Cost-effectiveness of Enhanced Depression Care for Patients With Acute Coronary Syndrome

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Conflict of Interest Disclosures: None
Collaborators

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Overview

• Rationale for cost-effectiveness (CE) analysis of Coronary Psychosocial Evaluation Studies (COPES)
• Approach to estimating cost and quality of life (QoL) outcomes
• Approach to CE analysis
• Results
Role for CE analysis in COPES

- Burden of illness of coronary heart disease (CHD)
  - 440,000 deaths each year
- Depression magnifies CHD risk
- Competing interventions in patients with CHD
  - smoking cessation programs
  - medication adherence interventions
- Cost and cost-effectiveness influence decision-making
Estimating cost-effectiveness

• Cost-effectiveness (CE) analysis compares relative value of decisions
• Economic costs = resource utilization or opportunity costs
• Quality-adjusted life-years (QALYs) or other units for effectiveness
  • integrates quality and quantity of life
  • Utility $\in [0 \text{ (death)}, 1 \text{ (perfect health)}]$
• utility x duration = quality-adjusted life-years
QALYs

Utility

Time (years)

Increased QALYs

With treatment
Without treatment
Cost-effectiveness ratio

\[
\text{CE ratio} = \frac{\text{Cost}_{\text{new policy}} - \text{Cost}_{\text{current policy}}}{\text{Effect}_{\text{new policy}} - \text{Effect}_{\text{current policy}}}
\]

\$\quad \text{Life years, QALYs}
COPES: Sources of healthcare utilization

- Intervention & control group
  - Outpatient visits
  - Hospitalizations
  - Medications
- Intervention group only
  - Pre-specified mental health visits
Estimating costs

- Ambulatory care (mental health, primary care, cardiology)
  - CPT codes and Medicare reimbursement
- Hospitalizations
  - DRGs and Medicare reimbursement
  - Acute myocardial infarction, angina, heart failure
- Medications
  - Antidepressants only (fluoxetine, paroxetine, etc.)
  - Average wholesale price
Data limitations

• Participants surveyed every two months
  • No closed healthcare system

• Incomplete data on outpatient care
  • Data are categorical, not continuous

• Incomplete data on non-ACS hospitalizations
Other important economic costs not considered

- Out of pocket expenses (e.g., copays)
- Time costs for travel, waiting, etc.
- Employment/productivity
Quality of life

- Participants completed the Short Form-12 (SF-12, version 2) health survey
- Completed other surveys to assess quality of life (QOL) but only SF-12 preference-based
- SF-12 responses available at baseline and at 6 month follow-up
SF-12v2™ Health Survey Scoring Demonstration

This survey asks for your views about your health. This information will help keep track of how you feel and how well you are able to do your usual activities.

Answer every question by selecting the answer as indicated. If you are unsure about how to answer a question, please give the best answer you can.

1. In general, would you say your health is:
   - Excellent
   - Very good
   - Good
   - Fair
   - Poor

2. The following questions are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?
   - Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf
   - Climbing several flights of stairs

3. During the past 4 weeks, how much of the time have you had any of the following problems with your work or other regular daily activities as a result of your physical health?
   - Accomplished less than you would like
   - Were limited in the kind of work or other activities

4. During the past 4 weeks, how much of the time have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)?
   - Accomplished less than you would like
   - Did work or activities less carefully than usual

5. During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?
   - Not at all
   - A little bit
   - Moderately
   - Quite a bit
   - Extremely

6. These questions are about how you feel and how things have been with you during the past 4 weeks. For each question, please give the one answer that comes closest to the way you have been feeling.
   How much of the time during the past 4 weeks...
   - Have you felt calm and peaceful?
   - Did you have a lot of energy?
   - Have you felt downhearted and depressed?

7. During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting friends, relatives, etc.)?
   - All of the time
   - Most of the time
   - Some of the time
   - A little of the time
   - None of the time

Thank you for completing these questions!
Estimating health utilities

- SF-12 responses converted to utilities using published regression equation
  - standard gamble-based preferences of 611 members of the general UK population

\[ Utility = 1 - \beta_1 \cdot sf12\_resp_1 - \beta_2 \cdot sf12\_resp_2 - \ldots - \lambda \ast worst\_resp \]

- Linear regression to adjust utility at follow-up using baseline utility and patient characteristics
Cost-effectiveness analysis

• Mean value is $\Delta C/\Delta E$
  • difference-in-differences of means, within-group and between baseline and follow-up
• Bootstrapping to estimate confidence intervals
  • resamples from original data with replacement
  • simulates population distribution of the CE ratio
  • typically performed at least 1,000 times
• Layered onto multiple imputation
• Intercooled Stata 11.2
Bootstrap process

$x_1, x_2, x_3, \ldots, x_n \quad \leftarrow \text{original data}$

$x_1, x_1, x_3, \ldots, x_{n-2}$

$x_3, x_1, x_3, \ldots, x_n$

$x_2, x_2, x_1, \ldots, x_{n-4} \quad \leftarrow \text{resampled data}$

$f(x)$

statistic of interest

HOSPITAL/INSTITUTE/CENTER

Cost-effectiveness of COPES

1,000 2,000 3,000 4,000 5,000 6,000

Cost-effectiveness ratio, $/QALY

Frequency

0 100 200 300 400 500 600 700 800

1,000 2,000 3,000 4,000 5,000 6,000

Cost-effectiveness of COPES

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Cost-effectiveness of COPES
SF-12 component scores – 6 mo

Physical component summary score

Mental component summary score

Intervention

Control

* = p<0.1

**=p<0.05
Health utility

Baseline (3 mo)  Follow-up (9 mo)

\[ p = 0.07 \]

Intervention  Control
Healthcare costs (at 6 mo)

- **Intervention**
  - Medications
  - Mental health visits
  - Primary care doctor
  - Cardiology visits
  - Hospitalization

- **Control**
  - Medications
  - Mental health visits
  - Primary care doctor
  - Cardiology visits
  - Hospitalization

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Cost-effectiveness of COPES
Cost-effectiveness scatter plot

$\Delta C = -$595 (SE=410)
$\Delta E = 0.02$ QALY (SE=0.007)

**Thank you!**