity score of *None, Mild, or Moderate*.

**Qualitative Assessment of Cancer Registrars' Opinion of the Program**

Cancer registrars completed a survey at the end of the project to assess

their opinion of the program. The survey consisted of seven questions focusing on satisfaction with the program and the difficulty, time consumption, and burden of coding comorbidity. The surveys were sent anonymously to the Education Co-Investigator for evaluation.

**Results**

**Quantitative Assessment of Cancer Registrars' Performance**

Percent agreement scores for all three time periods ranged from 88% to 100% (Table 4). The kappa scores on Day 3 of the training program ranged from 0.87 to 1.0; one-month scores ranged from 0.81 to 1.0; and six-month scores ranged from 0.68 to 1.0. All cancer registrars except Registrar 5 attained *Almost Perfect* to *Perfect* kappa values at every assessment period.

Table 5 shows sensitivity and specificity at Day 3, one month, and six months. At the Six-Month Assessment all cancer registrars obtained 100% sensitivity except Registrar 4. Specificity scores ranged from 88% to 100% on Day 3; 86% to 100% at one month; and 92%

**Table 5. Validity Assessment of Cancer Registrars' Performance**

Cancer Registrar	Day 3 of Training Session		One-Month Assessment		Six-Month Assessment	
	Sensitivity	Specificity	Sensitivity	Specificity	Sensitivity	Specificity
1	2/2 (100%)	8/8 (100%)	5/5 (100%)	11/11 (100%)	5/5 (100%)	11/11 (100%)
2	2/2 (100%)	7/8 (88%)	1/1 (100%)	12/13 (92%)	**	**
3	2/2 (100%)	8/8 (100%)	2/2 (100%)	13/14 (93%)	3/3 (100%)	12/13 (92%)
4	2/2 (100%)	8/8 (100%)	2/2 (100%)	14/14 (100%)	4/5 (80%)	11/11 (100%)
5	2/2 (100%)	7/8 (88%)	5/5 (100%)	17/18 (94%)	3/3 (100%)	12/13 (92%)
6	2/2 (100%)	8/8 (100%)	1/1 (100%)	12/12 (100%)	**	**
7	2/2 (100%)	8/8 (100%)	2/2 (100%)	12/14 (86%)	3/3 (100%)	13/13 (100%)
8	2/2 (100%)	7/8 (88%)	5/5 (100%)	17/17 (100%)	5/5 (100%)	11/11 (100%)
9	2/2 (100%)	8/8 (100%)	3/3 (100%)	12/13 (92%)	4/4 (100%)	11/12 (92%)

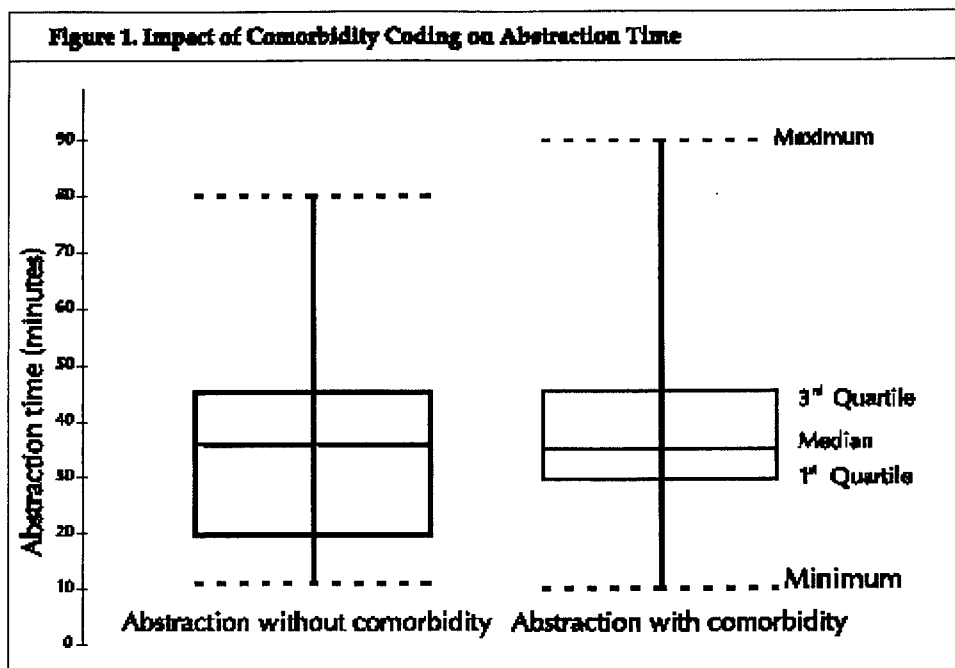
\*\* Missing values from Registrars 2 and 6 are a result of their resignation prior to the Six-Month Assessment

to 100% at six months.

The cancer registrars documented the time to abstract medical record information for 42 charts without comorbidity and 42 different charts with comorbidity. The mean time ( $\pm$ SD), in minutes, for chart abstraction without comorbidity was 35.9 (17.2) and with comorbidity was 38.0 (16.8). The mean difference was 2.1 minutes, indicating that the time for abstraction with comorbidity was slightly longer, on average, than coding without comorbidity. However, the 95% confidence interval around this mean difference extended from -5.32 minutes (coding with comorbidity was quicker) to 9.52 minutes. As seen by the box and whisker plot (figure 1), the median chart abstraction time with or without comorbidity was 35 minutes. The range in abstraction times between the 25<sup>th</sup> and 75<sup>th</sup> percentile without comorbidity was 20 to 45 minutes; with comorbidity times ranged from 30 to 45 minutes.

#### Qualitative Assessment of Cancer Registrars' Opinion of the Program

All 7 remaining participants responded to the survey about the program. When asked the question, "How difficult and burdensome, on average, is coding comorbidity in relation to what is usually coded for a chart?" 4 registrars answered *Slightly* and 3 registrars answered *Not At All*. When asked "How time consuming, on average, is coding comorbidity in relation to what is usually coded for a chart?" one registrar answered *Somewhat*, 5 answered *Slightly*, and one answered *Not At All*. The next question asked, "How well did we meet our main objective of teaching cancer registrars to accurately code comorbidity?" Five cancer registrars responded with *Extremely Well* and 2 responded *Very*. When asked about the overall satisfaction with the comorbidity education program, 4 answered *Extremely Satisfied*, one answered *Very Satisfied*, and one answered *Somewhat*. One cancer registrar commented, "I feel that the education program is excellent." Another said, "Comorbidity is no problem!"



#### Discussion

In this study, the authors demonstrate the utility and generalizability of a comorbidity education program for cancer registrars. Nine cancer registrars with varying levels of experience from 5 nonacademic teaching hospitals around the United States learned to code comorbidity during their usual medical record abstraction. The education program consisted of 21 hours of training over 3 days. The registrars also demonstrated the sustained ability to correctly code comorbidity 6 months after the completion of the program. Both certified tumor registrars (CTRs) and non-CTR abstractors demonstrated excellent performance.

The addition of comorbidity information to hospital-based and national cancer registries will improve the value of cancer statistics. One of the authors was invited to speak on the importance of comorbidity at the Annual Meeting of the Commission on Cancer in April of 2000. At this meeting, members of the Commission learned about the comorbidity education program and the ability of cancer registrars to directly code comorbidity from the medical record. While there was near unanimous agreement about the importance of comorbidity, there

was less agreement about the ideal methodology for its collection.

Comorbidity information for inclusion in cancer registries can be collected in three different ways. The most straightforward method involves the direct inspection of the medical record and evaluation of comorbidity using a valid comorbidity index. The comorbidity education program described in this manuscript is an example of such an approach. The advantages of this approach are the high degree of accuracy that results from the detailed chart review and the ability to standardize the grading of comorbidity across cancer centers. The disadvantages are the need for training and the additional effort required for the identification of the comorbid ailments. However, in this research, coding comorbidity required little additional time and effort. There are multiple other examples in the published medical literature.<sup>15-18</sup>

The second approach to coding comorbidity is to link the tumor registry information with electronic hospital-based discharge databases or other administrative or financial databases (e.g. Medicare). In this method, the comorbid conditions included in the electronic database and defined by the ICD-9-CM system (International Classification of Diseases, 9th Revision, Clini-

cal Modification) are used to assign levels of comorbidity. There are several different indices available to assign comorbidity from electronic administrative databases.<sup>19,20</sup> The use of preexisting electronic databases may be less costly than direct examination of the medical record. Greater consistency in coding comorbidity across hospitals may be achieved since all hospitals use the same ICD-9-CM methodology. There are, however, several distinct disadvantages. The linkage of tumor registry information with hospital discharge or other administrative databases is generally not a simple task and in some cases may not be possible at all. A second problem arises when there is no hospitalization prior to the diagnosis of cancer and thus no electronic hospital discharge record from which comorbidity can be determined. A recently published study by Bach et al using the SEER-Medicare linked database illustrates this point. In this study, the investigators examined the racial differences in the treatment of 10,984 early stage lung cancer patients from 1985 to 1993.<sup>21</sup> Overall comorbidity was determined using Medicare database and the Romano modification of Charlson index<sup>19</sup> from all inpatient hospitalizations occurring 12 months before diagnosis. A valid comorbidity value could not be determined for 76% of the patients since there was no hospitalization in the year before diagnosis! In addition, from the electronic discharge record it may be impossible to differentiate between complications of hospital care and pre-existing comorbid conditions. Finally, several researchers found that the use of ICD-9-CM codes in the electronic discharge databases to code comorbidity can lead to ambiguity and inconsistency of coding diseases.<sup>22,23</sup>

The third method of coding the severity of comorbidity is to use the severity adjustment systems that all acute-care hospitals already use as part of the DRG payment system. As a result of this system, hospitals adjust the DRG discharge group according to the severity of care required during the hospitalization. There are a large number of proprietary software packages available to hospitals to perform this severity

adjustment. In general, the severity adjustment is based on a variety of characteristics, including the amount and type of secondary diagnoses. As a result, the severity level assigned to the hospitalization could be used as a proxy of the overall level of comorbidity of the patient. The advantage of this system is that most, if not all, hospitals adjust hospitalization discharge DRG groupings for severity based on the type and degree of secondary procedures and the level of intensity of services provided. Therefore, assigning levels of comorbidity from this system would be relatively easy. The main disadvantage of this methodology is that there are many different severity adjustment software programs in use and they do not all use the same information for determining severity. Therefore, there is no assurance that the levels of severity assigned by the different software programs are similar. This lack of consistency is not important when conducting a single institution study, but is likely to be of major concern when results across multiple hospitals are combined within central or national cancer registries. Another disadvantage is that the characteristics deemed important to provide accurate severity adjustment for prospective reimbursement methodology may not be the same characteristics that are important for clinical prognostic stratification of cancer patients. In addition, the use of this methodology will lead to incomplete and inaccurate comorbidity assessment, since not all patients diagnosed with cancer will have a recent hospitalization, and the severity of illness assessment at the time of hospitalization may reflect a complication and not a comorbidity.

The results of this study demonstrate that registrars at nonacademic medical centers can code comorbidity accurately and efficiently from the medical records of patients with newly diagnosed cancer. This finding is similar to the results of previous research<sup>10</sup> at Barnes-Jewish Hospital, an academic teaching hospital. At all hospitals, the trained registrars required little additional time to code comorbidity. The inclusion of comorbidity information in national cancer registries will improve

the quality of cancer statistics in this country. In addition, this information can be incorporated into ongoing hospital or healthcare system quality monitoring and improvement. Cancer statistics are the foundation upon which rational decisions about screening, treatment, and prognosis are created. Cancer statistics help form public policy and personal decisions about cancer care. Improvements in the quality of cancer statistics will ultimately lead to better care for patients with cancer.

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