A Return On Investment Evaluation of An Antibiotic Audit and Feedback Program among Family Physicians

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Background

- It is estimated that worldwide in 2021, 1.14 million people died of antimicrobial-resistant infections.[1]
- For the years 2015 to 2050, antimicrobial resistance is expected to cost US$60 billion to European health systems, and US$74 billion to those of Canada, the United States, and Australia, combined.[2,3]
- The inappropriate use of antimicrobials in healthcare is a significant but modifiable contributor to antimicrobial costs, harms, and resistance.
- A randomized controlled trial conducted in Ontario, Canada demonstrated that a mailed antibiotic audit and feedback (A&F) intervention targeting 5,097 primary care physicians significantly reduced overall antibiotic prescribing.[4]

Objective

- To determine the return on investment (ROI) of a pragmatic, physician-randomized controlled trial of an antibiotic A&F intervention.

Methods

Table 1. Study Overview

Parameter	Description
Study design	Cost-benefit analysis
Target population	Community-dwelling patients aged 65 years and older
Intervention	Mailed letter and infographic that reported each physician's antibiotic prescribing rate compared to their peers
Comparator	No mailed letter (control)
Outcomes	Monetary savings, monetary costs, ROI
Time horizon	Six months
Perspective	Canadian publicly financed healthcare system

- An ROI was calculated to determine the whether the program is cost saving.

$$\textbf{ROI} = \frac{\text{Incremental monetary savings - Incremental monetary costs}}{\text{Incremental monetary costs}}$$

ROI > 1: program savings exceeds costs

Program costs: The costs associated with the antibiotic A&F program are reported in Table 2. These costs included personnel time for coding and customizing letters based on physician's prescribing patterns and costs for printing and mailing letters. All costs are reported in 2024 Canadian dollars.

Economic savings: We used data from the randomized controlled trial linked to administrative data to determine the probability and costs of antibiotic prescribing, adverse events, and undertreatment harms in the intervention and control groups (Table 2).

- For the base case, a probabilistic analysis was conducted to account for uncertainty across all parameters.
- One-way sensitivity analyses were conducted on key model parameters. A scenario analysis was conducted to assess how scaling the number of targeted physicians would impact the ROI.

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Table 2. Key Model Inputs

Parameter	Base case	SE	Distribution	Source
Program cost per physician	$5.50	0.70	Gamma	5
Antibiotic prescription cost	$553	8.38	Gamma	6
Adverse event cost	$13,745	488	Gamma	6
Undertreatment harms cost	$77,961	2,116	Gamma	6
Relative rate of receiving an antibiotic prescription for the A&F program vs. control	0.95	0.005	Lognormal	6
Relative rate of having an adverse event for the A&F program vs. control	0.98	0.021	Lognormal	6
Relative rate of undertreatment harms for the A&F program vs. control	0.98	0.016	Lognormal	6

Results

Table 3. Probabilistic results

	Total cost for program	Incremental cost	Total cost of antibiotics, adverse events, & undertreatment harms	Incremental savings	ROI (95% CI)
Antibiotic A&F program	5.50	5.50	1,996	43.04	**8.82 (1.32, 22.56)**
Control	0		2,039		

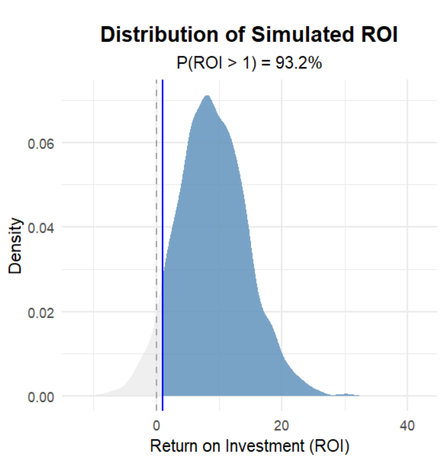

Figure 1. Return on investment distribution

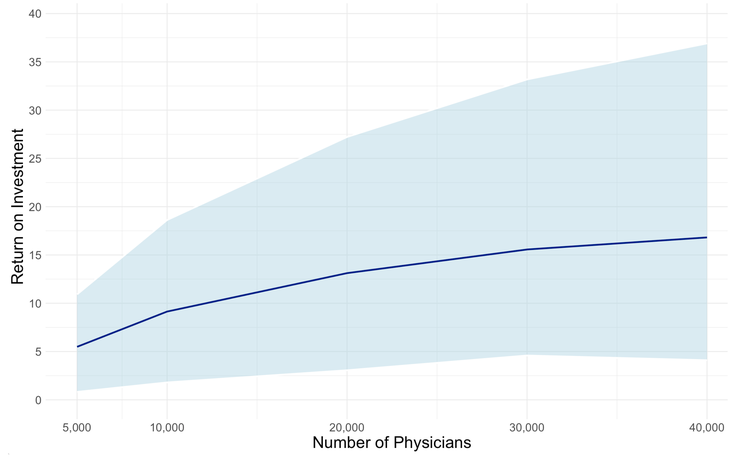

Figure 2. Return on investment by number of physicians

Conclusions

- For every dollar spent on the antibiotic A&F program, there was a return of CDN$8.82.
- These results offer compelling evidence for healthcare decision-makers on the economic and clinical benefits of implementing an A&F program in primary care.
- The ROI increases with broader participation, indicating even greater economic benefits at scale.

References

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[6]Estimated based on ICES data. August 2024.

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