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The Importance of Comorbidity to Cancer Care and Statistics

Presentation to the
American Cancer Society
March 21, 2002

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St. Louis, Missouri
Prostate Cancer Example

- Desch et al studied treatment recommendations for local or regional prostate cancer
- As comorbidity increased, the proportion of men receiving no treatment rose correspondingly
- Fewer than 30% of men with the most significant level of comorbidity received surgery, radiation therapy, or combinations of aggressive therapy as compared with almost 55% of men who had no comorbid ailments

*Med Care 1996;34:152-622*
### Advanced Head and Neck Cancer

<table>
<thead>
<tr>
<th>Severe Comorbidity</th>
<th>Initial Treatment</th>
<th>Risk Ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Radiation Therapy Only</td>
<td></td>
</tr>
<tr>
<td>Absent</td>
<td>100/534 (19%)</td>
<td>1.0</td>
</tr>
<tr>
<td>Present</td>
<td>38/74 (51%)</td>
<td>3.60 (2.38-5.44)</td>
</tr>
<tr>
<td>Total</td>
<td>138/608 (22%)</td>
<td></td>
</tr>
</tbody>
</table>
Colon Carcinoma

- Yancik studied impact of comorbidity on mortality for 1610 elderly patients

- One-year mortality rate was 28% (454/1610)

- After adjusting for age, gender, and cancer stage,
  - 5-6 comorbid ailments  RR (95% CI) = 1.4 (1.1,1.9)
  - > 6 comorbid ailments  RR (95% CI) = 1.8 (1.4,2.5)

Cancer 1998; 82:2123-2134
Overall Survival

$N = 3,378$
Impact of Comorbidity on Survival

N = 3378

Log Rank = 186.0, p < 0.001
Interaction Between Comorbidity, Treatment, and Outcome

Comorbid Conditions

Less Treatment Selected
(? Suboptimal)

Poor Outcomes

Stratification for comorbidity can control bias.

Yates, JW. Comorbidity Considerations in Geriatric Oncology Research.

CA Cancer J Clin 2001;51:329-326
Breast Cancer

- Satariano and Ragland determined the effect of comorbidity and tumor stage on survival
- Overall 3-year survival 85% (145/936)
- 3 or more comorbid ailments 20-fold higher rate of mortality when compared with patients without comorbidity
- Comorbid effects independent of age, race, tumor stage, histologic type, type of treatment, and social/behavioral factors

Ann Intern Med. 1994; 120:104-110
## Head and Neck Cancer
### Cox Proportional Hazards Model

<table>
<thead>
<tr>
<th>Variable</th>
<th>Category</th>
<th>Adjusted Risk Ratio*</th>
<th>95% CI</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe Comorbidity</td>
<td>Absent</td>
<td>1</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>Present</td>
<td>1.462</td>
<td>1.176-1.818</td>
<td>0.0006</td>
</tr>
</tbody>
</table>

* Adjusted for Anatomic Sub-Site, Tumor Stage, and Initial Treatment
Greenfield et al conducted a retrospective review to assess the degree of appropriate treatment for elderly women with breast cancer.

Sample included women who received cancer management at one of seven hospitals in Southern California.

Appropriate treatment defined according to Criteria Map that incorporated widely accepted practice standards.

Level of comorbidity (None/Mild or Severe) defined by Comorbidity Index.

*JAMA 1987;257:2766-2770*
# Relationship of Comorbidity to Management of Breast Cancer

<table>
<thead>
<tr>
<th>Comorbidity Index</th>
<th>Treatment</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Inappropriate</td>
<td>Appropriate</td>
</tr>
<tr>
<td>None, Mild</td>
<td>53 (19%)</td>
<td>231 (81%)</td>
</tr>
<tr>
<td>Severe</td>
<td>37 (41%)</td>
<td>53 (59%)</td>
</tr>
<tr>
<td>Total</td>
<td>90 (24%)</td>
<td>284 (76%)</td>
</tr>
</tbody>
</table>

P<0.001 $\chi^2=17.640$ Yates corrected
Poor Quality of Care?
Sound Clinical Judgment?
Inclusion of Comorbidity Improves Cancer Statistics, Research, and Patient Care

- Population-based epidemiological studies
- Cancer clinical trials
- Observational research, including quality of care
- Patient-physician communication
Breast Cancer Example

Survival vs. Duration in Years

- No Comorbidity
- SEER
- Severe Comorbidity
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.
Chart-Based Record Review

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

- Charlson Comorbidity Index

- The Index of Co-Existent Disease
Claims-Based Assessment

- Modifications of Charlson
  - Dartmouth-Manitoba ICD-9 conversion algorithm
    \[ J \text{Clin Epidemiol} \ 1993;46:1075-1090 \]
  - Deyo et al
    \[ J.\text{Clin.Epidemiol} \ 1992;45:613-619 \]
- Elixhauser Model
  \[ Med \text{Care} \ 1998;36:8-27 \]
- Klabunde et al -- in and out-patient claims
  \[ J \text{Clin Epidemiol} \ 2000;53:1258-1267 \]
- Von Korff et al chronic disease score from automated pharmacy records
  \[ J.\text{Clin Epidemiol}. \ 1992;45:197-203 \]
Comparison of Comorbidity Collection Methods

Chart-Based Approach

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

- Disadvantages
  - Additional work effort

Claims-Based Approach

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

- Disadvantages
  - Information may not be available for all patients in a tumor registry
  - Less complete and accurate assessment
### Overview of Comorbidity Research

<table>
<thead>
<tr>
<th>Comorbidity Education</th>
<th>Data Collection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statistical Analysis</td>
<td>Cancer Prognostics</td>
</tr>
</tbody>
</table>
As part of a NCI-sponsored cancer education grant, certified tumor registrars at five hospitals taught to code comorbidity.

Entire education program lasted 10 hours.

Training video: “The Whole Picture: Coding Comorbidity”

- Standardized comorbidity data collection form was used

- Modification of Kaplan-Feinstein Index was used to quantify the severity of the overall comorbid condition

- Comments and observations were incorporated into the education program
Before training program, cancer registrar estimated time required to abstract medical record

After training program, cancer registrar estimated time required to abstract medical record, including comorbidity
Burden of Coding Comorbidity

Abstraction Time (mins)

With Comorbidity

Without Comorbidity

Minimum

Median

First Quartile

Third Quartile

Maximum
Data Collection

- Established *Nationwide Comorbidity Network*

- To date, 11,457 newly diagnosed patients with cancer have been enrolled (600-800/month)

- Comorbid health has been linked to tumor registry (*ROADS*) information for first 3,326
Development/Validation of Cancer-Specific Models

- Lung
- Breast
- Head and Neck
- Colorectal
- Prostate
- Gynecological sites

These models will be unique:

- developed especially for cancer patients
- contain a wide range of comorbid ailments
- grade the severity of the individual ailments
- generate an overall severity score
- predict overall survival
- developed specifically to be used in conjunction with the standard ROADS-defined tumor registry data elements
Impact of Comorbidity on Survival

N = 3,326

Log Rank $\chi^2 = 195.24, p < 0.0001$
### Independent Prognostic Impact

**Multivariable Analysis of Comorbidity**

<table>
<thead>
<tr>
<th>Category</th>
<th>Adjusted RR*</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>Reference</td>
<td></td>
</tr>
<tr>
<td>Mild</td>
<td>1.2</td>
<td>0.9 – 1.4</td>
</tr>
<tr>
<td>Moderate</td>
<td>1.4</td>
<td>1.1 – 1.8</td>
</tr>
<tr>
<td>Severe</td>
<td>2.0</td>
<td>1.6 – 2.5</td>
</tr>
</tbody>
</table>

*Adjusted for Age, Gender, Race, Site, and Tumor Stage*
Cancer Prognostics

- The goal of this project is to make improvements to Prognostigram program and assess utility in patient care

- The Prognostigram program creates individualized survival curves based on multiple prognostic factors, including comorbidity

- Improve patient communication and medical decision making
**Survival According to Mode of Therapy**

**Regional Breast Cancer**

**CURRENT SITUATION**

Recommendations based on composite results

**FUTURE REALITY**

Tailored individual therapy

---

**Survival Rate**

- Chemotherapy
- Surgery
- Radiation Therapy
- No Treatment

**Survival Duration**

- Chemotherapy
- Surgery
- Radiation Therapy
- No Treatment

---

Mary Smith
Age 72
DM
HTN
s/p CABG
Conclusions

- Important in the selection of treatment, prognosis, and evaluation of quality of care

- *Comorbidity Education Program* trains registrars to collect comorbid health information from medical record

- Comorbidity should be added as a required data element

- New prognostic models will improve patient care, clinical research, and cancer statistics
Clinical Outcomes Research Web Site

http://oto.wustl.edu/clinepi/