


RESEARCH ARTICLE

Costs of using evidence-based implementation strategies for behavioral health integration in a large primary care system

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Funding information

Agency for Healthcare Research and Quality, Grant/Award Number: R18HS023173

Abstract

Objective: To describe the cost of using evidence-based implementation strategies for sustained behavioral health integration (BHI) involving population-based screening, assessment, and identification at 25 primary care sites of Kaiser Permanente Washington (2015-2018).

Data Sources/Study Setting: Project records, surveys, Bureau of Labor Statistics compensation data.

Study Design: Labor and nonlabor costs incurred by three implementation strategies: practice coaching, electronic health records clinical decision support, and performance feedback.

Data Collection/Extraction Methods: Personnel time spent on these strategies was estimated for five broad roles: (a) project leaders and administrative support, (b) practice coaches, (c) clinical decision support programmers, (d) performance metric programmers, and (e) primary care local implementation team members.

Principal Finding: Implementation involved 286 persons, 18 131 person-hours, costing \$1 587 139 or \$5 per primary care visit with screening or \$38 per primary care visit identifying depression, suicidal thoughts and/or alcohol or substance use disorders, in a single year. The majority of person-hours was devoted to project leadership (35%) and practice coaches (34%), and 36% of costs were for the first three sites.

Conclusions: When spread across patients screened in a single year, BHI implementation costs were well within the range for commonly used diagnostic assessments in primary care (eg, laboratory tests). This suggests that implementation costs alone should not be a substantial barrier to population-based BHI.

KEYWORDS

behavioral health integration, practice coaching, primary care, quality improvement

1 | INTRODUCTION

Over 47.6 million and 20.3 million Americans have mental health and substance use disorders, respectively.¹ Conditions such as

depression, alcohol, and other substance use disorders are some of the largest contributing factors to disability, death, and health care costs.²⁻⁴ There is growing recognition that integrating behavioral health care into primary care is an effective model for prevention,

identification, and management of individuals with common mental health and substance use disorders.⁵⁻⁹

Evidence-based strategies are recommended for sustained implementation of new models of care.¹⁰ However, one recognized barrier to use of evidence-based strategies for implementing behavioral health integration (BHI) is the lack of information on the costs of using such strategies.^{5,11-13} Even when payment models allow reimbursement of BHI,¹⁴⁻¹⁸ those payments are commonly procedure-based and do not necessarily cover the upstream costs of applying the evidence-based strategies for implementing BHI. Therefore, cost information is even more important for health system leaders considering BHI since these costs would need to be covered in the short term through grant funding or institutional investment.¹⁹ Underestimating the resources needed for applying evidence-based implementation strategies could jeopardize implementation success; over-estimating the resources needed could limit adoption. Hence, information on the costs of applying evidence-based strategies to implement BHI would help health system leaders with preparation and design of BHI.

The objective of this study is to evaluate the costs of using three evidence-based implementation strategies to support primary care clinic-based quality improvement teams to implement BHI: (a) practice coaches,²⁰ (b) Electronic Health Record (EHR) clinical decision support,²¹ and (c) performance monitoring and feedback.²² The program was designed and implemented at 25 Kaiser Permanente (KP) Washington primary care sites over a 41-month period, starting in 2014 as described previously in detail.^{23,24} Briefly, the program included annual screening, assessment, and identification for depression, suicidality, and unhealthy alcohol, cannabis, and other drug use (illicit and nonmedical use of prescription drugs). The implementation goals of the program were to promote sustained, population-based screening, assessment, and identification for these common behavioral health conditions. The program—funded by a grant to implement evidence-based care for unhealthy alcohol use from the Agency for Healthcare Research and Quality—was highly successful. At the end of the study, 89% of patients with primary care visits were being screened annually. Moreover, a KP Washington provider survey revealed that many providers reported that BHI had improved all four elements of the health care the quadruple aim: patient experience, provider Experience, quality of care, and costs (eg, due to lower specialty referral rates). As a result, the program is still currently being sustained (1.5 years after the conclusion of the study) by the health system leaders who continue with quarterly quality improvement meetings with each site as needed to encourage continued improvements in integrated behavioral health care.

2 | METHODS

2.1 | Behavioral health integration at Kaiser Permanente Washington

2.1.1 | Intervention description: Screening and assessment

To support increased identification and treatment of behavioral health conditions in primary care, KP Washington's BHI program

What this Study Adds

- Experts and health care payers support integration of behavioral health care into primary care as an effective way to address the high public health burden of behavioral health conditions.
- Evidence-based strategies are recommended for sustained implementation of best practices but there is little evidence regarding the cost of applying evidence-based strategies to implement behavioral health integration (BHI) in health systems.
- The results from applying three evidence-based implementation strategies in a large primary care system suggest that such costs alone are unlikely to be a substantial barrier to BHI implementation.

implemented routine administration of a 7-item BHI screening questionnaire to all adult primary care patients annually. The screening questionnaire consists of the Patient Health Questionnaire-2 (PHQ-2), Alcohol Use Disorders Identification Test-Consumption (AUDIT-C), and cannabis and other illicit drug use questions.²⁵⁻²⁹ A positive screen for depression, or report of high-risk alcohol, cannabis, or other drug use, triggers a set of predetermined EHR prompts for additional assessments, and diagnoses of depression and substance use disorders would trigger alerts prompting primary care providers to offer follow-up management and/or referral to specialty care.

2.1.2 | Implementation description: Personnel groups

As illustrated in Figure S1, each individual involved in implementation can be ascribed to one of five broad personnel groups: (a) Project leaders and administrative support, (b) practice coaches, (c) EHR clinical decision support programmers, (d) performance metric programmers, and (e) local implementation teams (ie, teams located within each primary care site and composed of local staff responsible for implementing BHI within their sites). The first four groups collectively are considered the project implementation team with personnel that worked across clinical sites; each local implementation team worked within its own site.

2.1.3 | Implementation description: Activities

To implement the intervention, the program used three evidence-based implementation strategies: practice coaching, EHR decision support, and performance monitoring and feedback described previously in detail.^{23,24} For each site, practice coaches offered active support to local implementation teams over a 6-month period,

including assistance with the design of site-specific workflows, training in stigma reduction, as well as, clinical knowledge about screening and assessing behavioral health conditions, and facilitation of weekly plan-do-check-adjust quality improvement meetings with local implementation teams. The program developed EHR decision support tools to prompt administration of a behavioral health screen for each patient presenting to a primary care site who had not yet received the screen in the past 12 months, along with other prompts for assessment and follow-up of patients with depression or substance use disorders. The program developed performance measure reports (ie, “dashboards”) to monitor screening and assessment and provide performance feedback to primary care local implementation teams at each site.

Practice coaches were a central component of this BHI implementation. They supported each of the other personnel groups. At each site, practice coaches met with local implementation teams, provided initial training and workflow planning, and provided support for quality improvement through weekly meetings for 2 months before BHI launch and up to 4 months after launch. A coach met weekly with the EHR and performance metric programmers to design and iteratively refine user-friendly EHR tools and performance feedback dashboards, respectively. The coaches also met weekly with the project leadership team to address system-level barriers and over time, to transition ongoing responsibility of the BHI project to health system leaders to ensure long-term sustainment of BHI. Detailed description of the implementation activities for each personnel group is provided in Table S1.

2.1.4 | Timeline

In September 2014, health system leaders and researchers began preparing for BHI implementation. Active implementation in three pilot primary care sites occurred March 2015 through March 2016. We define this period from September 2014 through March 2016 as the “developmental phase,” where the evidence-based implementation strategies were adapted to the KP Washington context. Following this, BHI was implemented in the remaining 22 primary care sites (ie, the “main phase”) from April 2016 to July 2018 in seven successive waves using a stepped wedge trial design (see Figure S2 for detailed implementation timeline).^{23,24}

2.2 | Economic evaluation

2.2.1 | Economic perspective and included costs

Our study focuses on the costs of using three evidence-based strategies for BHI implementation.^{30,31} Specifically, to provide health system leaders an estimate of the costs of active BHI implementation, we chose the perspective of a health care administrator in a clinical organization³² (ie, capturing the costs of BHI implementation that would be incurred by the health system). As such, we did not

include implementation costs that would be incurred by other parties such as federal agencies or patients. We do not include costs unrelated to implementation, such as practice or treatment costs that are incurred as a consequence of implementation (eg, treatment of individuals identified through screening).³⁰ Such costs, while important, should be assessed in a full economic model that balances all costs with all benefits of screening and treatment. Consistent with our chosen perspective, we also do not include costs incurred solely for research purposes. Within the included resource categories, we captured direct and indirect labor costs (eg, security and housekeeping) and nonlabor (eg, leased space, utilities) costs.³³ We included these costs as they would typically be incurred by the health system, regardless of whether it was grant supported. We expect our estimated costs to represent the costs incurred by health systems implementing similar population-based BHI programs using similar strategies.

We used the questionnaires developed by the Drug Abuse Treatment Cost Analysis Program (DATCAP) and the Substance Abuse Services Cost Analysis Program (SASCAP) to inform the resource categories for data collection as described below.^{33,34}

2.2.2 | Data Source: Project implementation team hours

For practice coaches, we used weekly self-reported estimates of hours spent on BHI implementation, across the whole study period. For leadership and administrative support staff, we used weekly self-reported hours spent on BHI implementation recorded during the latter half of the developmental phase, and the beginning, midpoint and end of the main phase of the project. These reports covered 77 weeks (39%) of the study period. We imputed the hours for noncovered periods by using the average observed weekly effort, separately for developmental and main phase, for each individual in the project leadership team. For EHR and performance metric programming staff, we obtained hours directly from the amount of time billed to the grant for these individuals. This data source is likely to be an accurate economic reflection of their time spent on EHR and performance metric programming since KP Washington has strict policies that require employees to certify their effort spent on tasks on a monthly basis.

2.2.3 | Data Source: Local implementation team hours

We estimated time in BHI meetings for local implementation teams using actual meeting attendance (from meeting attendance notes taken by the practice coaches) to track the hours spent by each local implementation team member on implementation planning and quality improvement. Attendance was tracked for 65% of meetings. We imputed the hours for those meetings missing attendance records by using the average attendance record that we did observe for each local implementation team member.

2.2.4 | Direct labor costs

To estimate employer labor costs for BHI, we multiplied person-hours that each individual spent on implementation by their estimated hourly wages, benefits, and employer-paid payroll taxes. Based on individuals' primary roles, we assigned each a Bureau of Labor Statistics (BLS) occupation title from over 700 available options from the 2017 BLS Washington State Occupational Employment Statistics Survey. From the same data source, we assigned each individual the mean hourly wages for that BLS occupation.³⁵ We used mean instead of median hourly wages because median wages were missing for 5 (20%) of the occupations of interest in the BLS dataset. We added in 6.2% and 1.45% to the wage estimates to account for payroll taxes paid by the employer for Social Security and Medicare, respectively, which are not accounted for in the BLS wage estimates.^{36,37} We obtained estimates of the percent of total compensation taken as benefits from the BLS' 2017 National Compensation Survey for private industry health care and social assistance workers in the Pacific region.^{38,39} We summed total compensation (ie, hourly wages, benefits, and employer-paid payroll taxes) for each worker, BLS occupation title, implementation component, total implementation costs and by study phase.

2.2.5 | Nonlabor and indirect labor costs

We estimated costs associated with practice coach travel to the primary care sites for local implementation team meetings. The practice coaches and most primary care sites were in Western Washington. For these sites, we calculated the automotive travel distance between practice coach offices and the sites and applied the Federal standard mileage reimbursement rates.⁴⁰ For the remaining primary care sites which were located in Eastern Washington, we calculated median flight prices, hotel, and rental car costs. Two practice coaches received initial training in practice coaching methods.⁴¹ We used the actual costs incurred for this initial training. The practice coach travel time for this training was included in the direct labor costs reported by the practice coaches.

To estimate overhead costs of BHI implementation, we converted our estimates of total person-hours spent on implementation to annual full-time equivalents by dividing by a forty-hour work week. Then, we multiplied the annual full-time equivalents by the office space square footage needed per full-time equivalent per year.⁴² This provides an expected office space square footage needed for the project which is multiplied by the estimated costs per square foot of office space in Seattle, WA (the primary site for the project implementation team).^{43,44} These estimated costs for office space includes costs for rent, building management, maintenance, security, and utility costs (see Table S2 "Office Space Calculations" worksheet for an interactive version of this calculation). We used the actual implementation supplies costs (eg, computing equipment, printing, food for meetings).

2.2.6 | Unit costs

To put the costs in perspective in relation to providing population-based BHI over a 1-year period, we used our estimated total implementation costs and data on KP Washington's health system to model the expected costs for a number of unit measures. Costs were estimated per insured enrollee, per primary care site, per primary care visit, per visit with BHI screening, and per patient assessed and identified as needing treatment for depression, alcohol use disorder, cannabis use disorder, or other substance use disorder. For this modeling exercise, we obtained estimates from the KP Washington primary care population using performance monitoring data for the month of July 2018. This was the last month of active implementation for the last two sites in our study (and up to 41 months after active implementation for the others). In contrast, no routine annual population-based behavioral health screening and assessment for KP Washington primary care patients were performed prior to BHI implementation. Hence, we arrive at the expected unit costs for various elements of care, spreading the implementation costs over a 12-month period.

2.2.7 | Sensitivity analyses

In our sensitivity analyses, we sought to generate a range of plausible estimates for the costs of BHI implementation for leaders in other health system settings that have different input costs. We conducted a sensitivity analysis (sensitivity analysis A) that used the BLS 25th and 75th percentile wages (where available) as inputs. Where unavailable for labor and for all nonlabor costs, we varied our mean values by 25%

There are multiple BLS occupational titles that could fulfill a particular role in BHI implementation. For example, we used BLS titles of Family and General Practitioners, General Internists, Obstetricians and Gynecologists, Psychiatrists, Nurse Practitioners, and Physician Assistants to fulfill the role of primary care providers in local implementation teams. We conducted a scenario sensitivity analysis (sensitivity analysis B) in which we calculated total implementation costs using the lowest and highest compensated BLS occupational title for each implementation role to estimate implementation costs for that role. For example, for the lower estimate, we ascribed all implementation hours for primary care providers within local implementation teams to nurse practitioners. Since the project leadership team is composed of physician and nonphysician leaders, for the lower bound estimate for this sensitivity analysis, we considered these as separate roles and assigned the lowest compensated physician BLS occupational title (ie, pediatrician) to physician leaders and the lowest compensated nonphysician BLS occupational title to nonphysician leaders (ie, psychologist).

While our primary focus is to describe the economic costs of implementing BHI and include, to the degree possible, opportunity costs to the health system, we recognize that at least in the short run some of the costs could be absorbed by allocating already existing resources from the health system and would therefore not be recognized as a cost to health system leaders. This short run accounting

TABLE 1 Labor (number of unique persons and person-hours) and nonlabor costs to implement Behavioral Health Integration at Kaiser Permanente Washington

Components of cost	Developmental Phase 9/2014 through 3/2016			Main Phase 4/2016 through 7/2018			Total (Developmental + Main) 9/2014 through 7/2018		
	Persons	Hours	Cost (\$)	Persons	Hours	Cost (\$)	Persons	Hours	Cost (\$)
Project implementation team personnel ^a									
Project leadership									
Project leaders	7	2184	264 952	7	3030	340 761	8	5214	605 713
Administrative support staff	2	396	8684	1	686	15 064	2	1082	23 749
Practice coaches	2	2004	152 601	3	4215	312 203	3	6219	464 804
EHR programmers	2	510	44 360	2	947	82 321	3	1457	126 681
Performance metric programmers	1	583	46 721	3	701	56 217	4	1284	102 938
Site-level local implementation team									
Primary care providers	10	98	14 029	59	685	89 293	69	783	103 323
Behavioral health social workers	4	35	1414	29	370	14 985	32	405	16 399
Clinical support staff	11	89	3619	71	772	27 708	82	861	31 328
Clinic and regional managers	9	69	5150	37	383	29 110	46	452	34 261
Administrative support staff	0	0	0	37	373	8199	37	373	8199
Total Personnel (Project + local implementation Teams)	48	5968	541 532	249	12 163	975 862	286	18 131	1 517 394
Nonlabor costs									
Office Space and other overhead ^b			18 025			36 733			54 758
Practice coach training program			6500			0			6500
Practice coach travel			29			1151			1180
Practice coach supplies			3962			3345			7307
Total nonlabor costs			28 516			41 229			69 745
Grand total costs			570 048			1 017 091			1 587 139

Abbreviation: EHR, Electronic Health Record.

^aSee Table S2 for mapping of project roles here with US Bureau of Labor Statistics occupation titles.

^bIncludes rent, building management, maintenance, security and utility costs.

cost may be important for health system leaders managing budgets. Therefore, we conducted a scenario analysis (sensitivity analysis C) where we removed the costs absorbed by allocating already existing resources in KP Washington. This included leased space costs, health system leaders on the project leadership team, and all local implementation team members.

We provide an interactive version of our model in Table S2 for users to test model assumptions and modify inputs to align with expected inputs from other health systems.

3 | RESULTS

3.1 | Persons and person-hours spent on activities

In total, BHI implementation in KP Washington required involvement from many individuals (286) and person-hours (18 131). (Table 1)

However, most of these individuals (266) were in the primary care site-level local implementation teams and contributed relatively little time to the project (2875 person-hours). Indeed, the project leadership team and the practice coaches, which were composed of 10 and three individuals, respectively, contributed more time (6296 and 6219 person-hours, respectively) than the local implementation teams.

3.2 | Cost of activities

Transforming the person-hours into labor costs and adding in nonlabor costs, we find that total implementation costs were \$1 587 139 (Table 1). Reflecting the higher time contribution of the project leadership team and the practice coaches and the higher salaries of the project leadership team, these two implementation components made up the majority (69%) of the project costs. The costs were

TABLE 2 Implementation costs for different units of measure (eg, cost per primary care visit) based on sample sizes from Kaiser Permanente Washington Health System over a 1-year period

Unit of measure	Assumptions	Number of units	Cost per Unit
General primary care population			
Total population in health system	Size of enrolled population	400 000	\$4
PC site	Number of PC sites	25	\$63 486
PC provider ^a	Number of PC providers	460	\$3450
PC visit	90% of enrolled with PC visit	360 000	\$4
PC visits with BHI screening ^b	89% of PC visits were screened	320 400	\$5
Primary care patients who completed BHI screening			
Depression and self-harm			
Positive depression screen (ie, PHQ-2 ≥ score 2 on either item)	17.0% of screened patients	54 468	\$29
Assessed for depression (ie, completed PHQ-9)	16.3% of screened patients	52 289	\$30
Identified with moderate to severe depression (ie, PHQ-9 ≥ 10)	12.8% of screened patients	40 851	\$39
Identified with frequent thoughts of self-harm (ie, PHQ-9 Q#9 2-3)	0.7% of screened patients	2092	\$759
Alcohol use			
Positive alcohol screen (ie, AUDIT-C ≥ 3 for women; ≥4 for men)	22.0% of screened patients	70 488	\$23
Positive screen for high-risk alcohol use (ie, AUDIT-C score ≥ 7)	2.0% of screened patients	6408	\$248
High-risk alcohol use and assessed with Alcohol Symptom Checklist	1.3% of screened patients	4037	\$393
Identified with high-risk alcohol use and ≥ 2 DSM-5 symptoms of alcohol use disorder	0.7% of screened patients	2099	\$756
Other substance use			
Positive cannabis screen (daily cannabis use)	4.0% of screened patients	12 816	\$124
Daily cannabis use and assessed with Substance Use Symptom Checklist	2.4% of screened patients	7690	\$206
Identified with daily cannabis use and ≥ 2 DSM-5 symptoms of SUD	0.7% of screened patients	2384	\$666
Positive screen for any other (ie, noncannabis) drug use	1.0% of screened patients	3204	\$495
Any other drug use and assessed with Substance Use Symptom Checklist	0.7% of screened patients	2083	\$762
Identified with any other drug use and ≥ 2 DSM-5 symptoms of SUD	0.3% of screened patients	875	\$1815
Aggregate			
Identified: depression, suicidal thoughts, and/or alcohol or SUD.	13.0% of screened patients	41 540	\$38

Abbreviations: AUDIT-C, The Alcohol Use Disorders Identification Test-Consumption questions; BHI, Behavioral Health Integration; DSM-5, Diagnostic and Statistical Manual of Mental Disorders-fifth edition; PC, Primary Care; PHQ-2 or PHQ-9, Patient Health Questionnaires-2 or 9; SUD, substance use disorders.

^aEstimate includes pediatric, part time, and temporary providers.

^bSeven item BHI screen includes PHQ-2, AUDIT-C, 1 question about frequency of past-year cannabis use, 1 question about frequency of past-year illicit drug use (or nonmedical use of prescription medication).

\$629 462 and \$464 804 for the project leadership team and practice coaches, respectively. Of note, the first three sites (developmental phase) accounted for 36% of the total costs, or \$190 016 per site compared to \$46 231 per site for the remaining 22 sites.

To put the total implementation costs into perspective, this equates to cost of \$5 per BHI screening or \$38 to identify a relevant behavioral health condition (Table 2). When disaggregated, the costs were similar across all relevant behavioral health conditions

TABLE 3 Sensitivity analysis A. Results using 25th and 75th percentile wages (when available^a) from the US Bureau of Labor Statistics' Washington State Occupational Employment Statistics Survey

Components of cost	Developmental phase costs (\$)		Main phase costs (\$)		Total costs (\$)	
	Lower estimate	Upper estimate	Lower estimate	Upper estimate	Lower estimate	Upper estimate
Practice coaching	107 083	173 139	221 725	354 066	328 808	527 206
Local implementation team	18 101	29 343	128 689	202 722	146 790	232 065
Project leadership	205 800	332 676	264 738	429 138	470 538	761 814
EHR clinical decision support programmers	35 563	52 566	65 996	97 548	101 560	150 114
Performance metric programmers	38 023	57 125	45 751	68 735	83 774	125 861
Total labor costs	404 570	644 849	726 900	1 152 210	1 131 469	1 797 059
Total nonlabor costs	21 387	35 645	30 922	51 537	54 136	85 355
Grand total costs	425 957	680 494	757 822	1 203 747	1 185 605	1 882 414

Abbreviation: EHR, Electronic Health Record.

^aValues were not available for five roles at the 75th percentile. For those missing values, we used mean + 25%. All nonlabor costs were varied by plus or minus 25% from the mean.

except for depression: \$759 per patient reporting frequent thoughts of self-harm, \$756 per patient with two or more DSM-5 symptoms of alcohol use disorders, and \$666-\$1815 for patients with two or more DSM-5 symptoms of substance use disorders. The cost to identify a patient with depression was considerably less, at \$39. This is because the percentage of screenings that identified depression was higher than for the other conditions (eg, 12.8% for depression vs < 1% alcohol, or substance use disorders).

3.3 | Sensitivity analyses

Our sensitivity analyses using the 25th and 75th percentiles in BLS wages produced a range of \$1 185 605 to \$1 882 414 for total implementation costs (sensitivity analysis A, Table 3). Similarly, our sensitivity analyses using the lowest and highest mean wage for the BLS occupation titles corresponding to each role produced a range of \$ 1 224 658 to \$1 856 780 (sensitivity analysis B, Table 4). Finally, our scenario analysis evaluating the short run accounting costs for BHI implementation yielded an overall estimate of \$952 577 (sensitivity analysis C, Table 5).

Table S2 gives a detailed report of hours, hourly wages, total hourly compensation, and costs by study phase, and BLS occupation title.

4 | DISCUSSION

Experts and payers have increasingly promoted BHI screening and follow-up to address the substantial public health burden and costs of behavioral health conditions.^{5,9,14-18} However, the costs of applying evidence-based strategies to implement routine sustained, population-based BHI screening and assessment are unknown. This

evidence gap limits widespread adoption of BHI since such costs are often not directly reimbursed by payers. Therefore, health system leaders need to be able to budget for BHI implementation appropriately. This study measured the costs associated with active implementation of population-based behavioral health screening, assessment, and identification in a large regional health system, from the perspective of health system leaders. We collected data on time spent on BHI implementation prospectively and used a mixed "actual" and "protocol-driven" approach⁴⁵ to capture labor and non-labor costs for five major implementation components.

We observed that the majority (93%) of persons involved in BHI implementation were ascribed to local implementation teams but the majority of effort (ie, person-hours) was spent on leadership and administrative support (35%) and practice coaches (34%). This is because each primary care site had a local implementation team composed of multiple staff members with small amounts of effort in BHI implementation for a 6-month time period. This result may also be reassuring to health system leaders who may be concerned with pulling local implementation team members from their clinical responsibilities to participate in BHI implementation. The minimal time requirements for local implementation team members in this study highlights the possibility of implementing sustained, population-based BHI without substantial changes in clinical staff resources. Further, approximately a third of total implementation costs were incurred by practice coaches, which reflects the central role that practice coaches played in facilitating BHI implementation.

If the implementation cost were spread across all patients screened in KP Washington primary care over a 12-month period, the costs per primary care visit would be \$5. Considering that the annual cost to provide primary care has been estimated to be between \$180⁴⁶ and \$330⁴⁷ per patient, the added cost is relatively small. Further, we observed that the initial developmental phase costs were 36% of total study costs. This implies that if BHI is sustained

TABLE 4 Sensitivity analysis B. Results using lowest and highest wage-earning US Bureau of Labor Statistics' Washington State Occupational Employment Statistics Survey occupation titles corresponding to each role

Components of cost	Developmental phase costs (\$)		Main phase costs (\$)		Total costs (\$)	
	Lower estimate	Upper estimate	Lower estimate	Upper estimate	Lower estimate	Upper estimate
Practice coaching	96 235	153 053	202 399	321 898	298 634	474 952
Local implementation team	16 502	25 000	124 914	185 071	141 417	210 070
Project leadership	212 943	364 197	272 299	508 196	485 242	872 393
EHR clinical decision support programmers ^a	44 360	44 360	82 321	82 321	126 681	126 681
Performance metric programmers ^a	46 721	46 721	56 217	56 217	102 938	102 938
Total labor costs	416 761	633 331	738 151	1 153 703	1 154 913	1 787 035
Total nonlabor costs	28 516	28 516	41 229	41 229	69 745	69 745
Grand total costs	445 277	661 847	779 380	1 194 933	1 224 658	1 856 780

Abbreviation: EHR, Electronic Health Record.

^aThese estimates do not vary in this scenario analysis because all individuals had the same Bureau of Labor Statistics occupation title.

TABLE 5 Sensitivity analysis C. Short run accounting cost for implementing Behavioral Health Integration. This analysis excludes costs for leased space, health system leaders on the project leadership team, and all local implementation team members

Components of cost	Developmental phase			Main phase			Total (developmental + Main)		
	Persons	Hours	Cost (\$)	Persons	Hours	Cost (\$)	Persons	Hours	Cost (\$)
Project Implementation team personnel ^a									
Project leadership									
Project leaders	3	792	112 246	3	801	107 172	3	1593	219 418
Administrative Support staff	2	396	8684	1	686	15 064	2	1082	23 749
Practice coaches	2	2004	152 601	3	4215	312 203	3	6219	464 804
EHR Programmers	2	510	44 360	2	947	82 321	3	1457	126 681
Performance metric programmers	1	583	46 721	3	701	56 217	4	1284	102 938
Total personnel	10	4284	364 612	12	7350	572 978	15	11 634	937 590
Nonlabor costs									
Practice coach training program			6500			0			6500
Practice COACH travel			29			1151			1180
Practice coach supplies			3962			3345			7307
Total nonlabor costs			10 491			4496			14 987
Grand total costs			375 104			577 474			952 577

Abbreviation: EHR, Electronic Health Record.

^aSee Table S2 for mapping of project roles here with US Bureau of Labor Statistics occupation titles.

over time (as it appears is true in KP Washington) or if BHI were implemented in a larger primary care system, the per patient costs for implementation would likely decrease as the developmental costs are spread over a larger number of patients.

To our knowledge, there has been only one other study to report costs of implementing BHI in primary care. Wallace et al reported on implementing BHI in 10 practice sites in Colorado.⁴⁸ They allowed

each practice to locally determine how to carry out BHI. The sites varied in assessment measures used, but the majority of sites implemented screening for depression, anxiety, and unhealthy alcohol use.⁴⁹ They found that the average amount incurred per practice was \$44 076. This is near the lower end of the 25th and 75th percentile sensitivity range for average implementation costs per site in our study (\$48 403-\$76 779). Part of this difference would be accounted

for by general medical care inflation, since that study reported results in 2013 dollars, and by lower average wages in Colorado.⁵⁰ Secondly, the practices were smaller with lower screening rates, with a total of 6529 (26%) patients screened, assessed or referred over a three-month period (compared to our study estimate of 320 400 (89%) patients screened over a 12-month period).⁴⁹ Third, although the Colorado intervention included some practice coaching and performance feedback, unlike this implementation effort it did not appear to have regularly scheduled quality improvement meetings every 1-2 weeks with practice coaches,²⁴ which accounted for a third of study expenses in the present study. Finally, the diverse set of sites in that study included nine primary care practices and one community mental health center with different ownership structures (nonprofit, clinician-owned, hospital-owned, and health maintenance organization-owned).

4.1 | Limitations

We did not capture the implementation costs associated with each local implementation team's work outside meetings to adapt and spread the BHI workflow within their sites. We also did not record person-time and costs for the initial BHI clinical and workflow training intended for all primary care staff and providers at the implementation sites (beyond the local implementation team members). This tends to bias our implementation cost downwards. However, the bias is slight since the person-time for each staff member involved training is low (30 minutes to 1 hour of training) given the limited resources available from the implementation sites. However, the costs for training the practice coaches in practice coaching methods and the costs of regular local implementation team quality improvement meetings were included as described in our methods section.

Activity-based costing (ie, reporting costs based on specific project activities) is a common alternative approach for reporting implementation costs.⁴⁵ The project leadership and practice coaches in this study were involved in all activities (such as planning, training, workflow development, quality improvement), and their data were not available broken down by activity. This limits the ability of health system leaders to predict the costs of implementation if they were to adjust the activities within their system. However, this limitation does not affect the accuracy of our estimates. Further, we do provide a description of the project activities for each personnel category (Table S1), we provide an interactive model to allow adjustments to those categories (Table S2), and we perform specific sensitivity analyses on the salaries and personnel employed as described below.

Our results are based on the experience of implementing BHI in a relatively large health system in Washington state and may not be generalizable to other settings. For example, our estimates on the unit costs presented in Table 2 (which depend on the size of the population) are likely lower than would be expected in smaller practices and health systems. We used BLS wages from Washington state and mean wages in Washington state are 14% higher across occupations compared to the national average.^{35,51} This would tend to increase

implementation cost estimates relative to areas with lower wages. However, we conducted sensitivity analyses varying both labor and nonlabor costs along plausible values (sensitivity analysis A). The results were between \$1.2 million and \$1.9 million for total implementation costs, a similar range of values to the sensitivity analysis in which we substituted the lowest and highest compensated BLS occupations that were observed to be used to fulfill an implementation role (sensitivity analysis B). This suggests that the choice of individuals to fulfill a role (eg, nurse practitioner to fulfill role as primary care provider) has as much budgetary impact as potential variations in salary within roles.

Finally, since our study focuses on the costs of using evidence-based strategies for BHI implementation, we did not capture downstream costs, which may add costs to the health system. Specifically, successful implementation is expected to increase screening and identification and associated costs. Bray et al⁴⁵ estimate the median cost of alcohol screening and brief intervention to be \$4 and \$48, respectively. Future studies should consider applying economic models that compare the downstream costs and benefits of applying such implementation strategies.

5 | CONCLUSIONS

Screening for depression and unhealthy alcohol use are recommended to help identify primary care patients in need of preventive counseling or treatment.^{8,52} KP Washington used state-of-the-art strategies to implement routine annual screening, assessment, and identification of depression, suicidality, and unhealthy alcohol, cannabis and substance use as part of behavioral health integration into primary care. Implementation costs over the 41-month implementation process totaled \$1 587 139, or \$5 per primary care visit with BHI screening in a single year. By quantifying these costs as well as providing more tailored costs through sensitivity analyses and an interactive model, this study provides valuable evidence to health system leaders on the human and financial resources needed to implement such a BHI program focused on high-quality screening, assessment, and identification.

ACKNOWLEDGMENT

Joint Acknowledgment/Disclosure Statement: This research was supported by funding from AHRQ grant # R18HS023173. No one at Kaiser Permanente outside of the co-authors have reviewed or commented upon the manuscript. The publication of study results was not contingent on AHRQ's or Kaiser Permanente's approval or censorship of the manuscript.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

How to cite this article: Yeung K, Richards J, Goemer E, et al. Costs of using evidence-based implementation strategies for behavioral health integration in a large primary care system. *Health Serv Res*. 2020;55:913–923. <https://doi.org/10.1111/1475-6773.13592>