

# Audit Feedback Interventions to Address High-Risk Prescriptions in Long-Term Care Homes: A Costing Study and Return on Investment Analysis

Kednapa Thavorn (✉ [kthavom@ohri.ca](mailto:kthavom@ohri.ca))

Ottawa Hospital Research Institute <https://orcid.org/0000-0003-4738-8447>

Srishti Kumar

Ottawa Hospital Research Institute

Catherine Reis

Women's College Institute for Health Systems Solutions and Virtual Care

Jonathan Lam

Ontario Health (Quality)

Gail Dobell

Ontario Health (Quality)

Cara Mulhall

Ontario Health (Quality)

Jeremy M. Grimshaw

Ottawa Hospital Research Institute

Noah Ivers

Women's College Institute for Health Systems Solutions and Virtual Care

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## Short report

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# Abstract

**Background:** Audit and feedback is a common implementation strategy, but little literature describes its costs. 'MyPractice' is an audit and feedback initiative produced by Ontario Health, the provincial agency tasked with supporting quality of care. This study sought to estimate the costs of 'MyPractice' and assess whether the financial benefit of 'MyPractice' offsets those costs.

**Methods:** We conducted a costing study from the perspective of the government of Ontario, which funds both Ontario Health and necessary healthcare costs for people living in long-term care (LTC) homes in the province. Total cost of 'MyPractice' was calculated as the sum of the costs of producing and disseminating the reports (covering three report releases) which were obtained from Ontario Health staff interviews and document reviews. Return on investment (ROI) was calculated as the ratio of net cost-savings and the intervention cost. Net cost-savings were estimated as the reduction in the costs of antipsychotics incurred by LTC home residents attributable to 'MyPractice' reports.

**Results:** Total intervention costs were C\$223,691 (C\$838 per physician and C\$74,564 per release). Costs incurred during the development phase accounted for 74% of the total cost (C\$166,117), while implementation costs for three report releases were responsible for 26% of the total costs (C\$57,575). The ROI for every C\$1 spent on the 'MyPractice' intervention was 1.22 (95% CI: 0.82, 1.61) for three report releases.

**Conclusion:** 'My Practice' report offers a good return on investment and the value for money increases if physicians sign up and view the reports.

## Background

Approximately 20.7% of long-term care home residents are prescribed antipsychotics without concurrent psychiatric diagnosis in Canada (1). Inappropriate use of these medications could increase risk of stroke, heart disease and kidney failures which increase risk of premature death (1,2). To reduce inappropriate prescribing of antipsychotics among long-term care home residents, quality improvement initiatives are increasingly being utilized (3). Audit and feedback (A&F) has emerged as a common method to improve the quality of health care practices. A&F interventions highlight discrepancies between desired and actual performance and encourage prescribers to address these discrepancies (4).

Previous studies have shown the effectiveness of A&F on prescriber behaviors (6,7,8). An Australian study, for example, examining the impact of A&F on antipsychotics prescribing for schizophrenia showed that A&F was effective in changing prescribing rates towards recommended levels (7). Another randomized control trial reported that the multi-strategic intervention consisting of A&F, including staff education and interdisciplinary reviews, resulted in a significant reduction in the proportion of long-term care home residents taking antipsychotics (8).

Despite growing evidence on effectiveness of A&F, little is known about the resources required to develop and implement such intervention. Given the constraint on health care budgets, credible information about A&F intervention costs could help inform the decision on whether an A&F intervention should be adopted or expanded. In this study, we estimated the costs of the 'MyPractice' reports, the A&F intervention that targets prescribing of antipsychotic medications in long-term care homes in Ontario and compared this to the benefits gained from the intervention.

## Methods

### Setting and Intervention

Prescription drug costs for long-term care home residents in Ontario are covered by the Ontario Drug Benefit Program. Ontario Health, formerly Health Quality Ontario, is the agency that advises government and health care providers in Ontario on evidence to support high-quality care to support improvements in quality, and to monitor and report on quality of health care provided in Ontario. The agency produces several 'MyPractice' clinician-focused reports with input from relevant stakeholders. The MyPractice long-term care report addresses high-risk prescriptions for long-term care home residents in the province of Ontario, Canada, with an initial focus on antipsychotic medications. The reports provided family physicians who work in long-term care homes the opportunity to voluntarily sign up to receive quarterly confidential feedback reports which compare the recipient's prescribing rate with the provincial average. In the early phase of 'MyPractice' initiative, physicians who signed up were sent an email when the report became available for download. To view the report, physicians had to sign in and download the report. More recently, the reports were sent to participating physicians through an email attachment.

The study period consisted of development and implementation phases of the antipsychotic topic area covering three report releases. The 'My Practice' initiative was designed and developed over eight months (from April to November 2016). Three 'MyPractice' reports were released over a period of seven months (from December 2016 to June 2017). At the time of the study, 267 physicians (28%) of 944 eligible physicians working in long-term care homes across Ontario signed up to receive the reports (4).

### Study Design

We conducted a costing study of the 'MyPractice' intervention from the perspective of government of Ontario (i.e., the insurer). We also calculated the return on investment (ROI) for 'MyPractice' by comparing the intervention cost to savings from reduction in antipsychotic medication prescribing, as a result of the intervention. The ROI analysis is a method to estimate net financial gains (or losses) from an intervention, considering resources invested to implement the program and the amount gained through increase in revenue, reduced costs, or both (9). The target population for ROI analysis included all physicians working in long-term care homes in Ontario who were provided the opportunity to sign up to receive 'My Practice' reports.

### Resource Use Data Collection and Unit Cost

We estimated the intervention cost using a gross costing technique, where costs were calculated as a product of resource use and unit costs. We obtained resource use data for developing and implementing the intervention and their unit costs from program financial records, service level agreements, and the program budget, through close consultation with Ontario Health staff. Costs were categorized into development and implementation costs.

Development costs comprised of the costs of data acquisition and personnel time for planning, report content development, developing technical infrastructure and administrative, and managerial support for the development phase. Implementation costs included the costs of personnel time for analysis, quality assurance, outreach, support for participant queries, administrative and managerial support. Cost data were presented in 2019 Canadian dollars.

## Analysis

### Cost Analysis

We estimated the total intervention cost as the sum of development and implementation costs for three report releases (seven months). We calculated the cost per physician by dividing the total intervention costs by the number of physicians who worked in long-term care homes and signed up to receive 'MyPractice' reports. We also projected the cost per physician if the 'MyPractice' initiative was adopted as a mandatory program, i.e. all physicians working in long-term care homes in Ontario received 'MyPractice' reports.

Further, we calculated the intervention cost per release by dividing the total intervention costs by the total number of report releases. Key drivers of development and implementation costs were also described.

In addition, we forecasted the annual cost of the 'MyPractice' intervention for the first year and subsequent years. The annual cost of 'MyPractice' for the first year was calculated as the sum of development costs and implementation costs for four quarterly report releases, while the upfront development costs were excluded for each subsequent year.

### ROI Analysis

The ROI of the 'My Practice' intervention was calculated as (9):

$$\frac{\textit{Net Cost Savings}}{\textit{Intervention Cost}}$$

An ROI greater than one indicates that the savings generated from the intervention are greater than the costs of the developing and implementing the intervention.

Net cost-savings were estimated from a retrospective cohort study that compared the mean proportion of long-term care home days on antipsychotics over the quarter before 'MyPractice' reports were released,

the quarter immediately following the first report and the quarter that followed (5). The cohort study showed that, compared to the baseline, antipsychotic prescribing reduced significantly at six months in all exposure groups, but the largest reduction was observed among physicians who signed up and viewed the report (-1.82%, 95% CI: -2.37%, -1.27%). For physicians who signed up but did not view the report and those who did not sign up, the percentages reduction in antipsychotic prescribing at 6-month were -1.35% (95% CI: -1.93%, -0.77%) and -0.88% (95% CI: -1.14%, -0.62%), respectively. For physicians who signed up and viewed the report, there was a 0.94% decrease in the mean proportion of long-term care home days on antipsychotics (95% CI: -1.54%, -0.35%) compared to those who did not the sign up.

Based on the reduction in the mean proportion of days on antipsychotics reported in the cohort study, we estimated cost-savings attributable to 'MyPractice' by multiplying the antipsychotic medication cost saved per resident and the total number of long-term care home residents in the province of Ontario (5). Antipsychotic medication cost saved per resident was estimated by multiplying the reduction in the number of days on antipsychotics attributable to 'MyPractice' (5) and the daily costs of antipsychotic medications that were equal to a weighted average of daily costs of clozapine, olanzapine, risperidone and quetiapine and the prevalence of each antipsychotic drug use among long-term care home residents (10,11).

For the base-case analysis, ROI for 'MyPractice' was calculated by weighting the effectiveness of three exposure groups over three report releases. Effectiveness of the 'MyPractice' intervention was based on within-group comparisons over 6 months, compared to baseline. We conducted scenario analyses projecting the 1-year and 2-year ROI for 'MyPractice' covering four and eight releases, respectively. In addition, we conducted scenario analyses by assuming that (1) all physicians signed up and viewed the reports (assumed this is 944), (2) all physicians signed up but did not view the reports, and (3) no physician signed up for the report. We also re-calculated the ROI by using the effectiveness of 'My Practice' based on within comparisons at three months and pairwise comparisons over six months as reported by Ivers and colleagues. We performed a probabilistic sensitivity analysis for each exposure group using the Monte Carlo simulation technique. We varied all parameters over  $\pm 25\%$  of their base values and repeated the ROI analysis over 1,000 iterations. Of these 1,000 iterations, we estimated the probability that that 'MyPractice' would provide a good return on investment (i.e. ROI > 1).

## Results

### Cost Analysis

The total intervention costs were estimated to be C\$223,691. The cost per physician who signed up for 'My Practice' reports was C\$838. The cost per release was C\$74,564. The cost of developing the intervention was C\$166,117 (74% of total cost) and the cost of implementation for three report releases was C\$57,575 (26% of total costs). Data acquisition and analysis accounted for the largest share (35%) of development costs, followed by report production (29%) and management (29%) costs (Table 1). Quality assurance of reports accounted for majority (55%) of implementation costs.

If the 'My Practice' initiative was mandatory, the cost per physician was projected to be C\$237.

Table 1  
Breakdown of development and implementation costs

DESCRIPTION		COST (C\$)	% OF SUB- TOTAL
Development Phase			
Report Production	Content development	46179	27.80%
	Editing	1827	1.10%
Technical Infrastructure	Development of feedback survey	2062	1.24%
	Technical development of web portal	6987	4.21%
Data Acquisition and Analysis	Indicator development and third-party vendor costs for data	58613	35.28%
Administrative Support	Scheduling of meetings	3197	1.92%
Management	Resource, partnership and relationship management	47252	28.45%
Total		166116	100.00%
Implementation Phase (3 report releases)			
Data Acquisition and Analysis	Third party vendor costs for data	8971	15.58%
Fact Checking and Quality Assurance	Ensuring report accuracy	31767	55.18%
Project Management Coordination Support	Support (online and telephone based) for queries by participants and timeline revisions	3447	5.99%
Outreach	Generating FAQs and website pop up feature	6569	11.41%
Administrative Support	Scheduling of meetings	1776	3.08%
Management	Resource, partnership and relationship management	5045	8.76%
Total		57575	100.00%
Abbreviations: A&F, Audit Feedback; FAQs, Frequently Asked Questions			

Since most costs incurred upfront, the average cost per release decreased significantly with increasing number of report release (Fig. 1). We forecasted that if 'MyPractice' were to be released quarterly, its

annual cost of the was estimated to be C\$241,370 for the first year (December 2016 to December 2017) and C\$70,716 for each subsequent year.

## ROI Analysis

The ROI for 'MyPractice' for three report releases was 1.22 (95% CI: 0.82, 1.61) for the base-case. The ROI for 'MyPractice' was 2.15 (95% CI: 1.50, 2.80) if all physicians signed up and viewed the reports, 1.59 (95% CI: 0.91, 2.28) if all physicians signed up but did not view the reports, and 1.04 (95% CI: 0.73, 1.35) if no physician sign up for the reports.

The ROI increased with greater number of report releases, and the largest increase was observed among the group that signed up and viewed the reports (Fig. 2). The ROI was highly sensitive to the effectiveness of 'MyPractice'. The larger impact of the intervention on the mean proportion of long-term care home days on antipsychotics, the greater the ROI values (Table 2, Fig. 2).

Table 2  
Results of scenario analyses

	ROI (for 3 report releases)	95% CI
Within group comparison <sup>a</sup> : baseline vs. 3-months		
Did not sign up	0.48	(0.26, 0.72)
Sign up but did not view the reports	0.85	(0.35, 1.35)
Sign up and view the reports	1.05	(0.57, 1.52)
Pairwise comparisons <sup>b</sup>		
Report view vs. no sign up	1.11	(0.41, 1.82)
No report view vs. no sign up	0.56	(0.18, 1.29)
Report view vs. no report view	0.56	(0.37, 1.49)
<sup>a</sup> ROI calculated for 3 report releases by using the effectiveness of 'My Practice' based on within group comparisons at 3 months from baseline;		
<sup>b</sup> ROI calculated for 3 report releases by using the effectiveness of 'My Practice' based on pair-wise comparisons at 6 months from baseline.		
Abbreviations: ROI, Return on Investment; CI, Confidence Interval		

The probability of ROI being greater than 1 for 'MyPractice' was 81.5% for the base-case. The probability of ROI being greater than 1 for 'MyPractice' was 100% for the group that signed up and viewed the

reports, 96% for the group that signed up and did not view the reports and 57% for the group that did not sign up (Fig. 3).

## Discussion

Our study highlights that the majority of 'MyPractice' costs (74%) were fixed and incurred upfront; the average cost per release therefore reduced significantly with increasing number of releases. This would suggest that releasing reports more frequently or scaling the intervention to larger number of long-term care homes would not significantly increase the total costs of the intervention.

We observed a positive ROI (ROI = 1.22) for the 'MyPractice' initiative. Positive ROI suggests that for every C\$1 spent on 'MyPractice', C\$1.22 will be gained through the reduction in costs associated with antipsychotic prescriptions. Our scenario analyses suggested that 'MyPractice' offered the largest positive return on investment for physicians who signed up and viewed the reports (ROI = 2.15), followed by for those who signed up and did not view the reports (ROI = 1.59). For physicians who did not sign up for the reports, the ROI was equal to one (ROI = 1.04) indicating that the cost of the intervention is offset by savings from the reduction in antipsychotic prescriptions; however, no additional gains are made. The ROI was found to increase with the greater number of report releases if the reduction in antipsychotic prescribing attributable to 'MyPractice' was sustained.

We identified only one existing study that assessed the costs of implementing an A&F intervention. Fretheim et al determined the costs of implementing a multifaceted intervention consisting of audit and feedback, outreach visits and computerized reminders to improve adherence to clinical practice guidelines for prescribing of antihypertensive and cholesterol-lowering drugs in primary practices in Norway (12). The intervention was conducted across 70 primary practices over one year. The total intervention cost for 257 physicians was C\$122,584 (C\$476.98 per physician). The total intervention cost included the costs of training, software development, printing, salary of pharmacists doing outreach visits, personnel time for technical and administrative support, travel and physician opportunity costs. The cost per physician reported by Fretheim et al was lower than our study possibly because they excluded costs of designing the intervention, which was the key driver of the total costs of 'MyPractice'.

Our study has certain limitations that must be acknowledged. Data on resources required for development and implementation of the 'MyPractice' initiative was collected retrospectively. Personnel time used for each activity may not be accurately reported. Moreover, reduction in prescribing of high-risk antipsychotics could reduce health system cost due to fewer readmissions and outpatient visits. However, we did not account for this potential downstream cost savings due to limited information on long-term effectiveness of A&F interventions. Despite these limitations, our study is one of the few comprehensive economic analyses of an audit and feedback initiative. Findings could help inform the decision to adopt or expand audit and feedback initiatives such as 'My Practice' to address prescribing of high-risk medications in long-term care homes. More studies on the cost of A&F interventions are required

as cost data from diverse contexts could highlight A&F design and delivery approaches that can make the intervention more affordable.

## Conclusion

In summary, 'MyPractice' is a good return on investment intervention to address prescribing of high-risk medication in long-term care homes. The financial benefits of this A&F program would improve if the physicians agree to view the reports and/or the program is continued over a longer duration.

## Abbreviations

Abbreviation	Definition
A&F	Audit and feedback
FAQs	Frequently asked questions
LTC	Long-term care
ROI	Return on investment

## Declarations

### Ethics approval and consent to participate

Not applicable

### Consent for publication

Not applicable

### Availability of data and materials

Data for cost analysis: The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

### Competing interests

The authors declare that they have no competing interests.

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Ontario SPOR SUPPORT Unit

### Authors' contributions

KT, JG and NI conceived the study and obtained the funding. KT and SK designed the study, conducted analysis and drafted the first version of the manuscript. All authors contributed to the study design, critical review of the manuscript, and to the manuscript edits and content. All authors read and approved the final manuscript.

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Not applicable

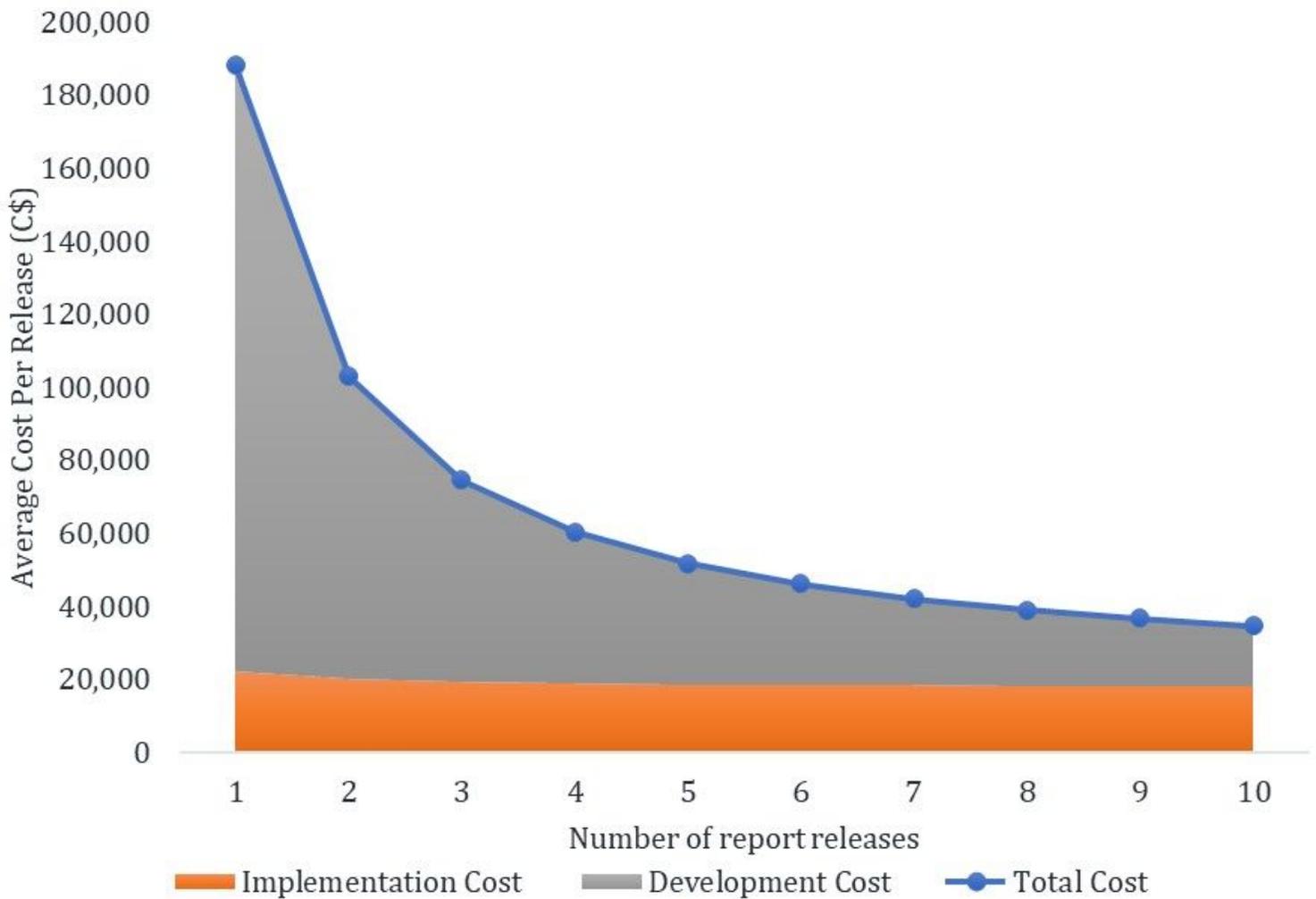
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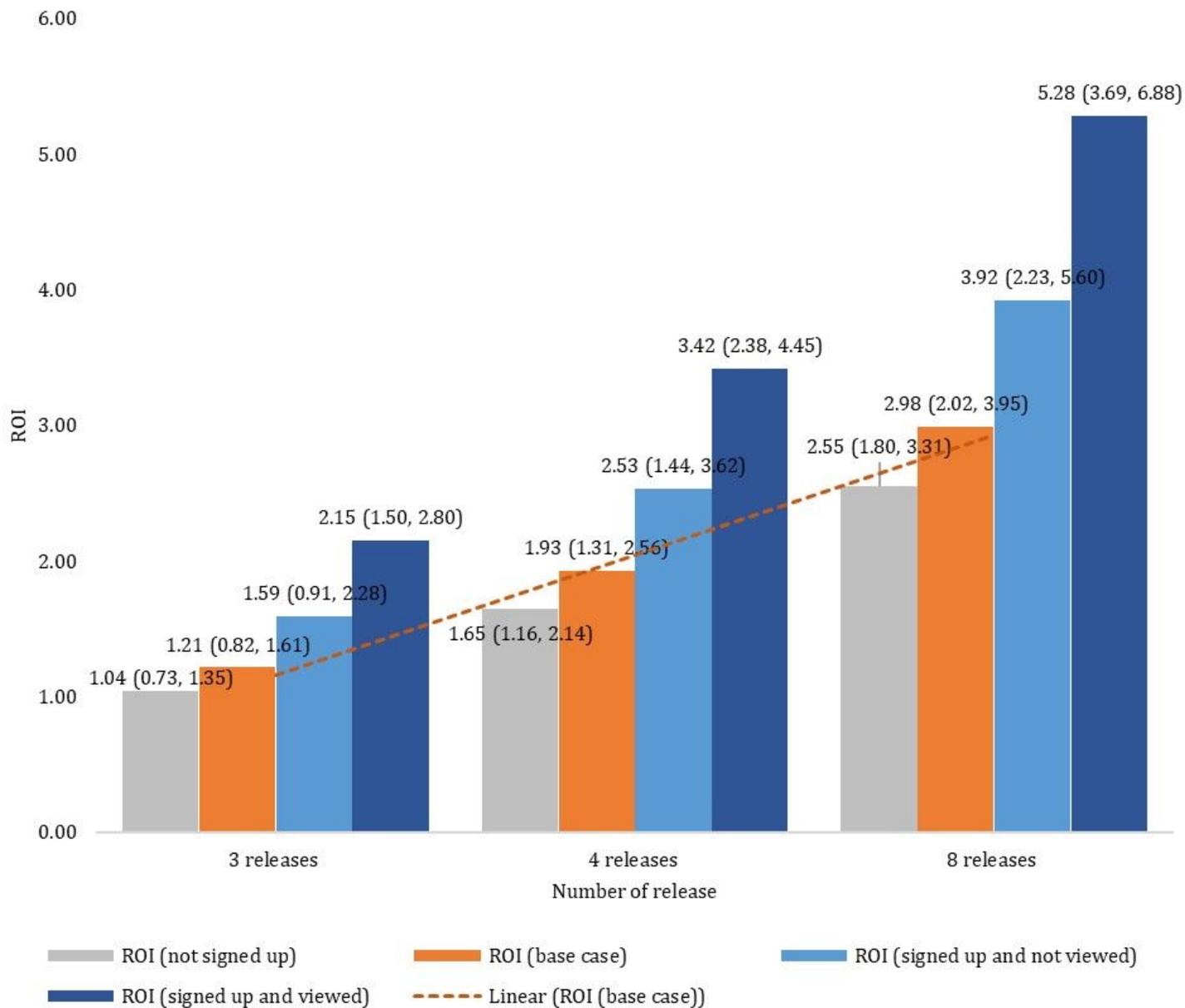
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## Figures



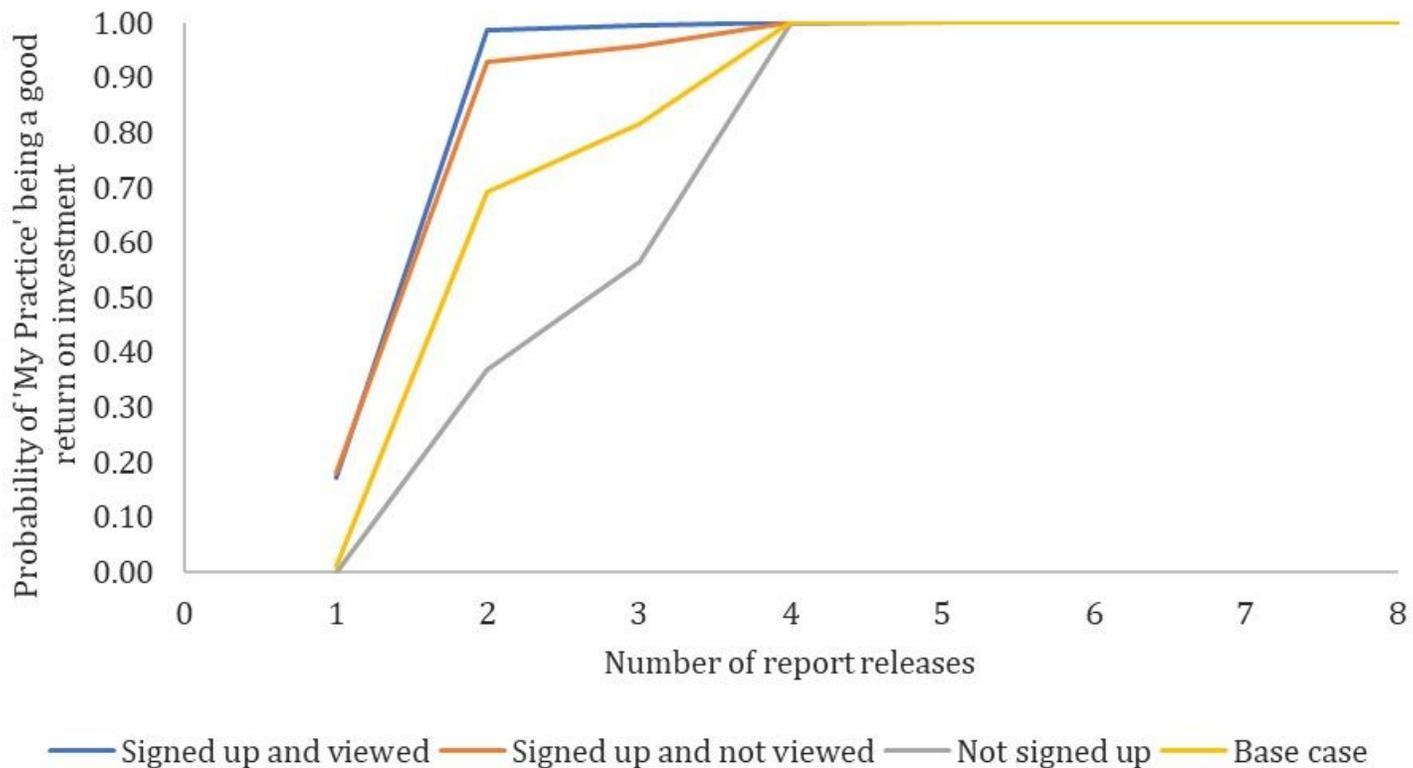
**Figure 1**

Average cost of 'MyPractice' by the number of report releases



**Figure 2**

ROI for 'My Practice' by the number of releases. ROI calculated using the effectiveness of 'My Practice' based on within group comparisons at 6 months from baseline.



**Figure 3**

Return on investment acceptability curves by the number of report releases

## Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [MyPracticeCostingROISupplementaryFebruary122020.docx](#)