

COMORBIDITY AS A NEW DATA ELEMENT COPYRIGHT NOTICE

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Comorbidity as a New Data Element

Presentation to the
Committee on Standards
Commission on Cancer

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Comorbidity Instruments

- Several instruments have been developed to classify different comorbid diseases and to quantify the severity of the overall comorbid condition
- None of the instruments were specifically designed to study comorbidity in cancer patients
- Nevertheless, these instruments have been used to classify comorbidity in several types of cancers and have performed well

- Instruments to measure the severity of comorbidity can be classified into four mutually exclusive groups depending on the
 - origin of the data
(medical record review *vs.* claims-based)
 - applicability of the instrument
(general *vs.* disease-specific)



Medical Record Review

- Kaplan-Feinstein Index
- Charlson Comorbidity Index
- The Index of Co-Existent Disease

Kaplan-Feinstein Index

- Developed from the study of comorbidity in patients with diabetes mellitus
- The KFI has been used to study the impact of comorbidity in several cancers
- Specific diseases and conditions are classified into four groups-- none, mild, moderate, or severe according to severity of organ decompensation and prognostic impact

Kaplan, Feinstein. *J Chron Dis.* 1974;27:387-404

Charlson Comorbidity Index (CCI)

- Developed from studies of one-year mortality for patients admitted to a medical unit of a teaching hospital
- Scores for comorbid diseases derived from a weighted index based on the adjusted relative risk of mortality associated with each disease
- Total score is sum of weighted scores

Index of Co-Existent Disease (ICED)

- Designed to predict LOS and resource utilization after hospitalization
- Instrument assesses patient status in two domains
 - Individual Disease Severity (IDS)
 - reflects severity of health categories (0-4)
 - Functional Severity
 - assesses physical impairment before treatment (0-2)
- Peak intensities for each domain are grouped to give ICED score (0-3)

Claims-Based

- Modifications of Charlson
 - Dartmouth-Manitoba ICD-9 conversion algorithm
 - Deyo et al
 - Ghali et al
- Von Korff et al chronic disease score from automated pharmacy records

Charlson Comorbidity Index—Electronic Version

Assigned weights for diseases	Conditions	ICD-9-CM Codes
2	Hemiplegia	344.1, 342-342.9
	Moderate or sever renal disease	582-582.9, 583-583.7, 585, 586, 588-588.9
	Diabetes with end organ damage	250.4-250.6
	Any tumor	140-172.9, 174-195.8
	Leukemia	204-208.9
	Lymphoma	200-203.8
3	Moderate or severe liver disease	572.2-572.8, 456.0-456.21
6	Metastatic solid tumor	196-199.1
	AIDS	042-044.9

Comparison of Comorbidity Collection Methods

Medical Record Approach

■ Advantages

- Score can be assigned to the majority of patients
- Very accurate assessment of comorbidity

■ Disadvantages

- Comorbidity coding added approximately 6% additional work effort

Claims-Based Approach

■ Advantages

- Available in many states for many people
- Less expensive alternative

■ Disadvantages

- Databases not available for all patient in a tumor registry
- Less accurate assessment

Problem with Claims-Based Information

- Bach et al used Seer-Medicare linked database to study racial differences in the treatment of 10,984 early stage lung cancer patients from 1985 to 1993
- Comorbidity assessed using Romano modification of Charlson index from all inpatient hospitalizations occurring 12-months before diagnosis
- Romano-Charlson comorbidity index could not be ascertained for 8,348 (76%) patients since there was no hospitalization in the year before diagnosis

NEJM 1999;341:1198-1205

Adult Comorbidity Evaluation-27

- 27-item comorbidity index for patients with cancer
- Developed through modification of the *Kaplan-Feinstein Comorbidity Index (KFI)*
- Modifications were made through discussions with clinical experts and a review of the literature
- Validated in study of 190 cancer patients treated at Barnes-Jewish Hospital

Adult Comorbidity Evaluation-27

Identify the important medical comorbidities and grade severity using the index. Overall Comorbidity Score is defined according to the highest ranked single ailment, except in the case where two or more Grade 2 ailments occur in different organ systems. In this situation, the overall comorbidity score should be designated Grade 3.

Cogent comorbid ailment	Grade 3 Severe Decompensation	Grade 2 Moderate Decompensation	Grade 1 Mild Decompensation
Cardiovascular System			
Myocardial Infarct	<ul style="list-style-type: none"> ▪ MI ≤ 6 months 	<ul style="list-style-type: none"> ▪ MI > 6 months ago 	<ul style="list-style-type: none"> ▪ Old MI by ECG only, age undetermined
Angina / Coronary Artery Disease	<ul style="list-style-type: none"> ▪ Unstable angina 	<ul style="list-style-type: none"> ▪ Chronic exertional angina ▪ Recent (≤ 6 months) Coronary Artery Bypass Graft (CABG) or Percutaneous Transluminal Coronary Angioplasty (PTCA) ▪ Recent (≤ 6 months) coronary stent 	<ul style="list-style-type: none"> ▪ ECG or stress test evidence or catheterization evidence of coronary disease without symptoms ▪ Angina pectoris not requiring hospitalization ▪ CABG or PTCA (>6 mos.) ▪ Coronary stent (>6 mos.)
Congestive Heart Failure (CHF)	<ul style="list-style-type: none"> ▪ Hospitalized for CHF within past 6 months ▪ Ejection fraction < 20% 	<ul style="list-style-type: none"> ▪ Hospitalized for CHF >6 months prior ▪ CHF with dyspnea which limits activities 	<ul style="list-style-type: none"> ▪ CHF with dyspnea which has responded to treatment ▪ Exertional dyspnea ▪ Paroxysmal Nocturnal Dyspnea (PND)
Arrhythmias	<ul style="list-style-type: none"> ▪ Ventricular arrhythmia ≤ 6 months 	<ul style="list-style-type: none"> ▪ Ventricular arrhythmia > 6 months ago ▪ Chronic atrial fibrillation or flutter ▪ Pacemaker 	<ul style="list-style-type: none"> ▪ Sick Sinus Syndrome
Hypertension	<ul style="list-style-type: none"> ▪ DBP > 130 mm Hg ▪ Severe malignant papilledema or other eye changes ▪ Encephalopathy 	<ul style="list-style-type: none"> ▪ DBP 115-129 mm Hg ▪ Secondary cardiovascular symptoms: vertigo, epistaxis, headaches 	<ul style="list-style-type: none"> ▪ DBP 90-114 mm Hg ▪ DBP < 90 mm Hg while taking antihypertensive medications
Venous Disease	<ul style="list-style-type: none"> ▪ Recent PE (≤ 6 mos.) ▪ Use of venous filter for PE's 	<ul style="list-style-type: none"> ▪ DVT controlled with Coumadin or heparin ▪ Old PE > 6 months 	<ul style="list-style-type: none"> ▪ Old DVT no longer treated with Coumadin or Heparin
Peripheral Arterial Disease	<ul style="list-style-type: none"> ▪ Bypass or amputation for gangrene or arterial insufficiency < 6 months ago ▪ Untreated thoracic or abdominal aneurysm (>6 cm) 	<ul style="list-style-type: none"> ▪ Bypass or amputation for gangrene or arterial insufficiency > 6 months ▪ Chronic insufficiency 	<ul style="list-style-type: none"> ▪ Intermittent claudication ▪ Untreated thoracic or abdominal aneurysm (< 6 cm) ▪ s/p abdominal or thoracic aortic aneurysm repair

Example

Congestive Heart Failure

- Mild – Exertional or paroxysmal dyspnea which has responded to treatment
- Moderate – Hospitalized more than six months ago
- Severe – Hospitalized within last 6 months or ejection fraction $< 20\%$



Overall Comorbidity Score

- Highest ranked single ailment
- In cases where two or more Moderate ailments occur in different organ systems, the Overall Comorbidity Score should be designated as Severe

Example

CONDITION	DECOMPENSATION
Myocardial Infarct more than 6 months ago	Moderate
DBP 90-114 mm Hg	Mild
History of alcohol abuse, but not presently drinking	Mild
Overall Comorbidity Score	Moderate

Example

CONDITION

DECOMPENSATION

Chronic exertional angina

Moderate

Major depression controlled
with medication

Mild

Diabetes requiring insulin

Moderate

Overall Comorbidity Score

Severe

Educational Program Assessment

- CTR coding performance was assessed with weighted kappa statistic, sensitivity, specificity, and interviews
 - Trained research assistant and co-investigators served as “gold standard” for the assessment of overall comorbidity
 - Difficulty coding and time commitment

Design of the Research Program

- Training of the research assistant
- Set up education program working with Co-Investigator
- Education of cancer registrars at the five participating hospitals on the importance of comorbidity
- One and six- month reassessment of cancer registrars performance
- Post-program evaluation

Training of the Research Assistant

- This training included a 1-month intensive period with the PI
- The ability of the RA to review the medical record, identify comorbid ailments, use the comorbidity instrument, and accurately assign comorbidity severity levels was assessed
- The PI served as the "gold standard" to assess the accuracy of the RA
- The RA performed well (weighted kappa value > 0.9)

Set Up Education Program

- The PI, RA, and Co-Investigator met prior to training the participating cancer registrars to determine effective teaching techniques
- A three-day agenda was established for the education program

- The education materials included
 - comorbidity coding book
 - comorbidity video "The Whole Picture: Coding Comorbidity"
 - 40 medical records of cancer patients with varying comorbidity severity from Barnes-Jewish Hospital
- 15 medical records of cancer patients from the participating centers

Nationwide Comorbidity Network

Hospital Name	City, State	# of Registrars	Estimated cases/year	Commission on Cancer Program
Washington Hospital Center	Washington, D.C.	3	818	Teaching Hospital Cancer Program
North Kansas City Hospital	Kansas City, MO	1	583	Community Hospital Cancer Program
Queen of the Valley Hospital	Napa, CA	1	377	Community Hospital Cancer Program
Dakota Clinic	Fargo, ND	3	948	Community Hospital Cancer Program
Hannibal Regional Hospital	Hannibal, MO	1	216	Community Hospital Cancer Program

Education of Cancer Registrars at the Five Participating Hospitals

- The RA traveled to each of the five participating sites to train the cancer registrars to code comorbidity in June 1999
- A total of nine cancer registrars participated in the program

- The RA spent three days at each site
- Prior to the RA coming to the sites, the participating oncology data centers recorded the number of new cases and the time spent abstracting each case for one week

Day One

- Introduction to the program and viewing of the educational videotape
- Review of the Comorbidity Coding Book and *Adult Comorbidity Evaluation-27*
- The cancer registrars learned the criteria to determine the severity of each comorbid condition
- Cancer registrars received ten standard medical records to code comorbidity

- Comorbidity scores were assigned by the research team at Barnes-Jewish Hospital and were referred to as "gold standard"
- RA discussed the comorbidity coding classification
- Problems, misunderstandings, or alternative interpretations were discussed

Day Two

- Cancer registrars given 20 standard medical records to code comorbidity
- The RA assessed the results and provided feedback in the areas of difficulty

Day Three

- Cancer registrars coded another ten standard medical records and 15 randomly selected medical records from the cancer registrars' own institution
- RA assessed the accuracy of the rating of comorbidity
- RA also provided support to insure that the cancer registrars felt confident in the coding of medical comorbidity

- Cancer registrars who did not feel confident or display accuracy (*weighted kappa value of 0.8 or greater*) received additional attention from the RA
- All comments, clarifications, and specific instructions identified during these training sessions not already contained within the Comorbidity Coding Manual were addressed and added to the educational program, as appropriate

One and Six- Month Reassessment

- To ensure continued accuracy of comorbidity coding, the RA traveled to each site one and six-months after the initial training session to review a random selection of medical records
- Each participating site sent completed comorbidity *ACE-27* forms to the PI each week
- The PI selected a random sample of sixteen charts for each cancer registrar at all sites for detail review by the RA

- RA reviewed the records blinded to the comorbidity score assigned by the cancer registrars
- After the RA completed the review, all differences in the comorbidity score were discussed at that time with each individual and the group as a whole

Post-Program Evaluation

- A questionnaire was sent to each cancer registrar at the completion of the project
- Gather feedback for improvements to the education program
- Questionnaires were returned anonymously to the Education Co-Investigator for evaluation

Quantitative Assessment of Cancer Registrars' Performance

- Reliability
 - Weighted Kappa Statistic
- Validity
 - Sensitivity
 - Specificity

- Weighted kappa statistic – the degree of agreement beyond what would be expected by chance
 - .41 - .60 Moderate
 - .61 - .80 Substantial
 - .81 - 1.00 Almost perfect
- Sensitivity – the proportion of correctly identified individuals with severe comorbidity
- Specificity – the proportion of correctly identified individuals without severe comorbidity

Reliability Results

Cancer Registrar	Weighted Kappa		
	Day 3 of Training	One-month Assessment	Six-month Assessment
1	0.92	1.0	1.0
2	0.96	0.83	----
3	0.96	0.97	0.94
4	1.0	0.88	0.95
5	0.87	0.81	0.68
6	0.96	1.0	----
7	0.96	0.86	0.97
8	0.96	0.94	1.0
9	0.96	0.94	0.97

Validity Results

Cancer Registrar	Sensitivity		
	Day 3 of Training	One-month Assessment	Six-month Assessment
1	2/2 (100%)	5/5 (100%)	5/5 (100%)
2	2/2 (100%)	1/1 (100%)	----
3	2/2 (100%)	2/2 (100%)	3/3 (100%)
4	2/2 (100%)	2/2 (100%)	4/5 (80%)
5	2/2 (100%)	5/5 (100%)	3/3 (100%)
6	2/2 (100%)	1/1 (100%)	----
7	2/2 (100%)	2/2 (100%)	3/3 (100%)
8	2/2 (100%)	5/5 (100%)	5/5 (100%)
9	2/2 (100%)	3/3 (100%)	4/4 (100%)

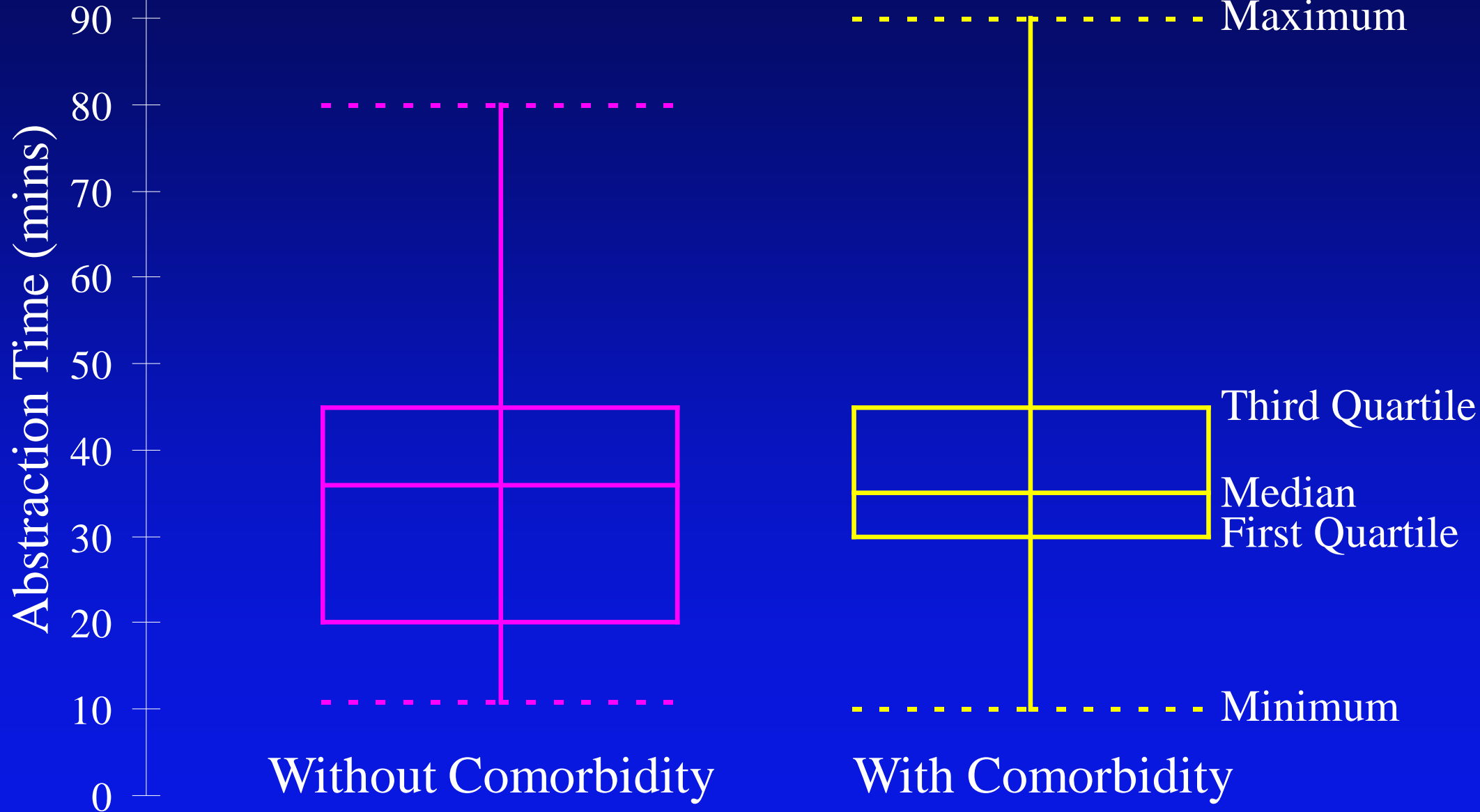
Validity Results

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

Burden of Coding Comorbidity

- Amount of time required to abstract complete medical record, including comorbidity
- Before training program, cancer registrar estimated time required to abstract complete medical record
- After training program, cancer registrar estimated time required to abstract complete medical record, including comorbidity

Box and Whisker Plot



Qualitative Assessment of Cancer Education Program

	Extremely	Very	Somewhat	Slightly	Not at all
How difficult is it to code comorbidity?	0	0	0	4	1
How time consuming, on average, is coding comorbidity?	0	0	0	4	1
How burdensome is coding comorbidity?	0	0	0	4	1

“Comorbidity is no problem!”

Qualitative Assessment of Cancer Education Program

	Extremely	Very	Somewhat	Slightly	Not at all
How well did we meet our main objective of teaching cancer registrars to code comorbidity accurately?	5	0	0	0	0
Overall, how satisfied were you with the comorbidity education program?	4	1	0	0	0

“I feel that the education program is excellent.”

Conclusions

- Results show that CTRs can code comorbidity efficiently and effectively
- Severity of comorbidity is associated with survival, selection of initial treatment, and assessment of quality of care
- Therefore, comorbidity coding should be included in hospital-based and national cancer registries

Future Work

- Obtain support from COC Committee on Standards to add comorbidity as a required data element
- With COC support, request NAACCR Data Standards Committee to add comorbidity as a required data element
- Development of a Web-based Comorbidity Education Program