Budget Impact Analysis

Todd Wagner, PhD

April 20, 2022

HERC
Health Economics Resource Center

VA
U.S. Department of Veterans Affairs
Veterans Health Administration
Health Services Research & Development Service

Acknowledgements

- This work has benefitted from my work with Heather Gold, Alex Dopp, Jo Jacobs, David Goodrich, Jean Yoon, Angela So, Amy Kilbourne, Steve Asch, Donna Zulman, Amanda Midboe, Enola Proctor, Russ Glasgow, Andrew Quanbeck, Ties Hoomans, and Jim Burgess

- No conflicts; errors are my own

Far from Perfect

- Institute of Medicine (IOM) estimated that 30% of health spending was wasted.[1]

1. Smith M, Saunders R, Stuckhardt L, et al., editors. *Best Care at Lower Cost: The Path to Continuously Learning Health Care in America. Washington, D.C.: Institute of Medicine. The National Academies Press, 2012.*

Table 2. Cost Estimates by Waste Domain

Domain	Costs, $US Billion	
	Annual Estimates	Total Range
Failure of Care Delivery		
Hospital-acquired conditions and adverse events[18-22]	5.7-46.6	
Clinician-related inefficiency (variability in care, inefficient use of high-cost physicians)[27,28]	8.0	**102.4-165.7**
Lack of adoption of preventive care practices (obesity, vaccines, diabetes, hypertension)[23-26]	88.6-111.1	
Failure of Care Coordination		
Unnecessary admissions and avoidable complications[19,29]	5.9-56.3	**27.2-78.2**
Readmissions[30,31]	21.25-21.93	
Overtreatment or Low-Value Care		
Low-value medication use[12,32-35]	14.4-29.1	
Low-value screening, testing, or procedures[14,36,37]	17.2-27.9	**75.7-101.2**
Overuse of end-of-life care[38]	44.1	
Pricing Failure		
Medication pricing failure[8]	169.7	
Payer-based health services pricing failure[39,40]	31.4-41.2	**230.7-240.5**
Laboratory and ambulatory pricing[41]	29.7	
Fraud and Abuse		
Fraud and abuse in Medicare[42-44]	58.5-83.9	**58.5-83.9**
Administrative Complexity		
Billing and coding waste[45]	248	**265.6**
Physician time spent reporting on quality measures[10]	17.6	
Total		**760-935**

Delivery Failure
~$200-340 B

Shrank WH, et al. Waste in the US Health Care System: Estimated Costs and Potential for Savings. *JAMA.*, 2019.

Delivery Failures

- Health care systems frequently have to decide whether to implement interventions designed to reduce gaps in the quality of care.

- A lack of information on the cost of these interventions is often cited as a barrier to implementation.

Value

- Managers could employ cost-effectiveness analysis (CEA) to help make decisions.

- CEA is the most widely accepted and well-known method for assessing the value of a medical intervention.

Garber AM, Phelps CE. Economic foundations of cost-effectiveness analysis. *J Health Econ.* 1997;16(1):1-31.
Gold MR, Siegel JE, Russell LB, Weinstein MC, eds. *Cost-Effectiveness in Health and Medicine.* Oxford University Press; 1996.
Neumann P, Sanders G, Russell L, Siegel J, Ganiats T, eds. *Cost-effectiveness in Health and Medicine.* Oxford University Press; 2016.

CEA

- Compares two or more options with regard to gains in outcomes, measured in quality adjusted life years (QALYs), relative to costs

$$\frac{\text{Ave Cost}_a - \text{Avg Cost}_b}{\text{Ave QALY}_a - \text{Avg QALY}_b}$$

Incremental cost-effectiveness ratio (ICER)

- Traditionally: long term, societal costs

Gap

- Health care organizations often resist implementing interventions that are cost-effective, why?
  - Is it a failure of decision making?
  - Is it a failure of CEA?
  - Both?

Today's Objectives

- Give you insights into why this gap exists and persists
- Describe methods for economic evaluation in implementation science
- Explain budget impact analysis in detail

But first….

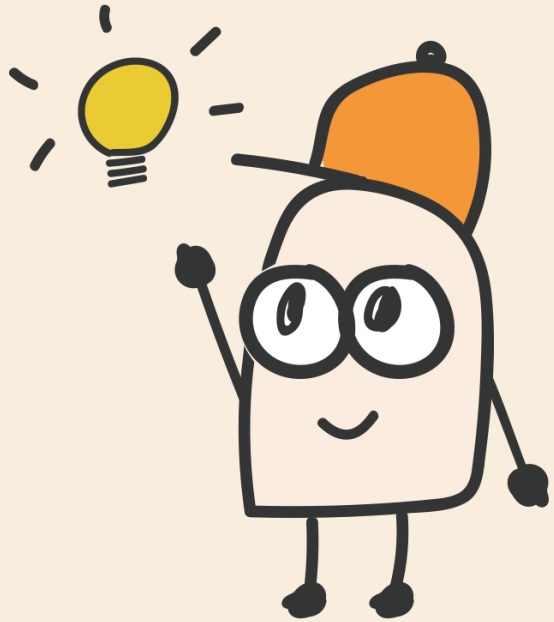

JOB OFFER

Implementing Change

- Hospital CEO offers you a job to reduce costs and improve care in the ICU.
- The base pay isn't that great, but there is a huge bonus if the hospital's costs decrease.
- Do you take the job?

Luckily, you're smart

Search Google Scholar



Call your friend who is a critical care nurse

ICU Care

- More than 51,000 ICU beds in the US in 2015
- ICUs usually have three types of patients
  - Those who need life sustaining care
  - Dying patients
  - Lower acuity patients where the clinician wants extra monitoring of vitals
- Many hospitals are adding ICU beds, yet up to 40% of ICU admissions are not for life sustaining care.

ICU Care is Expensive

- Expensive staff
- Fancy equipment
- Lots of additional care, especially early on
  - Tests
  - Medications
  - Scans
  - Additional monitoring

	Cost Per Added Day (VA 2018)		
Day of Stay	Total Cost	Variable Costs	Fixed Costs
1	9,605	5,210	5,915
2	6,838	3,692	2,712
3	7,250	3,951	2,829
4	7,914	4,303	3,069
5	7,332	4,050	2,889
6	7,826	4,362	2,988
7	6,458	3,541	2,645

Two Short Term Options

- Option 1: Divert low acuity patients out of the ICU (diversion)

- Option 2: Transfer low acuity patients out of the ICU earlier (expedited transfer)

Chiou H, Jopling JK, Scott JY, et al. Detecting organisational innovations leading to improved ICU outcomes: a protocol for a double-blinded national positive deviance study of critical care delivery. *BMJ open.* 2017;7(6):e015930.

Poll– What is your winning bet?

- Option 1: Divert low acuity patients out of the ICU (diversion)

- Option 2: Transfer low acuity patients out of the ICU earlier (expedited transfer)

Option 1: Diversion

- This means that some ICU beds will go unfilled.
  - ↓ in tests, tubes, monitoring, scans, etc.
  - Possible ↓ in labor costs
  - No decrease in space and other fixed costs
- Net effect is unclear
- Bonus seems unlikely; depends on your labor costs and how quickly you can redeploy staff

Option 2: Expedited Transfer

- Keeps ICU beds occupied
  - Same staff
  - Same space costs
- But, more day 1 admissions
  - With more day 1 admissions, there is an increase in tests, tubes, monitoring, scans, etc.
- Net effect is ↑ average cost per patient
- Definitely no bonus

Economic Reality

- There are a couple important issues at play here. Understanding these are key to how you think about innovation and economics in health care.

- Key issues
  - Production is a process. It yields information on effort. Costs can be computed using accounting rules.
  - Embedded in these accounting rules are:
    - Time horizon: Short vs long term
    - Efficiency
  - Accounting costs do not always match the **opportunity costs**.

Opportunity Cost

- The costs of using resources for a particular activity are the benefits foregone because the resources were not used in the next best alternative—this is the opportunity cost. (WHO, 2003)

- Opportunity cost is theoretical, but it is what we should be measuring.

Opportunity Costs are Everywhere

- You consider this in your everyday life
  - Do you go out for dinner?
  - Where do you invest your money?

- Organizations use it all the time.
  - Example: cost of a no show for a medical clinic or an airline

Traditional CEA

- The CEA Panel (1996) recommended the societal perspective (all costs) over the lifespan of the participants.

- Wow. That's a lot of information.
  - Technically tough
  - Hard to interpret
  - Maybe ideal for federal policy, but what about other decision makers or program managers?

- That also makes assumptions about the decision maker and their opportunity cost

- This can lead to paradoxical findings

Paradox in Substance Use Tx

- Over the past two decades,
  - Increasing evidence that substance use treatment was cost effective
  - Large contraction in substance use treatment programs
- Ettner et al[1] found that substance use treatment was cost-effective due to savings in criminal justice.
- VA investments in substance use treatment do not save the hospital money.[2]
- Implementation is often a local decision and so identifying the right perspective is important.

1. Ettner SL, et al. Benefit-cost in the California treatment outcome project: does substance abuse treatment "pay for itself"? Health Serv Res 2006;41(1):192-213.
2. Humphreys K, **Wagner TH**, Gage M. If substance use disorder treatment more than offsets its costs, why don't more medical centers want to provide it? A budget impact analysis in the Veterans Health Administration. J Subst Abuse Treat 2011;41(3):243-51.

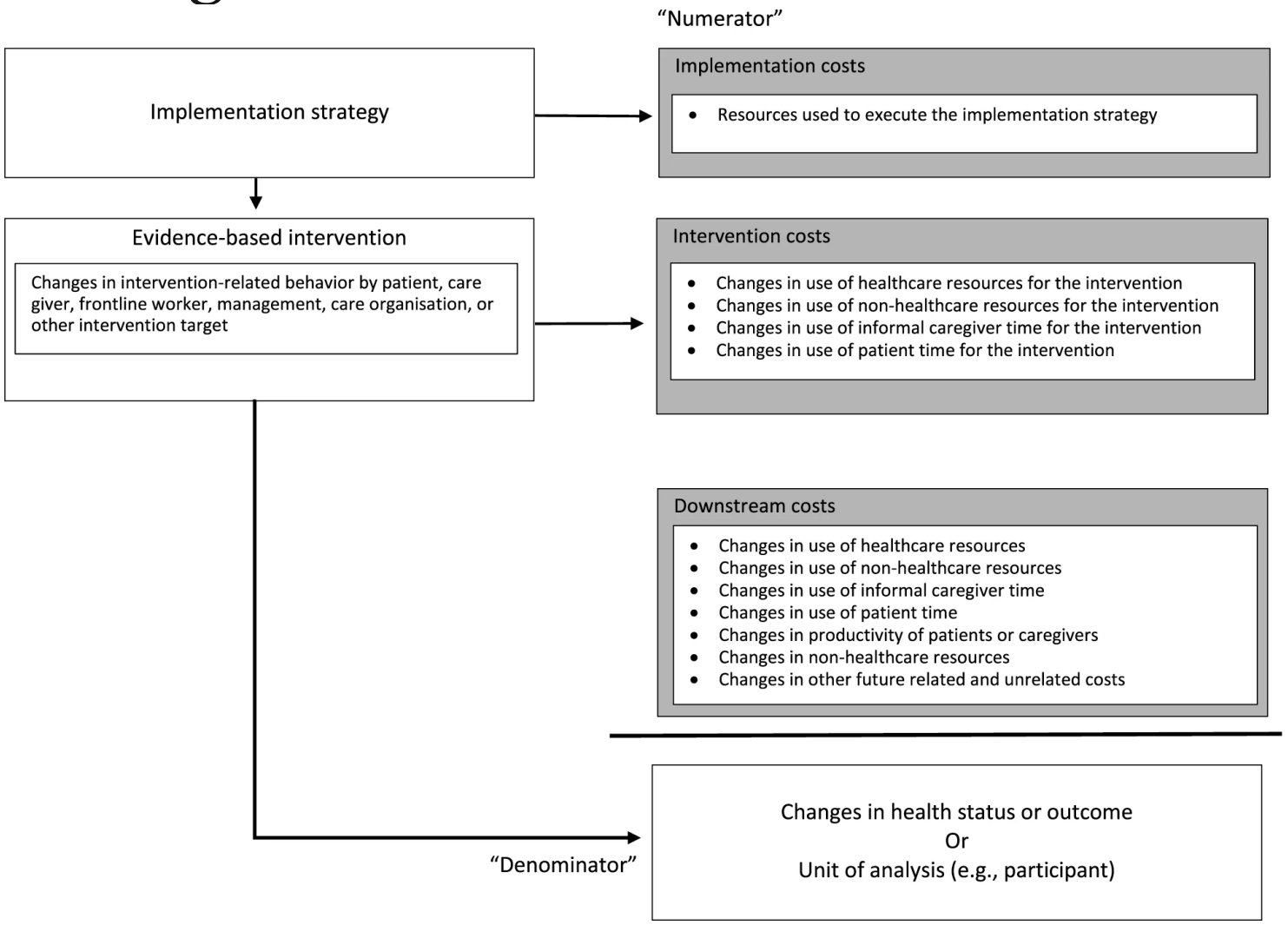
What do managers want?

- Managers often want:
  - Analyses that reflect their perspective
    - Societal is too broad.
    - They have a budget.
  - Analyses that reflect their time horizon
    - Lifetime is too long.
    - Budgets are usually 1-3 years.

Three Keys to Economic Evaluation

1. Perspective
2. Time horizon
3. Use cost estimates that best reflect the opportunity cost for the perspective and the time horizon

Cost Categories



Gold, McDermott, Hoomans, Wagner. Cost data in implementation science: categories and approaches to costing. Implementation Science 2022;17(1):1-2.

Is it Just a Problem of Perspective?

"Poor things!"

Time Horizon

- Changing the time horizon is more complicated than changing the perspective.

- Embedded in the time horizon are different opportunity costs.
  - Variable costs: supplies, labor
  - Fixed costs: capital equipment, buildings

Fixed Costs in the Short-Term

- Analyses that take a short-term perspective should exclude costs that are fixed in that time period.
- This method is rarely adopted in practice, but it can be particularly important for implementation research, where “success” is often gauged in the next 1 to 3 years.

Variable and Fixed Costs

Total Cost ($)	Var Cost ($)	Fixed Cost ($)	% variable	
Inpatient				Diagnostic Related Group (MSDRG)
29,212	20,199	9,013	67%	major joint/limb reattachment procedure of upper extremities (483)
46,158	25,825	20,333	56%	other vascular procedures with complications (253)
39,465	21,437	18,028	54%	septicemia or severe sepsis (871)
71,802	38,864	32,938	54%	coronary bypass w/o cardiac cath, no complications (236)
31,649	15,369	16,280	49%	alcohol/drug abuse or dependence with rehabilitation (895)
Outpatient				VA Clinic
93	75	18	81%	Pharmacy
361	286	75	79%	Prosthetics
99	62	37	63%	Laboratory
765	450	315	59%	Emergency Care
355	208	147	59%	Primary care

ICU example re-examined

- CEO asked you to save money in short run
- Only way to do that is by focusing on short-term variable costs
  - Diverting low acuity patients away from the ICU saves variable costs and is the winning strategy.
  - Conversely, cycling patients through the ICU faster would increase variable costs.

ICUs in the Long Run

- Diverting low-acuity patients away from the ICU may work in the short-run.
- BUT, this strategy does not work in the long-run.
- In the long-run, vacant beds must be converted into productive resources.

Measuring Implementation Costs

Measurement

- Implementation scientists use strategies to achieve change.
  - Strategies require effort (i.e., they have an opportunity cost)
  - Strategies are separate from the target (i.e., what that the strategy seeks to increase or decrease)

- Let's focus on the strategies first.

Cost Estimation

- There is no database of payments for implementation strategies
- So you will need to estimate the costs yourself
- Creating process maps can be helpful for figuring out who to survey

Process Map for Stroke

- Creating a process map can help identify:
  - Who is involved
  - How often they are involved
  - Situations or conditions for which they are involved
- Develop tools for tracking labor in these processes
- Ex: Cidav's work: https://implementationscience.biomedcentral.com/articles/10.1186/s13012-020-00993-1

Meurer WJ, et al. Provider perceptions of barriers to the emergency use of tPA for acute ischemic stroke. BMC Emergency Medicine. 2011 Dec 1;11(1):5.

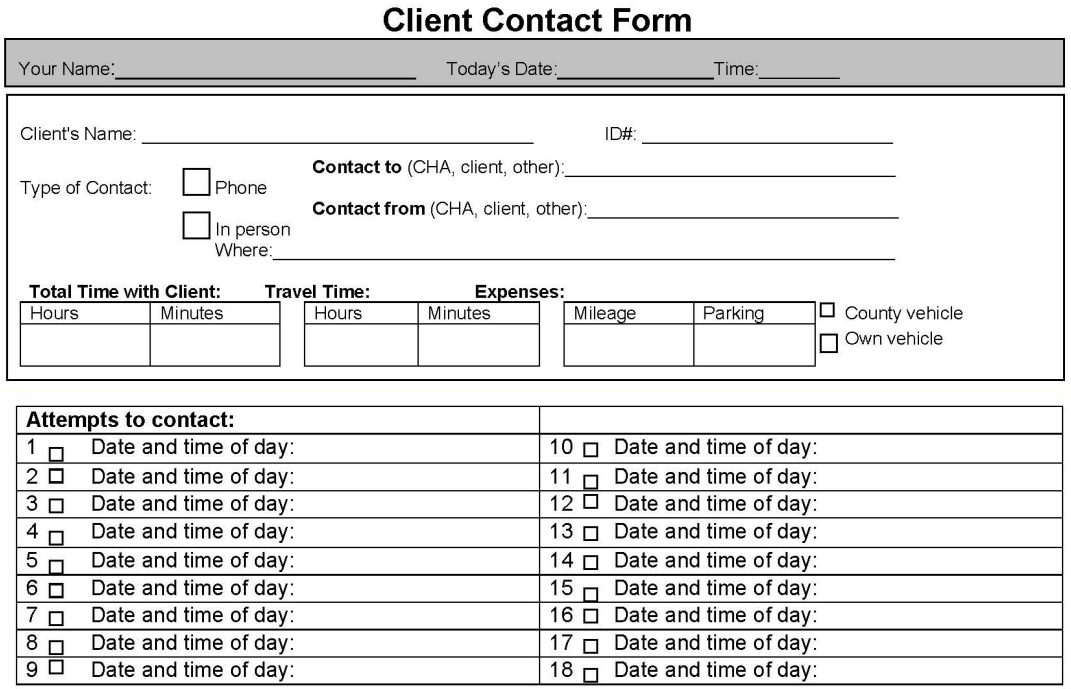
Different Names, Same Method

- Micro-costing is often called by other names
  - Direct measurement
  - Time Drive Activity Based Costing
  - By and large, the methods are the same

- Key questions
  - Precision
  - Accuracy

Measuring Labor Activities

- Develop a method for tracking staff activities
- Some activities require you to collect time estimates.
- Some activities map to a time estimate with little variation



Client Contact Form

Your Name:_____ Today's Date:_____ Time:_____

Client's Name: _____ ID#: _____

Type of Contact: ☐ Phone ☐ In person

Contact to (CHA, client, other):_____

Contact from (CHA, client, other):_____

Where:_____

Total Time with Client:		**Travel Time:**		**Expenses:**		
Hours	Minutes	Hours	Minutes	Mileage	Parking	☐ County vehicle ☐ Own vehicle

Attempts to contact:	
1 ☐ Date and time of day:	10 ☐ Date and time of day:
2 ☐ Date and time of day:	11 ☐ Date and time of day:
3 ☐ Date and time of day:	12 ☐ Date and time of day:
4 ☐ Date and time of day:	13 ☐ Date and time of day:
5 ☐ Date and time of day:	14 ☐ Date and time of day:
6 ☐ Date and time of day:	15 ☐ Date and time of day:
7 ☐ Date and time of day:	16 ☐ Date and time of day:
8 ☐ Date and time of day:	17 ☐ Date and time of day:
9 ☐ Date and time of day:	18 ☐ Date and time of day:

Accuracy

- No one likes completing timecards / forms
- Completion is better if
  - The staff are involved in the design
  - Effort is minimal
  - Reporting is built into workflow (e.g., into the EMR)
  - Reports are reviewed (audit and feedback)
- Accuracy reflects timeliness
  - Monthly activity reports are unlikely to be accurate unless activity is rare and salient
  - Tradeoff in accuracy and respondent burden

Personnel Costs

- Labor costs
  - US: Bureau of Labor Statistics labor costs: https://www.bls.gov/bls/blswage.htm
  - EU: Eurostat https://ec.europa.eu/eurostat/web/labour-market/earnings/main-tables
  - Australia: https://www.abs.gov.au/
  - Wages vary within a country; you may want local costs
- Also
  - May need to include benefits
  - Need to include direct/productive and indirect/non-productive costs (e.g., meeting times)
  - Translating costs from one country to another is hard; costs may not translate due to regulation and licensing

Supplies & Space

- Supplies: Track major supplies
  - Capital investments, such as computers, need to be amortized and depreciated. Common to assume 3-5 year life span for electronics.
  - Most supplies are at market rate

- Space
  - Do you need to include space costs?
  - What kind of space do the staff need?
  - What is the best cost estimate for that space?
  - Home based cardiac rehabilitation direct costs ~55% of total cost in Veterans Affairs system: www.herc.research.va.gov/include/page.asp?id=technical-report-36-indirect-costs
  - Highly dependent on location

Compute Costs

- Costs=quantity of units * unit costs
  - This intervention cost is usually at the program level
  - Program costs may be important and may differ by context (size, location)

- For most analyses, however, we will want these costs at the patient level

Patient level Denominator

- To obtain patient level costs, you need to assign program costs to patients
- How do you define this group / denominator?
- Example:
  - Veterans Affairs system implemented a National Telestroke Program at specific medical centers (dates are known).
    1. Stroke patients program users
    2. Program users

Distributing Costs to Patients: Precision

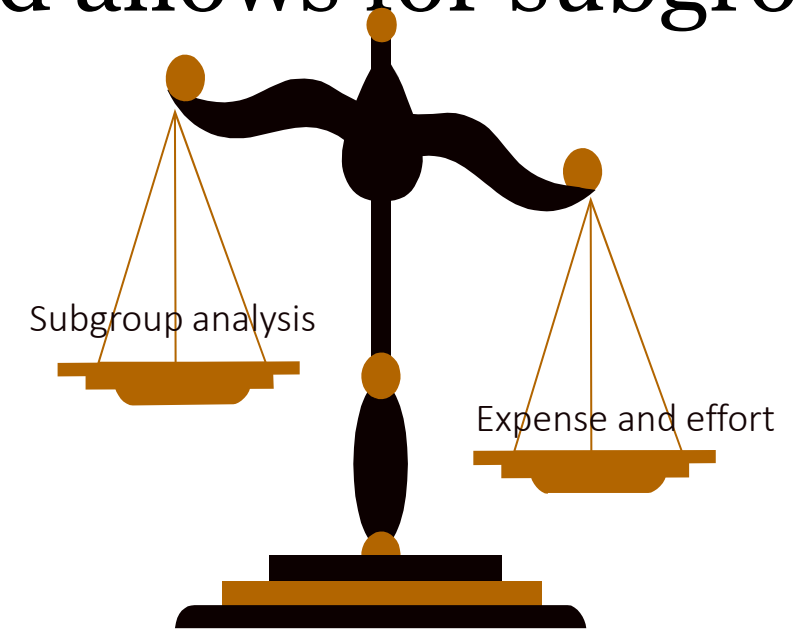
- Intervention used 2 FTE for 1000 participants
- Total labor cost is $100,000 for a year

- Less Precise Method: Labor cost per participant is $100,000/1,000 or $100 per person

- More Precise Method: Create a relative value unit that allows you to distribute costs.
  - In one study, we tracked time spent working with each participant. We used these time estimates to distribute costs.

The Precision Tradeoff:
Precise method allows for subgroup analysis

If there is no variation in costs then subgroup analyses are not possible.



Costs Reflect the Environment

- You need to understand the current environment to understand the cost data generation process
- Costs differ in observable ways: wages and cost of living
- Costs also differ in less observable ways: efficiency and quality

Factors to Consider When Estimating Intervention Costs

- Learning curves and efficiency and capacity
  - Unit costs may decrease with learning (stage of implementation completion).
  - This may be an outcome or a confounder
- Distribution cost is not zero at the margin
  - Changing drugs does not affect distribution costs. But implementation studies often affect other parts of the delivery system, which may be important
- Variation in Fidelity
  - Unit costs may be a function of fidelity

Wagner TH, Yoon J, Jacobs JC, So A, Kilbourne AM, Yu W, Goodrich DE. Estimating Costs of an Implementation Intervention. Medical Decision Making. 2020 Nov;40(8):959-67.

Implementation Costs

- Sometimes you can separate implementation costs from target/treatment costs
- But often the implementation and target/treatment costs are intertwined, so the costs cannot be separated
- Differentiate these costs whenever possible
- Two examples

Example 1: TPA for Stroke

- Tissue plasminogen activator (TPA) is a highly effective clot-busting treatment for ischemic stroke.
- For TPA to be effective, organizations must coordinate care processes quickly.
- Known: purchase price for TPA
- Unknown is the cost of using different strategies to increase coordination

Example 2: Depression Treatment

- Team-based collaborative care is more effective than traditional approaches for depression tx.
- Health care providers can use strategies to increase the number of patients receiving collaborative care.
- Unknown:
  - the cost of the collaborative care
  - the costs of the implementation strategies

Budget Impact Analysis (BIA)

BIA

- The budget impact analysis (BIA) emerged from the International Society of Pharmacoeconomics and Outcomes Research (ISPOR).[1,2]

- It is increasingly popular in implementation science, but there are more complexities when dealing with behavioral interventions.

1. Mauskopf J,. Principles of Good Practice for Budget Impact Analysis…. *Value in Health. 2007;10:336-347.*
2. Sullivan SD, et al. Budget impact analysis-principles of good practice…*Value in Health. 2014;17(1):5-14.*
3. Wagner TH, et al. Estimating Costs of an Implementation Intervention*. Medical Decision Making*. 2020 Nov;40(8):959-67.
4. Wagner TH, et al. Estimating downstream budget impacts in implementation research. *Medical Decision Making*. 2020;40(8):968–77.

BIA: Caveat

- Budget impact analysis focuses on the numerator.
- You can track outcomes, but the goal of the BIA is the $.
- Not all factors that are important have a cost.

BIA Focus

- BIA is generally focused on a specific perspective (health care payer)
- BIA is generally focused on a short-term time horizon
- Includes the cost of the implementation strategies and patient costs

Patient Outcomes

- BIA does not measure non-financial outcomes or utilities.
  - No need to survey patients
  - No calculation of quality adjusted life years (QALYs)
  - Outcomes are assumed to be known or ignorable

- Is this really ignorable?

Summary

- Economic evaluations require thoughtful attention to some key parameters
  - Perspective
  - Time Horizon
- Micro-costing is often needed to estimate implementation costs
  - Accuracy
  - Precision
- Helping decision makers make better decisions requires you translate some complicated issues, that can change over time, while also understanding their incentives.

Questions?

For more information visit the HERC website at www.herc.research.va.gov

Email us at HERC@va.gov

Call us at (650) 617-2630

@toddhwagner
@herc_va

HERC
Health Economics Resource Center

VA | U.S. Department of Veterans Affairs
Veterans Health Administration
Health Services Research & Development Service