METHODS IN ECONOMIC ANALYSIS OF PATIENT SUPPORT PROGRAMS IN AGING

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Objectives of this Workshop

1. Recognize circumstances in which economic analyses of aging programs are impactful to policymakers, versus when they are necessary
2. Discuss the major types of applied health economic analyses
3. Discuss which costs and outcomes may be included in applied health economic analyses
4. Discuss our team’s experiences in conducting economic analyses on aging programs
Why do we need economic analyses of aging programs?

• Increased financial burden of diseases of aging
• Increased societal realization that resources for healthcare are finite
• Need to express value of aging programs in ways that are meaningful to healthcare policymakers:
  – Health Plans
    • Traditional insurer
    • Managed care organization (MCO)
    • Pharmacy benefit manager
  – Government / Society
    • US: CMS, State Medicaid programs (FDA: not presently)
    • UK: NICE
    • Other countries
When are Economic Analyses of Aging Programs Most Impactful to Policymakers? Patients with Moderate Disease

- **Mild Disease**
  - Least Costly
  - Community-dwelling
  - Cares for self
  - Can make decisions
  - Undiagnosed or newly diagnosed
  - Disease burden to family is low
  - Can self-report outcomes

- **Moderate Disease**
  - Community-dwelling
  - Informal caregiving then formal caregiving
  - Needs assistance making decisions
  - Diagnosed
  - Disease Burden to family is moderate
  - Cannot self-report; reliance on caregiver

- **Severe Disease**
  - Most Costly
  - Institutionalized
  - Formal caregiving
  - Cannot make decisions
  - Medical complications
  - Disease burden to family is high
  - Outcomes difficult to capture

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Economic Analyses most impactful here
When do Economic Analyses of Aging Programs become NECESSARY for Policymakers? Consider Program Effect vs. Expected Cost

<table>
<thead>
<tr>
<th>PROGRAM EFFECT</th>
<th>High</th>
<th>Equal</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Equal</td>
<td>No</td>
<td>Neutral</td>
<td>No</td>
</tr>
<tr>
<td>Low</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

# Applied Health Economics: Types of Analysis

<table>
<thead>
<tr>
<th>Method</th>
<th>Economic Value Measure</th>
<th>Outcome Measure</th>
<th>When to Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost Minimization</td>
<td>Lowest cost option</td>
<td>Any measure so long as it is considered equal between the two treatments</td>
<td>When you have 2 options with equal outcomes and just need to determine cost.</td>
</tr>
<tr>
<td>Cost Consequence</td>
<td>All costs: direct, indirect</td>
<td>Multiple outcomes of various measurements – clinical or other</td>
<td>When you can not or do not want to standardize outcomes; or when there are multiple outcomes measured in different units</td>
</tr>
<tr>
<td>Cost Effectiveness</td>
<td>Incremental Cost effectiveness ratio</td>
<td>Outcome is a measure of clinical effectiveness</td>
<td>When 2 options can be measured with the same clinical endpoint (e.g. LDL points lowered; treatment goal achieved; events avoided)</td>
</tr>
<tr>
<td>Cost Utility</td>
<td>Cost per Quality adjusted life year (QALY)</td>
<td>Outcome is a utility score such as a QALY</td>
<td>To compare 2 treatments for a given condition or compare treatments across conditions</td>
</tr>
<tr>
<td>Cost Benefit</td>
<td>Cost – Benefits</td>
<td>Dollar value of total treatment/ intervention benefits</td>
<td>When the benefits of treatment can be converted into dollars – this is rare</td>
</tr>
</tbody>
</table>

Note: Matrix excludes return on investment (ROI) and opportunity cost analysis since these approaches do not involve weighing costs with clinical outcome.
# Applied Health Economics: How Costs and Outcomes are Expressed for Each Type of Analysis*

<table>
<thead>
<tr>
<th>METHODOLOGY</th>
<th>COST UNIT</th>
<th>OUTCOME UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>COI / BOI</td>
<td>$</td>
<td>Not measured</td>
</tr>
<tr>
<td>CMA</td>
<td>$</td>
<td>Assumed to be equivalent for the interventions compared</td>
</tr>
<tr>
<td>CBA</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>CEA</td>
<td>$</td>
<td>Natural units</td>
</tr>
<tr>
<td>CUA</td>
<td>$</td>
<td>QALYs or other utility measure</td>
</tr>
</tbody>
</table>

Two Ways to Conduct Applied Economic Analyses

1. “Piggyback” the economic analysis alongside a trial
2. Develop an economic model using data from different sources
What is an Economic Model?

PAST AND PRESENT COSTS AND OUTCOMES ARE USED TO PREDICT FUTURE COSTS AND OUTCOMES.
Cost-Effectiveness Analysis (CEA)

• Used when intervention costs are easily measured in dollars, but outcomes are difficult to quantify or best if left in natural units

• Units of effectiveness: examples
  – Meaningful improvement ADL
  – Life-years extended $\rightarrow$ usually QUALITY-ADJUSTED LIFE YEARS (QALYs)
Cost-Effectiveness Analysis (CEA)

• Results expressed as average cost-effectiveness ratio (ACER) or incremental cost-effectiveness ratio (ICER)
  – ACER is calculated by dividing treatment cost by the outcome
    • Example: in 100 patients, treatment cost is $50,000; results in 90 cures, then ACER = $50,000/90 = $556 per cure
    • Independent of other treatments
  – ICER
    • Preferred method because reveals the cost per effectiveness unit, of switching from one treatment to another
Example: How to Calculate Incremental Cost-effectiveness Ratio (ICER)

- Cost required to obtain additional units of effectiveness, for intervention A vs. intervention B
  - Example (100 patients): Treatment A costs $50,000 and results in 90 cures; Treatment B costs $100,000 and results in 95 cures

\[
\text{ICER} = \frac{($100,000 - $50,000)}{(95-90)} = $10,000 \text{ per cure}
\]
# Outcomes which should be considered for Cost-Effectiveness Analyses of Aging Programs

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Potential Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Patient outcomes:</strong></td>
<td></td>
</tr>
<tr>
<td>Functional status</td>
<td>ADL, IADL</td>
</tr>
<tr>
<td>Psychological burden</td>
<td>Physical and mental QOL</td>
</tr>
<tr>
<td></td>
<td>Depression, anxiety, and/or stress</td>
</tr>
<tr>
<td>Productivity</td>
<td>Work productivity</td>
</tr>
<tr>
<td></td>
<td>Time for social/leisurely activities</td>
</tr>
<tr>
<td>Patient safety</td>
<td>Rate of falls</td>
</tr>
<tr>
<td><strong>Caregiver outcomes:</strong></td>
<td></td>
</tr>
<tr>
<td>Caregiver time</td>
<td>Time spent doing other things</td>
</tr>
<tr>
<td></td>
<td>Increased work hours caregiver</td>
</tr>
<tr>
<td></td>
<td>Employability</td>
</tr>
<tr>
<td></td>
<td>Time for social/leisurely activities</td>
</tr>
<tr>
<td>Caregiver’s psychological burden</td>
<td>Depression, anxiety, and/or stress</td>
</tr>
<tr>
<td><strong>Societal outcomes:</strong></td>
<td></td>
</tr>
<tr>
<td>Quality and quantity of life</td>
<td>Life years gained; QALYs</td>
</tr>
<tr>
<td>Institutionalization</td>
<td>Time to institutionalization</td>
</tr>
<tr>
<td></td>
<td>Institutionalization rate</td>
</tr>
</tbody>
</table>

1 Caregiver refers to an informal caregiver who is unpaid and typically a family member or friend
What is a Quality Adjusted Life Year (QALY)?

• Used as a measure of outcome in the incremental cost effectiveness ratio (ICER), i.e., in the DENOMINATOR

• Is a general effectiveness measure which captures the utility of an individual's health, based on their reported physical and emotional health states over one year
  – That health state is then weighted according to established population values
    • 0 to 1
    • 1: perfect health
    • 0: health state equivalent to death
Validated Instruments for Measuring Heath Utility (Quality-Adjusted Life)

- EuroQol (EQ-5D):
  - Developed by EuroQol group and consists of 5 dimensions: mobility, self care, usual activities, pain/discomfort, and anxiety/depression\(^2\)
  - Reports health utility on the day of the assessment and was scored using the US valuation system developed by Shaw, et al, with scoring algorithm from the US Agency for Healthcare Research and Quality
  - Scored as EQ-5D Index with utilities ranging from 0 (death) to 1 (perfect health)

- HUI 2/3 system contains both the HUI 2 instrument, and the HUI 3 instrument:
  - HUI2 consists of 6 attributes (sensation, mobility, emotion, cognition, self-care, pain; excluding fertility) of four or five levels
  - HUI3 consists of 8 attributes (vision, hearing, speech, ambulation, dexterity, emotion, cognition, pain) defined by five or six levels
  - Recall period of 1 week
  - Scoring algorithm reflects the preferences of the Canadian general population
Types of Costs Used in Applied Economic Analyses of Aging Programs

- Direct health care costs
- Lost productivity costs
- Time costs
Direct health care costs

• Health care services
  – Medical care used by patients
  • In/out patient visits, visit to psychologists/counselors, residential treatment, emergency visits, prescription drug, laboratory procedures
Lost Productivity Costs

- Time lost from work (if employed, for informal caregivers and patient)
  - Reduced work hours (if working)
  - Duration of emotional disturbance influencing productivity
  - Rate of the productivity compared to the best level of productivity
Time Costs

• Unreimbursed Care Providers
  – Time spent in intervention
  – Training sessions for interventionist
  – Time spent conducting telephone support
  – Time spent traveling to/from patient home or senior center
  – Time spent in preparation and documentation

• Unreimbursed Supervisor
  – Time spent managing and supervising interventionists (e.g., in person, by phone, by email)
Time Costs (continued)

• Time spent by patient and caregiver traveling to and waiting for medical treatment
• Time spent by family and informal caregiver assisting with food, lodging, transportation, clothing, shopping
How Do We Measure these Costs? If Piggybacking Economic Analysis to Trial, then Microcosting can be Used

- “Microcosting”: You can look at this as “itemizing” the resources and costs required to deliver a healthcare service
- Microcosting of human resources may require measuring time in motion, which consists of measuring each staff member’s time \( \times \) their wage rate to estimate the costs of their service
- Microcosting of non-human resources may require use of a tracking log, or a billing database where travel, supplies, and equipment are itemized
Example of Trial Using Microcosting Approach:

Randomized Controlled Trial of the Beat the Blues Intervention for Depressed African American Elders (NIMH grant 1RC1MH090770-01)
Beat the Blues Trial: Background

- Depression exerts significant morbidity in older adults; while antidepressant medications can be effective for some people, little data exist on non-pharmacological support programs.

- Beat the Blues (BTB) is a non-pharmacological intervention designed to teach older low income, urban, community dwelling depressed African Americans coping skills.

- BTB was tested in an 8-month randomized two-group experimental design (treatment vs. wait list control).

- Economic Analysis was piggybacked alongside the trial:
  - Costs obtained using microcosting approach.
  - Outcomes obtained using health utility instruments (EQ-5D and HUI 2/3).
  - Cost effectiveness to be computed as ICER (cost per utility).
Beat the Blues Trial: Methods

• Patients were enrolled in the BTB trial during 2009 and 2010

• Eligibility criteria consisted of the following:
  
  • Had depressive symptoms (PHQ-9 score ≥5),
  • Were African American
  • ≥55 years old
  • English speaking
  • Cognitively intact (Mini Mental Status Exam ≥24)

• Other baseline data included demographics, comorbid health conditions, medications for depression, anxiety, sleep, and pain, and functionality (Activities of Daily Living or ADL, and Instrumental Activities of Daily Living or IADL)

• Health utility (outcome used in the cost effectiveness analysis) captured using EQ-5D and HUI 2/3
Beat the Blues Trial: Cost Effectiveness Design

T1: Baseline
T2: 4 Months
T3: 8 Months

Experimental Period (BTB Intervention)
Post-Intervention Period
Control Period (Usual Care)

Group A: Control Period (Usual Care) → Experimental Period (BTB Intervention) → N=61

Group B: Experimental Period (BTB Intervention) → Post-Intervention Period → N=61

T1: Baseline
T2: 4 Months
T3: 8 Months

N=61
Beat the Blues Trial: Micro-costs Captured

<table>
<thead>
<tr>
<th>Cost Category</th>
<th>Form</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screening</td>
<td>Screening Data Form</td>
<td>Data will be used to determine the total time spent screening.</td>
</tr>
<tr>
<td>Intervention Delivery Cost</td>
<td>Client Contact Log (BTB Interventionist)</td>
<td>Data will be used to calculate time spent in informal/formal contacts with the client and time spent conducting intervention related activity</td>
</tr>
<tr>
<td></td>
<td>Session by Session Delivery Assessment Form</td>
<td>Data will be used to calculate time spent delivering the intervention</td>
</tr>
<tr>
<td>Supervision</td>
<td>Social Worker Supervision Log</td>
<td>This form captures all time spent supervising interventionist</td>
</tr>
<tr>
<td></td>
<td>IHSP Supervisor Contact Log</td>
<td>Data will be used to calculate time spent supervising by the IHSP supervisor</td>
</tr>
<tr>
<td></td>
<td>Research Coordinator Supervisor Log form</td>
<td>Data will be used to calculate time spent supervising the research coordinator</td>
</tr>
<tr>
<td></td>
<td>Adverse Events Alert Log</td>
<td>Data will be used to determine the time required to address adverse events occurring during the trial</td>
</tr>
</tbody>
</table>
Beat the Blues Trial: Lessons Learned So Far

- Piggybacking yields economic analyses with strong internal validity
- Microcosting is tedious but results in refined data
- Everyone needs to be trained on why and how the cost measures are being measured
- Economic measures add to the time required to complete study assessments
- Economic analyses require an investment in specialized personnel and resources
  - Methodologist
  - Analyst
  - Research Assistant
Questions / Group Discussion
For further information, feel free to contact:

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