JOHNS HOPKINS BLOOMBERG SCHOOL of PUBLIC HEALTH

Methods of Calculating Costs

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Outline

- Cost is price times quantity
- Basic Terms
- Why measure costs?
- How to measure costs?
- Empirical and modeling
- Good sources on cost measurement

Cost is price times quantity

- Need data on prices and quantities
- There are issues with obtaining both types of data
- Price data may be specific to where the data are being collected or may represent charges rather than costs of production
- Quantities may be difficult to track

Basic Terms

- Perspective—whose costs
- Current year—dollar value after adjusting for inflation
- Cash flow—costs experienced year by year in a multiple year program
- Present value—how much money is needed today to fund a cash flow over time assuming that interest can be earned on unspent money
- Total cost—all costs
- Incremental cost—additional costs of one intervention or program compared with another

Why measure costs?

- Budgeting
- Input into some type of economic evaluation

Budgeting—Things that are needed

- Costs from the perspective of the organization that is bearing the costs
- Total costs in order to budget
- Costs in current year's currency in order to know how much to allocate
- Useful to know about "cash flow" in addition to using present value

Inputs into economic evaluations—what types of evaluations

- Budget impact
- Cost of illness or burden of disease
- Cost minimization
- Cost effectiveness/Cost utility
- Cost benefit
- Cost consequence

Inputs into economic evaluations—what is needed

- To know the perspective
- Usually incremental costs
- Usually present value

For what are economic evaluations useful?

- An input into the decision making process
- If on a tight budget this may be the only or most important input into the decision making process
- Often economic considerations are just one of many inputs into the decision making process since there are many things for which economics cannot account
  - Fairness, equity, disparities
    - Economics can help to explain these without necessarily having an answer on how to weight these considerations in the decision making process

How to measure costs

- Proxies for costs
- Claims data
- Cost accounting system
- Micro-costing
- Regression analysis

Proxies

- Do not have data directly related to the intervention or population that is being studied or evaluated
- Have data from a secondary source
- This creates an approximation if an approximation is all that is needed
- Usually at an early stage of studying an intervention or program and making a decision on future implementation
- Allows us to look at average cost but does not provide much information on cross patient variation

Example with Proxies—Slide 1

- Guided Care project
  - Nurse patient navigator intervention
  - Nurse within a physician practice to coordinate care for patients within the practice
    - Aim is higher quality, less expensive care with less of a burden on caregivers
- Implemented in three systems
  - Tri-care, FFS, managed care
- Very challenging just to achieve similar measure of quantities using claims data with variable coding and variable details

Example with Proxies—Slide 2

- Used CMS's published data on average expenses for a hospital day, a home care episode, a physician visit, etc.
- For the nurse patient navigator we used average salary and benefits
- For the cost-benefit analysis we used a projected maximum caseload
- All results are approximations at best just to give some idea
- Study to date has focused only on first eight months of care with this system

Claims data

- If have one organization this can be fairly straightforward
- Tend to use paid amount rather than billed amount
- When have multiple claims data sources have to reconcile how claims are managed and paid
- Can use detail of claims to develop episodes of care
- Difficult to try to look at care that is specifically related to a given disease so often measure all costs
- Can divide costs by different types (ER, physician, hospital, etc.)
- If payer pays a similar amount for all services of a given type it can be difficult to study across patient variation

Example with Claims Data-1

- Hospital at Home
  - Provide care for community acquired pneumonia, COPD, cellulitis, and congestive heart failure that would need a hospital admission in the home
  - Physician on call with required visits
  - Nursing care initially 24 hours per day
  - Send to hospital as needed for specific procedures
  - Keep person comfortable and try to avoid diseases from the hospital
  - Key is to understand how the claims for the hospital at home care were filed

Example with Claims Data-2

- Three systems
  - One FFS, one HMO, on VA
- The VA did not have claims per se
- The other two were analyzed in a way to make them as equivalent as possible
- Look at amount paid
- Compare the total costs of the index episode in a period with regular hospitalization and a period with hospital at home

Cost Accounting System

- Useful if there is a single organization as there is not necessarily uniformity of the implementation of these systems across organizations
- Need to apportion salaries, overhead, and other costs that are not easily linked to single services
- Can also use an “ingredients” approach to link to specific individuals/services
- Sometimes use simple apportioning as a function of size
- Other times use more complicated approaches that allow for interaction in different cost centers and link overhead to resources rather than just size
- Can be used to study across patient variation

Cost Accounting Example

- VA involved in the home hospital study
  - Complex step down cost accounting approach to allocate resources to patients in the intervention
- Could also be done if a single hospital were viewed as an example for other hospitals
  - Suppose Johns Hopkins Hospital had a new intervention
    - Should it be considered a good example
    - Perhaps a new kiosk-based questionnaire system for individuals who present to an ED with dizziness

Micro Costing

- Gathering detailed information on all resources
  - Personnel time
  - Supplies
  - Mileage (if the intervention involves going into the community)
- How detailed?
  - Use a PDA with time stamps by the minute
  - Half hour intervals
- How much of a burden does this impose on those who are implementing the intervention?
- Good if service is new and there is no standard reimbursement and we are interested in exploring within service between patient variation

Micro Costing Example #1

- Sometimes the method of tracking personnel time follows a patient
- Preschool child screening for vision disorders
- Children were screened by different personnel using different devices
  - Each child received multiple screenings
- Time stamp at each location where the child's sheet was stamped at the start and end of each screening
- Easy compliance

Micro Costing Example #2

- RCT comparing two surgical interventions for women with dysfunctional uterine bleeding
- A 24 page form that asked about every physician, resident, scalpel, basin and other resource used
- Too much information
- Not good compliance
- Huge burden

Micro Costing Example #3

- In an international setting we simple asked staff to estimate time at the level of half a morning or whole morning and the same for the afternoon

Micro Costing Example #3

- Social work intervention with time stamps on activities, particularly when calling clients
  - As long as the time stamp is more or less built into the information system there is high compliance
- Otherwise, asking staff to fill out time down to the minute is likely to be over burdensome

Micro Costing Example #4

- Study of nurses and community health workers intervening with low income mothers
- Staff recorded time out and time in from each home visit (and each unsuccessful attempt)
- Staff recorded time on the phone
- Staff recorded mileage
- Problem with multi-tasking

Micro Costing Example #5

- Gathering data on pediatric asthma medications
- Contacting many pharmacies around Baltimore
- Incredible effort

Regression Analysis

- Often secondary analysis of a large data set in which a specific condition is identified
- Data are usually self-reported
- Not necessarily good for understanding cost of a particular treatment
- Can be very useful for understanding the cost of a condition when looking at prevention of the condition
- The level of detail available (total charges, total costs, cost by category of service) varies from one study to the next

Regression analysis example

- Cost of obesity has been studied using the Medical Expenditure Panel Survey data
  - Large national survey data set at AHRQ
- Compare people who are obese or overweight with people who are not
- Multivariable regression
- Analyzing costs this way can be tricky as the distributions are non-normal, there may be lots of zeros, and the analytic techniques are not always straightforward

Cost Calculations Over Time

- If have old data, need to bring up to date using inflation
  - Overall consumer price index
  - Medical care
  - Region specific
  - Producer price index?
- For calculations of present value the techniques are well developed and are fairly straightforward with an spreadsheet program

Conclusions

- Many options on how to calculate costs
- Many purposes for which costs can be calculated
- Choice of best method will depend on the purpose, the perspective, and the tradeoff with the burden that will be imposed on research staff

Empirical and Modeling

- Empirical costs are preferred for many reasons
- There are some situations in which a combination of empirical data is used to generate a model and the model is the best information we have for comparing costs of different interventions
- Modeling is viewed as acceptable
- Usually part of a decision analysis model

For an Excellent Overview

- *Medical Care*
- July 2009
- Volume 47
- Issue (7 Suppl 1)
- A collection of articles from a conference held at AHRQ to discuss costing methods and issues