Return on Investment Assessment: When, Why, and How to Use It

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Melanie D. Whittington, PhD
Health Economic Methodologist, Denver/Seattle COIN
Research Faculty, University of Colorado Anschutz Medical Campus
Melanie.Whittington@va.gov

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Webinar Outline

- What is return on investment assessment?
- Why should you use return on investment assessment?
- When can you use return on investment assessment?
- How do you conduct a return on investment assessment?

Poll Question #1

What is your role in the VA? (Select one)

- Research Investigator/PI
- Data manager, analyst, or programmer
- Project coordinator
- Clinical or operations staff
- Other VA role

Poll Question #2

What is your level of knowledge with return on investment assessment? (Select all that apply)

- I have conducted one/multiple.
- I have been trained on how to conduct one, but haven't.
- I have an understanding of the basic concepts.
- I'm brand new to return on investment assessment.

What is Return on Investment?

- A way to calculate financial gains/losses while accounting for resources invested
- Compares the cost offsets of an intervention (from increased revenue, reduced costs) to the investment required

$$\frac{Returns\colon\ cost\ offsets\ from\ investment}{Investment\colon\ investment\ amount}$$

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What is (NOT) Return on Investment?

- Cost-effectiveness analysis (CEA)
- CEA: the cost for each unit of HEALTH GAIN achieved from an action
- ROI: financial gain in monetary units from each dollar invested in the action
- Both: expressed as a ratio, implementation costs

Why Return on Investment?

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Why Return on Investment?

- Maximize impact of investments and resource use
- Compare among alternatives (even with different outcomes)
- Inform sustainability of investments and resource use

When to do Return on Investment?

- Before investing in an action
  - Purpose: Planning Tool
  - Outcome: Projected return on investment
  - Other Analyses: Break-even analysis (inputs, time horizon)
  - Data Required: Pilot data, inputs from literature, estimates

When to do Return on Investment?

- After investing in an action
  - Purpose: Evaluation Tool
  - Outcome: Actual return on investment
  - Other Analyses: Sensitivity analyses, Break-even analyses
  - Data Required: Actual data from project

Requirements to do Return on Investment?

1. Data are being collected on an outcome that **can be** monetized (utilization, infections, etc.)
2. Data on the cost of the investment **can be** collected

How to Do Return on Investment?

- The ratio of two monetary values

$$\frac{cost\ offsets\ from\ investment}{investment\ amount}$$

- Numerator: cost offsets from investment
  - Financial gains generated by changes in quality, efficiency, utilization, revenue, etc.
- Denominator: investment amount
  - Costs of developing and operating the action

Steps of Return on Investment:

1. Define perspective (costs to whom?)
2. Define time horizon (costs when?)
3. Calculate cost of investment (denominator)
4. Estimate impact of the investment (part of RCT, observational study, etc.)
5. Monetize impact of investment (numerator)
6. Compute return on investment (divide numerator by denominator)
7. Interpret return on investment

Step 1: Define Perspective

- Identify whose costs and revenues you will consider
- All financial estimates should be related to that perspective
- Can choose multiple perspectives (hospital and societal)
- Common Perspectives:
  - Hospital
  - Patient
  - Societal

Step 2: Define Time Horizon

- Could vary from a few months to multiple years
- Should capture when operating procedures are impacted
- Long enough to see the financial impact of investment
- Need to adjust all costs to the same year
  - Inflation
  - Discounting

Step 3: Cost of Investment

- Identify and quantify all financial contributors
- Costs could occur at different stages:
  - Start-Up
  - Implementation
  - Maintenance
- Cost categories:
  - Personnel
  - Supplies/equipment
  - Training
  - Information systems
  - Communication
  - Indirect costs

Step 4: Impact of Investment

- Define a comparison group
  - 2 conditions: with the action and without the action
- Pre/Post
  - Doesn't control for time trends
- Intervention vs. Control
  - Similar characteristics
- Pre/Post and Intervention vs. Control (difference in differences)
  - Parallel pre-period trends
- Return on investment is usually an add-on to this type of evaluation

Step 5: Monetize Impact

- Changes in revenues and costs
- Often use utilization: admissions, length of stay, outpatient visits, etc.
  - Indirect approach: Multiply unit cost by utilization rates
  - Direct approach: Use cost data from utilization
- Productivity/efficiency costs (often for patient or societal perspective)

Step 6: Compute Return on Investment

- Return on Investment (ROI):

$$\frac{cost\ offsets\ from\ improvement\ actions}{investment\ in\ improvement\ actions}$$

- Numerator: cost offsets from improvement actions
  - financial gains from the implementation of the improvement actions, which are generated by changes in quality, efficiency, and utilization of services or payments for those services
- Denominator: investment in improvement actions
  - costs of developing and operating the improvement actions
- Numerator is cost offsets, not net savings
  - Net savings=cost offsets-cost of investment

Step 7: Interpret Return on Investment

- *ROI greater than 1*: returns are greater than the investment
  - Positive ROI
  - ROI of 1.8 indicates that for every $1 invested in the action, $1.80 will be gained for the VHA
- *ROI less than 0*: there are no returns
  - Negative ROI
  - ROI of -1.5 indicates that for every $1 invested in the action, $1.50 will be lost by the VHA
- *ROI between 0 and 1*: returns are positive but not greater than the investment
  - Negative ROI
  - ROI of 0.8 indicates that for every $1 invested in the action, 80 cents will be recouped by the VHA

Return on Investment: Example 1

Whittington, M. D., Atherly, A. J., Bradley, C. J., Campbell, J. C. & Lindrooth, R. C. 2017. Value of Public Health Funding in Preventing Hospital Bloodstream Infections in the United States. *American Journal of Public Health, 107*(11).

- **Background:** In 2013, 15 state health departments received funding to prevent healthcare-associated infections
- **Objective:** Evaluate the impact of the funding on bloodstream infection rates and calculate return on investment
- **Econometric Analysis:** Difference-in-differences specification with fixed effect was modeled controlling for regression to the mean
- **Return on Investment:** Cost offsets due to infections averted divided by the investment

Step 1: Define Perspective

- Health System Perspective
- Costs included:
  - Investment allocated to state public health departments
  - Money saved from infections averted
- Could also be patient-level costs (productivity) that were not included

Step 2: Define Time Horizon

- Base-Case: 1 year (2013), the only year of funding allocation
- Sensitivity Analysis: 2 years (2013-2014), one year of funding, and one year after

Step 3: Cost of Investment

- Due to perspective and study design, we used the full amount allocated to the state health departments
  - $6,839,735 in 2013
  - $0 in 2014
- Sub-analyses could have identified individual state health departments to micro-cost how they used the investment

Step 4: Impact of Investment

- Intervention Population: 15 states that received the funding
- Comparator Population: 35 states and Washington, DC that did not receive the funding
- Analysis: difference in differences specification with standardized infection ratio as the primary outcome; extrapolated reduction in infection ratio to infections averted
- Data: publicly available data from CMS Hospital Compare from 2011-2014

Step 4: Impact of Investment

	Fixed Effect	Regression to the Mean	GLM
Reduction in CLABSI Rates			
Percent Change in 2013	-34.8%* (16.6%)	-33.7%* (13.3%)	-36.7%* (14.5%)
Percent Change in 2014	-6.1% (16.8%)	0.8% (18.0%)	13.8% (9.3%)
Reduction in CLABSI Infections			
Number Averted in 2013	1,652	1,600	1,742

*$p<0.05$

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Step 5: Monetize Impact

*Unit * Unit Cost*

- Multiplied number of infections averted (unit) by the average cost of a bloodstream infection (unit cost)
- Average cost of a bloodstream infection: $25,135

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Step 5: Monetize Impact

	Mean (Interval)
Number Infections Averted	1,600* (324, 2,876)
Cost per Infection	$25,135
Cost Offsets (Infections Averted x Cost per Case)	$40,216,000* ($8,143,740, $72,288,260)
Cost of Investment	$6,839,735
Cost Savings (Cost Offsets - Investment)	$33,376,265* ($1,304,005, $65,448,525)

Used bootstrapping to identify interval around estimates, *$p<0.05$

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Poll Question #3

What is the return on investment and how would you interpret it? (Select one)

- 4.88, positive
- 4.88, negative
- 5.88, positive
- 5.88, negative

Step 6: Compute Return on Investment

	Mean (Interval)
Number Infections Averted	1,600 (324, 2,876)
Cost per Infection	$25,135
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Cost of Investment	$6,839,735
Cost Savings (Cost Offsets - Investment)	$33,376,265 ($1,304,005, $65,448,525)
Return on Investment (Cost Offsets / Investment)	5.88 (1.19, 10.57)

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Step 7: Interpret Return on Investment

- For every $1.00 invested, there was a return of $5.88
- Positive return on investment
  - Improvement in health outcomes (cost offsets=numerator) outweighed the investment (cost=denominator)
- Suggests continued funding of activity as a good use of resources

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Return on Investment: Example 2

- **Background:** Up to 50% of Veterans are dual-users, receiving VA and non-VA care. Strategies for effectively coordinating care in this dual-use population have not kept pace, resulting in worse outcomes for dual-users.
- **Objective:** Estimate the costs, potential cost offsets, net savings, and return on investment associated with the implementation of a care coordination program.
- **Study:** Develop and implement a care coordination program for high-risk dual-users.
- **Return on Investment:** Cost offsets associated with a reduction in healthcare utilization costs, divided by the cost of the care coordination program.

Step 1: Define Perspective

- Veterans Health Administration

Step 2: Define Time Horizon

- Through 90 days after receipt of care coordination

Step 3: Cost of Investment

- There is a cost associated with implementation; therefore, we want to estimate the cost of all potential resource use needed to implement the care coordination program
- Use micro-costing techniques to determine total cost of intervention
  - Time logs
  - Invoices
  - Key informant interviews
- Cost buckets:
  - Personnel, supplies, equipment and depreciation, training, information systems, outreach and communication, external consultants

Step 4: Impact of Investment

- Comparator:
  - Dual-use Veterans who do not receive care coordination
  - A within-person comparison that compares an individual's likelihood of hospitalization within 90 days (from their CAN score) to their observed likelihood of hospitalization over the 90 day period
- Compare changes in healthcare utilization (hospitalizations, ED visits, outpatient visits, laboratory tests, observation stays) over time in the intervention and comparator groups

Step 5: Monetize Impact

- Approach #1: use utilization counts and unit cost from HERC average cost files
- Approach #2: use actual costs from MCA/DSS cost data or other fee files
- non-VA utilization paid for by VA

Step 6: Compute Return on Investment

$$\frac{cost\ offsets\ from\ care\ coordination\ program}{investment\ in\ care\ coordination\ program}$$

Step 7: Interpret Return on Investment

- Greater than 1 (positive return on investment): greater cost offsets than investment
- Between 0 and 1 (negative return on investment): cost offsets observed, by not greater than investment
- Less than 0 (negative return on investment): no cost offsets observed

Negative ROI Still Good Value?

- A positive return on investment requires more savings (numerator) than investment (denominator)
- A return on investment less than 1 may still be considered good value for money
  - If payer is willing to pay more for improvements in health
  - Question becomes how much more payers are willing to pay for improvements in health

Resources

- Return on Investment Estimation, Quality Indicators Toolkit, Agency for Healthcare Research and Quality

Questions?

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