Introduction to Cost Analysis

~ illustrated with a recent implementation science example ~

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Outline

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- Why cost analysis?
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  - The Collaborative Chronic Care Model (CCM)
  - The BHIP-CCM Enhancement Project
- Cost minimization analysis of the BHIP Enhancement Project
- Summary and wrap-up

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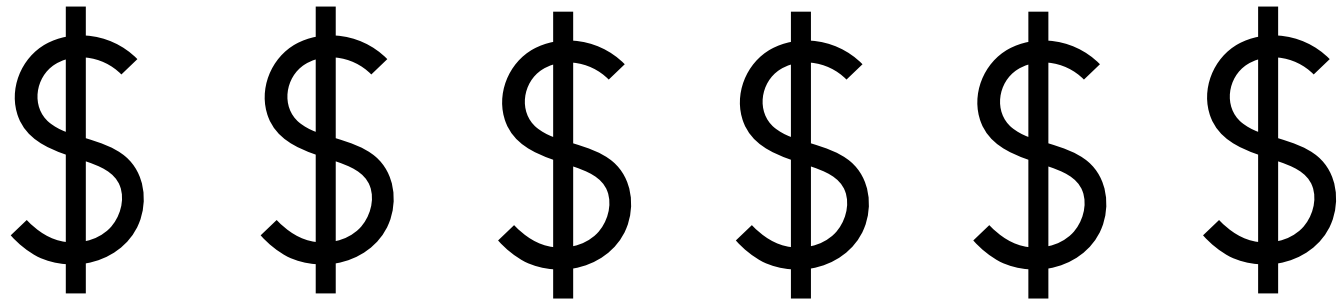
- Disclaimer: I'm a relative novice at this stuff (one conference presentation, one manuscript revision under review)
  - I'm hoping to whet your appetite but I'm not the final authority by any means!
  - Presentation by Neta, Gold, & Wagner last month
  - Accessible intro text: *Cost Effectiveness in Health and Medicine* – Gold et al.

Why cost analysis?

- Healthcare resources are limited
- Every dollar spent on a given intervention is a dollar potentially NOT spent on something else
- Cost considerations—especially up-front costs—are an important contributor to medical decision-making
- US healthcare system appears to be uniquely inefficient compared to other countries



Eisman, Kilbourne, & Dopp, 2019 in Psychiatry Research; Proctor et al., 2011 in APMH-MHSR; Garber & Skinner, 2008 in J Econ. Perspectives

Basic considerations of cost analysis

1) Whose money?

- Described as the “perspective” of the cost analysis, i.e. whose costs are being considered

2) What inputs and outputs?

- How broadly are costs defined?
- What comparisons are being made?

Basic considerations of cost analysis

1) Whose money?

- Societal perspective: very broad
  - All monetary inputs
  - All downstream effects
  - Example: fortifying cereal grains with folic acid
- Health system perspective: costs/savings to a specific system (e.g. VHA)
  - Employee time/salaries
  - Example: to follow (BHIP-CCM Enhancement Project)
- Lots of others
  - Examples: employee health plan, Medicare

Basic considerations of cost analysis

2) What inputs and outputs?

- Cost benefit analysis: boils everything down to dollar values
  - Can be used to compare costs vs. savings for two or more interventions
- Cost effectiveness analysis: what cost (in dollars) to obtain what effect or gain (e.g. lives saved)?
  - Note the benefit here need not be in dollar values
  - Example: Quality Adjusted Life Years (QALYs)
- Cost minimization analysis: assuming two or more interventions have equivalent clinical outcomes, which achieves those outcomes at the lowest cost?
  - Example: to follow

Basic considerations of cost analysis

Overall guidance: clearly specify the perspective from which your analyses will be conducted, as well as how costs and outcomes will be calculated.

Example Project: Background

The Behavioral Health Interdisciplinary Program (BHIP)

- Organizing of general outpatient mental health clinics into **teams** across VA
- Originally suggested staffing: 5.5 – 7.5 multidisciplinary staff for ~1,000 Veterans
- How best to structure these teams?

The Collaborative Chronic Care Model (CCM)

- Evidence-based way to structure care for chronic conditions
- Originally developed in 1990's: chronic health issues (e.g. diabetes)
- Recent reviews: effectiveness in RCTs extends to mental health (e.g. depression, anxiety, bipolar); frequently cost-neutral

Wagner et al., 1996; Woltmann et al., 2012; Miller et al., 2013

The Collaborative Care Model (CCM)

CCM Goal: Anticipatory, Continuous, Evidence-Based, Collaborative Care via…				
CCM-2: Work Role Redesign	**CCM-3: Veteran Self-Management Support**	**CCM-4: Provider Decision Support**	**CCM-5: Information Management**	**CCM-6: Community Linkages**
• Care management • Need-driven access • Activated follow-up	• Focus on the individual's values and skills • Shared decision-making • Self-mgt skills • Recovery-orientation	• Provider education • Practice guidelines • Specialty consultation	***Population***: • Registry ***Provider:*** • Feedback ***Patient:*** • Outcome tracking	• Additional resources • Peer-based support
CCM-1: Organizational Leadership and Support				

The BHIP-CCM Enhancement Project

- Hybrid II, stepped wedge trial at nine sites (3 sites x 3 waves)
  - Implementation Facilitation (internal and external)
  - Workbook-guided *(The BHIP-CCM Enhancement Guide)*
- Protocol Paper: Bauer et al., 2016 *(Implementation Science)*
- Primary Outcomes: Bauer et al., 2019 *(JAMA Network Open)*
- Facilitation associated with:
  - Improved team functioning
  - Reduced hospitalizations
  - Improved health status for patients with 3+ mental health diagnoses

Cost Minimization Analysis

Yes… But At What Cost?

- Initial question: *Did reduced hospitalizations counterbalance facilitation costs?*

- Cost minimization analysis from the health system perspective
  - Assumes equal clinical outcomes across conditions…
  - … and therefore focuses on relative costs to the health system (in this case, VHA)

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Cost Minimization Analysis

Yes… But At What Cost?

- Tabulated costs:
  - Cost for year of internal and external facilitation
  - Cost for inpatient and outpatient visits (facilitation year vs. previous year)
  - “Anchor” sample to start of facilitation
  - Comparison: patients treated in other outpatient general mental health clinics at same hospitals (“non-CCM-enhanced teams”)

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Cost Minimization Analysis

Data Sources

- Internal Facilitation Costs
  - Time: estimated at 10% FTE
  - Salary: direct data; VA salary tables; estimates when necessary
- External Facilitation Costs
  - Time: 7% FTE estimated from “thin slice” time-motion tracking (Dr. Bo Kim)
  - Salary: direct data
- Outpatient and Inpatient Costs
  - Encounters/days: VA medical record
  - Cost estimates: Health Economics Resource Center (HERC)

Cost Minimization Analysis

Analytic Plan

- Simple differences-in-differences (DID) calculation
  - Change in costs over time for CCM-enhanced teams vs. non-CCM-enhanced teams

- Sensitivity analyses (Monte Carlo simulation x10,000)
  - Vary facilitation costs +/- 15%
  - Vary inpatient and outpatient costs +/- 95% DID CI

Results – Base Case

Base Case Cost Estimates

Cost Source	Cost Estimate
Internal Facilitation	$12,750 per site
External Facilitation	$11,750 per site
Site Visit – External Facilitator Travel	$1,500 per site
Site Visit – Clinician Time (1/2 day)	$2,000
Total	**$28,000**

Results – Base Case

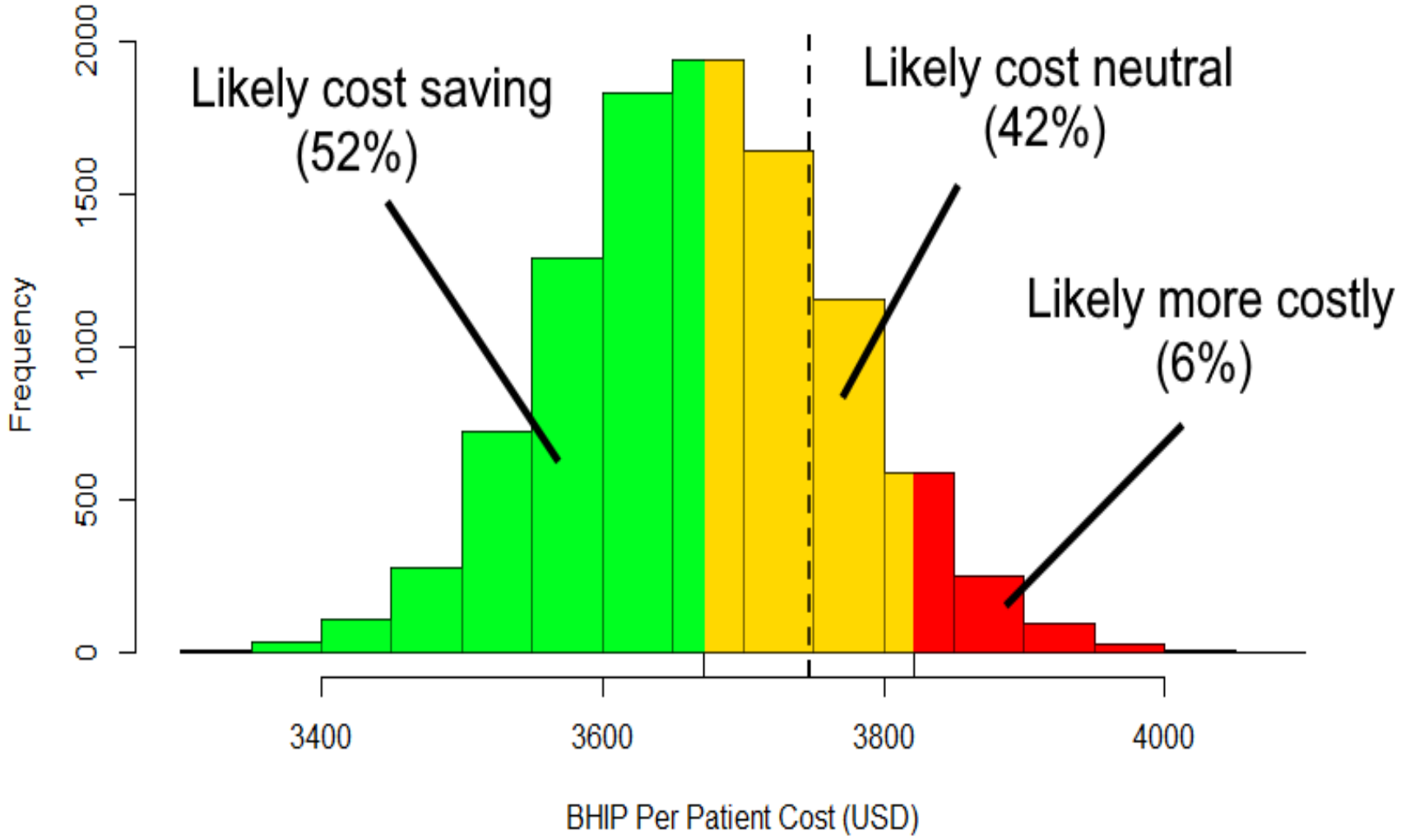
Base Case Service Utilization and Cost Changes

- Compared to patients in comparison teams

Cost / Savings Source	Cost / Saving Estimate	Typical Team (N = 700)
Outpatient Mental Health Visits	Cost $50 per patient	Cost $35,000
Outpatient Physical Health Visits	No change	No change
Inpatient Mental Health Stays	Save $167 per patient	Save $116,900
Inpatient Physical Health Stays	Cost $39 per patient	Cost $27,300
Total Service Utilization	Save $78 per patient	Save $54,600
Total, Including Facilitation	**Save $38 per patient**	**Save ~$26,600 ***

MH service cost savings: **1.8%**
Total service cost savings: **0.3%**

Results – Monte Carlo Simulations



Conclusions

- CCM implementation in BHIPs cost about $28,000 per team
- Resulted in:
  - Modest increase in outpatient mental health costs
  - Significant drop in inpatient mental health costs
- Service utilization for facilitation year: about $48,000 in savings (return of about ~1.7 : 1) compared to non-CCM-enhanced teams
- Monte Carlo simulation: CCM implementation significantly cost-saving in 52% of iterations, essentially cost-neutral (+/- <2%) in additional 42% of iterations

Limitations and Caveats

- CMA assumes equal clinical outcomes, but we did not have outcome data for comparison teams
  - … but reduced hospitalizations suggest CCM care is at least comparable
  - … and superior CCM care would mean that we were getting better care at lower cost with CCM enhancement

- Unable to account for costs outside VHA
  - … but over 90% of sample had facilitation-year services within VHA

Limitations and Caveats

- Physical health visits not statistically significant (large variance) and therefore not included in cost simulations
  - … but this is standard practice for these types of analyses

- Findings only applicable to systems where reduced inpatient costs translate to actual cost savings. Fundamentally different for:
  - Fee-for-service systems (in which reduced inpatient utilization means reduced revenue instead of reduced costs)
  - Systems with mandated inpatient service capacity, or where shifting services from inpatient → outpatient is otherwise infeasible/expensive

Summary and Wrap-up

- Cost analysis can help determine the best use of limited healthcare dollars
  - Of particular interest for implementation research as up-front costs to get interventions started may be a key consideration for health system leaders
- Important to specify the perspective from which analyses are conducted, as well as the particular costs and outcomes being considered
- Partnering with health economist(s) is really helpful!
  - HERC Cyberseminar Series on cost effectiveness in health: email cyberseminar@va.gov

Discussion

Thank you for your time and attention!

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