Case Mix Applications

interRAI Conference 16 & 17 June 2005
Radisson Resort, Gold Coast, Australia

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Agenda

- Applying RUG-III for efficiency and productivity measurement
  - Measuring performance
- Applying RUG-III for home care
  - RUG-III/HC Home Care Classification
Measuring Efficiency

- **Why**
  - Costs, productivity, performance, cost/quality, staffing, etc.

- **Productive efficiency**
  - The relationship between the output of a good and the inputs (e.g. capital and labour) required to produce that good

- **Defining output of long-term care**
  - Case-Mix Adjusted Patient Days

- **Defining inputs**
  - Production Costs

- **Methods for measuring efficiency**
  - Production and Cost Functions
  - Frontier Methods (Data Envelopment Analysis - DEA)
    - Scores 0 to 1
Efficiency Frontier

Technical efficiency is defined as a firm which uses less inputs than another firm to produce the same output, or alternatively a firm that produces more output than another firm using the same inputs.
Case Mix by Facility Type

- Health Centre: 1.22
- Hospitals: 0.98
- Residential Homes: 0.72
- Assisted Living: 0.98
Case-Mix Adjustment

Comparing efficiency scores using different systems to adjust for case mix.

The Association Between Quality of Care and Technical Efficiency in Long-Term Care*

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Study Sample

- 114 long-term care units in Finland
- Collected in 2002
- Ward level analysis
- Average unit size = 30 beds
Technical Efficiency (n=114)

Wards arranged by increasing technical efficiency scores. The y-axis denotes efficiency score, the x-axis denotes wards, and the width of each bar is the ward’s size.
Analyzing Correlates

- Quality vs. Efficiency
  - Correlates between efficiency scores and quality indicator scores
- Wards ranked
  - Poor / Good Quality
  - CHSRA QIs
- Comparing equivalence in rank
  - Mann-Whitney U Test
<table>
<thead>
<tr>
<th>Variable</th>
<th>Quality groups</th>
<th>Mean rank in efficiency</th>
<th>Asymptotic sig.</th>
<th>Correlation between efficiency scores and continuous quality indicators in pooled data (n = 114), P values in parentheses</th>
<th>Association between poor quality and high efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevalence of depression with no treatment, %</td>
<td>Good quality 55</td>
<td>0.05</td>
<td>0.00 (1.00)</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Prevalence of bladder or bowel incontinence, low risk, %</td>
<td>Poor quality 72</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prevalence of bladder or bowel incontinence, high risk, %</td>
<td>Good quality 51</td>
<td>&lt;0.001</td>
<td>0.59 (&lt;0.001)</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Prevalence of indwelling catheters, low risk, %</td>
<td>Poor quality 92</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prevalence of indwelling catheters, high risk, %</td>
<td>Good quality 53</td>
<td>&lt;0.001</td>
<td>0.28 (&lt;0.001)</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Prevalence of faecal impaction, %</td>
<td>Good quality 55</td>
<td>0.01</td>
<td>0.42 (&lt;0.001)</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Prevalence of bedfast residents, %</td>
<td>Poor quality 83</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Lack of training/skill practice or range of motion</td>
<td>Good quality 55</td>
<td>0.5</td>
<td>0.15 (0.12)</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>for mobility dependent residents, %</td>
<td>Poor quality 72</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prevalence of daily physical restraints, %</td>
<td>Good quality 51</td>
<td>&lt;0.001</td>
<td>0.66 (&lt;0.001)</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Prevalence of little or no activity, %</td>
<td>Poor quality 82</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prevalence of stage 1–4 pressure ulcers, low risk, %</td>
<td>Good quality 54</td>
<td>&lt;0.001</td>
<td>0.36 (&lt;0.001)</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Poor quality 79</td>
<td></td>
<td></td>
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</tbody>
</table>
Summary

- Case-mix adjustment essential in measuring productive and cost efficiency
- Possible trade-offs between quality of care and technical efficiency
- Further analysis important for policy making, e.g., staffing levels
Testing A RUG-III Based Case-mix System For Home Care*

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Objectives

- Test RUG-III based case-mix system for home care clients
- Validate nursing home RUG-III for home care
  - Basis: Minimum Data Set for Home Care (MDS-HC)
- Develop refined RUG-III system with items relevant for home care
Study Sample

- Michigan community based clients - eligible for nursing home level of care
  - MDS-HC
  - N=804

- Dependent variable
  - Resource use (care time) recorded by assessors
  - Estimated weekly intensity of formal and informal care

- Independent variables
  - RUG-III groups
  - MDS-HC items
RUG-III models for home care (1/2)

- Basic RUG-III
  - Included RUG-III variables available in the MDS-HC
  - 18 groups
RUG-III models for home care (2/2)

- **RUG-III/HC**
  - 23 groups
  - Uses index of 3 IADLs (Instrumental Activities of Daily Living)
    - meal preparation
    - managing medications
    - phone use
RUG-III/HC Classification

**Client**
- **Special Rehabilitation**
  - ADL
  - IADL 0 or 1-3
    - RA
      - 0
      - 1-3
    - RA_1
      - 1.15
    - RA_2
      - 2.01
    - IADL 0-1 or 2-3

- **Extensive Services**
  - TREATMENTS
    - SE1
      - 1.86
    - SE2
      - na
    - SE3
      - na

- **Special Care**
  - ADL
    - IADL 0-1 or 2-3
      - SSA
        - 7-13
      - SSB
        - 14-15

- **Clinically Complex**
  - ADL
    - IADL 0-1 or 2-3
      - CA
        - 4-5
    - CA_1
      - 0.34
      - IADL 0-1 or 2-3
    - CA_2
      - 0.94

- **Impaired Cognition**
  - ADL
    - IADL 0-1 or 2-3
      - IA
        - 4-5
    - IA_1
      - 0.25
    - IA_2
      - 1.43

- **Behavioral Problems**
  - ADL
    - IADL 0-1 or 2-3
      - BA
        - 4-5
    - BA_1
      - 0.31
    - BA_2
      - 1.05

- **Reduced Physical Functions**
  - ADL
    - IADL 0-1 or 2-3
      - PA
        - 4-6
    - PA_1
      - 0.35
    - PA_2
      - 0.91

**Clinical Categories**

- **ADL Split Groups**

**Groups**
Analytic Methods

- Automatic Interaction Detection (AID)
  - PC-Group
  - Test the inclusion of IADLs

- ANOVA
  - Basic RUG-III, RUG-III/HC
  - R-square - predictive power
  - CMI - relative resource use
Results

- Care time
  - Formal care = 0.57 hours per day
  - Informal care = 4.3 hours per day

- Wage-weighted resource use
  - Formal care 28% of total cost
  - Informal care - wage weight 0.5
    (home health aide 1.0)
Major RUG-III Categories

- Physical: 49%
- Clinically Impaired: 11%
- Special: 28%
- Impaired: 4%
- Behavior: 2%
- Extensive: 1%

Legend:
- Special
- Extensive
- Clinically
- Impaired
- Behavior
- Physical
Variance Explanations

<table>
<thead>
<tr>
<th></th>
<th>Basic RUG-III</th>
<th>RUG-III/HC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variance</td>
<td>28%</td>
<td>34%</td>
</tr>
<tr>
<td>Explanations</td>
<td></td>
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</tr>
</tbody>
</table>

Legend:
- +Agency
- Groups
Conclusions

- Acceptable variance explanations (34%)
- Inclusion of IADLs improved the basic RUG-III model
- Need to incorporate informal care in developing a case-mix measure for home care
- Preserve incentives for providing informal care - a major challenge in developing a payment system
Thank You!

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