

# Healthcare System Effects of Pay-for-Performance for Smoking Status Documentation

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**Objectives:** To evaluate the impact on smoking status documentation of a payer-sponsored pay-for-performance (P4P) incentive that targeted a minority of an integrated healthcare delivery system's patients.

**Study Design:** Three commercial insurers simultaneously adopted P4P incentives to document smoking status of their members with 3 chronic diseases. The healthcare system responded by adding a smoking status reminder to all patients' electronic health records (EHRs). We measured change in smoking status documentation before (2008-2009) and after (2010-2011) P4P implementation by patient P4P eligibility.

**Methods:** The P4P-eligible patients were compared primarily with a subset of non-P4P-eligible patients who resembled P4P-eligible patients and also with all non-P4P-eligible patients. Multivariate models adjusted for patient and provider characteristics and accounted for provider-level clustering and preimplementation trends.

**Results:** Documentation increased from 48% of 207,471 patients before P4P to 71% of 227,574 patients after P4P. Improvement from 56% to 83% occurred among P4P-eligible patients (adjusted odds ratio [AOR], 3.6; 95% confidence interval [CI], 2.9-4.5) and from 56% to 80% among the comparable subset of non-P4P-eligible patients (AOR, 3.0; 95% CI, 2.3-3.9). The difference in improvement between groups was significant (AOR, 1.3; 95% CI, 1.1-1.4;  $P = .009$ ).

**Conclusions:** A P4P incentive targeting a minority of a healthcare system's patients stimulated adoption of a systemwide EHR reminder and improved smoking status documentation overall. Combining a P4P incentive with an EHR reminder might help healthcare systems improve treatment delivery for smokers and meet "meaningful use" standards for EHRs.

*Am J Manag Care. 2013;19(7):554-561*

For author information and disclosures, see end of text.

Smoking kills more than 440,000 people in the United States annually and remains the leading preventable cause of death.<sup>1,2</sup> Despite the availability of effective treatments for tobacco dependence, physicians assess smoking at only 63% of visits and offer counseling to only 21% of smokers.<sup>3</sup> Identification and documentation of smoking status are the first steps to addressing tobacco dependence and have been shown to increase physicians' delivery of treatment.<sup>1</sup> Clinical practice guidelines for treating tobacco dependence recognize the importance of documentation and call for routine smoking status screening and documentation by healthcare systems. The US government's "meaningful use" electronic health record (EHR) incentive program requires smoking status identification in a coded field.<sup>1,4</sup> Yet achieving a high rate of smoking status documentation is a challenge for many healthcare systems.<sup>5</sup>

Efforts to improve smoking status documentation have included electronic or paper-based reminders, performance feedback, and a simple vital sign stamp.<sup>1,6-16</sup> Pay-for-performance (P4P) incentives have been used in some systems to promote delivery of guideline-based tobacco treatment, or as a component of broader quality improvement efforts.<sup>7-9,17,18</sup> These studies have examined performance incentives for various guideline-based treatment activities, including smoking status documentation, documentation of physician-delivered counseling, referral to telephone counseling, and payments to providers for patients' tobacco abstinence. Prior studies of P4P for smoking status documentation were limited to US physician groups or healthcare delivery systems outside the United States.<sup>7-9,17,18</sup> Relatively little is known about the effects of P4P programs in large, multipayer, integrated US healthcare delivery systems in which P4P incentives do not apply to all patients in the system. A payer-sponsored P4P incentive in a multipayer system may only be effective for the patient population to whom it applies. However, practice changes stimulated by a targeted P4P measure can have broader benefits that improve documentation and treatment delivery for targeted and non-targeted patients.

A P4P incentive that was introduced in 2010 in a large multipayer healthcare delivery system rewarded practices for documenting the smoking status of patients with specific commercial insurers and 3 chronic diseases. The organization's multiple payers and diverse provider groups with varied practice styles

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and patient populations make standardized quality improvement efforts especially challenging. Our objective was to study the effect of a targeted, payer-sponsored P4P incentive payment on smoking status documentation across the healthcare system.

## METHODS

### Study Setting

Partners HealthCare Inc is a large integrated healthcare delivery system in eastern Massachusetts whose provider network, Partners Community HealthCare, Inc (PCHI), represents more than 5000 primary care and specialist physicians, and works with multiple payers including commercial insurers, Medicare, and Medicaid.<sup>19,20</sup> All PCHI-affiliated practices use one of several different EHRs. This study was restricted to the practices using the system's predominant EHR, the Longitudinal Medical Record, a locally developed system used by 63% of PCHI practices that was first implemented in 1998. Active providers have been using the EHR for a median of 3.5 years (interquartile range, 1.4-6.7 years). It includes progress notes, laboratory results, medication lists, electronic prescribing, and a variety of clinical reminders.<sup>21</sup>

### Intervention

Since 2001, PCHI has negotiated P4P contracts with 3 large, commercial, not-for-profit insurers who collectively cover the majority of commercially insured patients.<sup>20</sup> Starting on January 1, 2010, the 3 commercial insurers contracted separately with PCHI to pay practices for achieving a target smoking status documentation rate among a group of high-risk patients. The incentive was implemented using a withheld amount that was returned to practices meeting the prespecified target. Selected targets must meet agreed-upon standards of care that are easy to measure, likely to improve quality of care, and involve enough patients for statistical reliability.<sup>20</sup> The amount of payment to practices depended on revenue from P4P-eligible patients and ranged from 3% to 4.8% of practice revenue from the participating insurers for all P4P measures, and \$3.8 million was at risk in PCHI for the smoking status documentation measure. Based on the preincentive documentation and the national guideline recommending that patients be screened at every visit, the target documentation rate was set at 80%.<sup>1</sup> Documentation was measured among eligible patients over a 2-year span (January 1, 2010, to December 31, 2011), with payment at the end of the first year for progress toward the goal and at the end of the second year for reaching the goal.

### Take-Away Points

Routine documentation of smoking status improves clinicians' delivery of tobacco treatment and is mandated in "meaningful use" standards for electronic health records but can be challenging to accomplish.

- A payer-sponsored pay-for-performance incentive prompted systemwide action by the healthcare system, resulting in improved documentation among both targeted and nontargeted patients.
- The effect was greatest among targeted patients, suggesting the financial incentive added value as well as prompting the reminder.
- Combining a performance incentive with an electronic reminder could help healthcare systems to improve treatment for tobacco use and enable population health interventions for smokers.

Eligible patients were adults ( $\geq 18$  years old) who made a visit to a PCHI outpatient practice during the measurement period, were insured by 1 of 3 participating commercial insurers, and had a high risk chronic condition (hypertension, diabetes, or coronary heart disease). The eligible visit could have been to any PCHI specialist or primary care practice in academic-affiliated or community-based practices.

To help practices reach the 80% target, PCHI added an organizationwide clinical decision support tool consisting of a clinical reminder to document smoking status in all patients' EHRs. The nontargeted EHR reminder was implemented concurrently with the P4P program on January 1, 2010. The EHR-based reminder was designed so that clicking the reminder linked to the coded field for smoking status documentation. Documentation could also be accessed in the EHR through a vital signs entry screen or a health monitoring grid that tracks preventive care and chronic disease management.

### Design

To measure the effects of the P4P program on prevalent smoking status documentation, we conducted an observational study before and after P4P implementation. We compared smoking status documentation between the group of high-risk patients who were targeted by the P4P incentive and (1) all non-P4P-eligible patients and (2) a subset of non-P4P-eligible patients who most resembled the P4P-eligible group by having commercial insurance and the same targeted diagnoses as P4P-eligible patients. The study was approved by Partners HealthCare System's Institutional Review Board.

### Data Source

We used data from the EHR to estimate the effect of the P4P incentive on smoking status documentation. We identified adult patients ( $\geq 18$  years old) who had an office visit with a PCHI provider before (2008-2009) or after (2010-2011) the P4P incentive. We extracted patient data including smoking status, age at the visit, sex, race/ethnicity and primary language entered at registration, insurance, primary care pro-

vider, and number of outpatient visits to PCHI practices. We identified the 3 high-risk, chronic conditions included in the P4P incentive. Patients were designated as having the chronic condition if the diagnosis was entered into the EHR before the qualifying visit for that period. Hypertension was defined as a coded entry on the problem list, with the last systolic blood pressure greater than 135 mm Hg or the last diastolic blood pressure greater than 85 mm Hg. Coronary heart disease was based on coded problem list entries of coronary arteriosclerosis, angioplasty, stent placement, coronary artery bypass graft, or myocardial infarction. Diabetes was based on a coded problem list entry of diabetes or a glycated hemoglobin value greater than 7.0%.

We included provider-level demographic data (age and sex) for the primary care provider designated in patients' EHR registration at the start of the study year. Provider-level data were taken from a master provider list maintained by PCHI. Some provider-level data were missing; for these, we included a dummy variable for missing data.

### Outcome

Smoking status documentation is designated in a structured field in the EHR as "active smoker," "past smoker," and "never smoker." To measure the change in documentation before and after implementation of the P4P incentive, we calculated prevalent documentation of smoking status on December 31, 2009, and December 31, 2011. To match the 2-year duration of the P4P program, we pooled patients with at least 1 visit in the 2 years before (2008-2009) and the 2 years after (2010-2011) the P4P implementation. We hypothesized that documentation prevalence would not be significantly different from year to year before P4P implementation, and confirmed this hypothesis prior to pooling.

### Data Analysis

We calculated the unadjusted prevalence of smoking status documentation before and after the P4P incentive among P4P-eligible patients (as defined above), among all non-P4P-eligible patients, and among a subset of the non-P4P-eligible patients who were comparable to the eligible patients in having had a visit to a PCHI provider and a qualifying high-risk chronic condition, but a nonparticipating commercial insurer. We measured the prevalence of documentation among providers stratified by the proportion of P4P-eligible patients seen.

We used multivariable logistic regression modeling to test the hypothesis that P4P measures plus the EHR reminder increased rates of smoking status documentation after the contract was introduced on January 1, 2010. We compared the P4P-eligible patients with the comparable subset of non-

P4P-eligible patients before and after P4P implementation using first-order interaction terms. We adjusted for patient age, sex, race/ethnicity, language, and number of visits per year, and provider age and sex. To account for clustering, we chose to cluster by provider rather than practice as the higher-level unit of analysis because changing provider behaviors was the primary aim of the P4P and the EHR reminder. We accounted for clustering using generalized estimating equation techniques. We investigated practice-level effects by calculating the proportion of visits to each practice by patients with P4P insurance. We found no association between clinics' proportion of P4P-insured visits and patient eligibility, so we did not include this in multivariable analyses.

We calculated adjusted odds ratios (AORs) comparing smoking status documentation before and after P4P implementation among the P4P-eligible group and the non-P4P-eligible comparison group. The first-order interaction terms of time (before and after) by P4P eligibility were used to test whether patients targeted by the P4P incentive had higher rates of documentation than those not targeted. We tested the difference in change in documentation by eligibility. Analyses were performed with SAS software, version 9.3 (SAS Institute Inc, Cary, North Carolina).

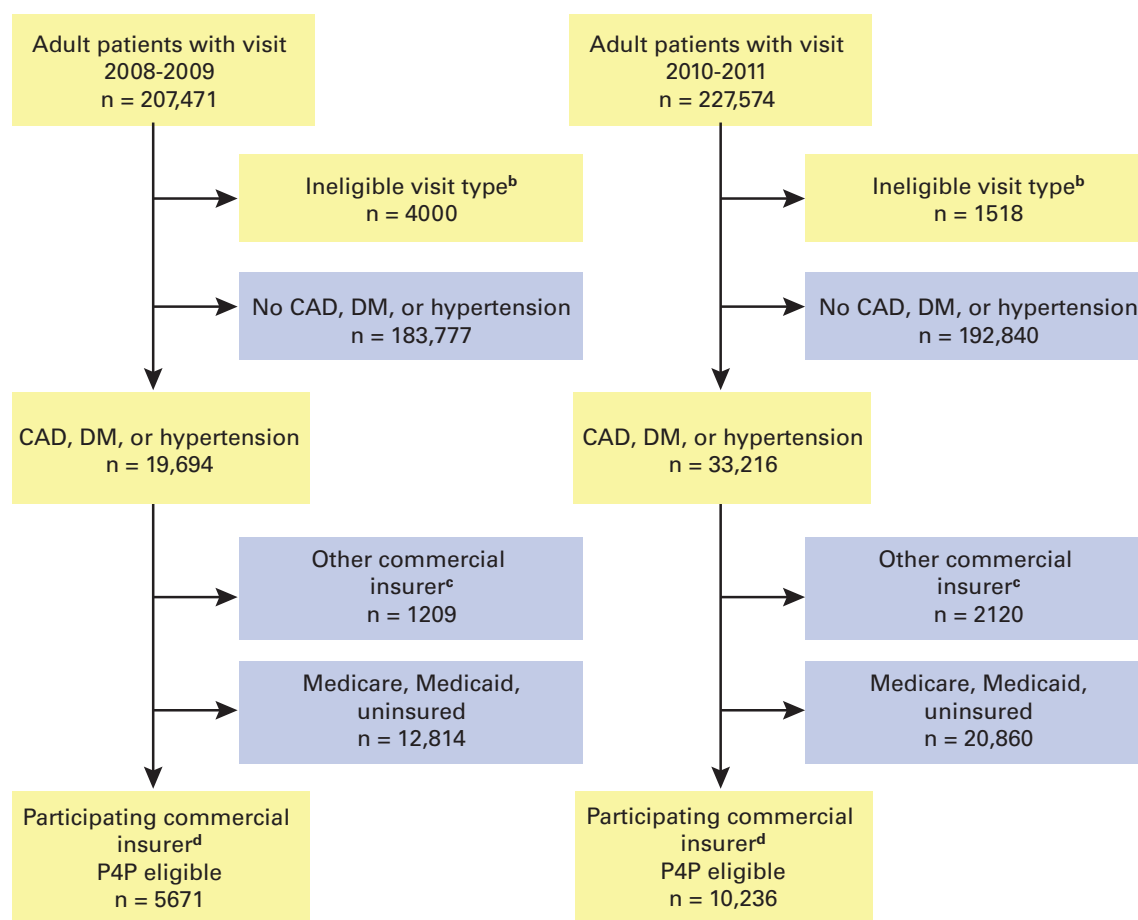
## RESULTS

From 2008 to 2009, 207,741 adults had 1 or more visits to PCHI outpatient providers who used the predominant EHR system for their records. Among these, 5671 (3%) were eligible for the P4P incentive and 1209 (1%) were in the similar but non-P4P-eligible control group (Figure 1). The P4P-eligible and similar but non-P4P-eligible patients together were seen by 807 providers, who individually saw between 1 and 191 of the patients with 1 of the 3 chronic diseases and commercial insurance. In 2010 and 2011, after the P4P introduction, 227,574 adults visited outpatient clinics using the EHR; 10,236 (4%) were P4P eligible and 2120 (1%) were in the non-P4P-eligible comparison group (Figure 1).

Compared with all non-P4P patients, P4P-eligible patients were older and more likely to be male, black, and English speaking, and to make more visits (Table 1). Providers for P4P-eligible patients were more likely to be female and were older. The subset of non-P4P-eligible patients were slightly older (55 vs 54 years) but were otherwise similar to P4P-eligible patients.

Overall, smoking status documentation increased each year among all patients seen during the study period, from 47% in 2008 and 49% in 2009 to 63% in 2010 after the P4P intervention and 74% in 2011. The relative increase in documentation from 2008 to 2011 was the largest among never smokers, with

■ **Figure 1.** Patient Population Before (2008-2009) and After (2010-2011) Pay-for-Performance Implementation<sup>a</sup>



CAD indicates coronary artery disease; DM, diabetes mellitus; P4P, pay-for-performance.

<sup>a</sup>Shaded blue boxes represent all non-P4P-eligible patients.

<sup>b</sup>Patients with ineligible visits had only a visit outside of their academic-affiliated or community-based primary care practice.

<sup>c</sup>These patients who had CAD, DM, or hypertension and a commercial insurer who did not participate in the P4P contract were the subset of non-P4P-eligible patients who were most similar to P4P-eligible patients and were the primary comparison group in adjusted models.

<sup>d</sup>Participating commercial insurers were 3 not-for-profit insurers who contracted for P4P.

documentation increasing by 26% in this group compared with an 18% increase in past smokers and a 14% increase in active smokers. By eligibility, the increase in documentation was greater among P4P-eligible patients than among all non-P4P-eligible patients or the subset of non-P4P-eligible patients who were comparable to the P4P-eligible patients (Figure 2). When patients were pooled into 2-year periods before and after the P4P intervention, documentation increased among the P4P-eligible patients from 56% before (2008-2009) to 83% after P4P implementation (2010-2011) (Table 2). The increase was similar among the subset of comparable but non-P4P-eligible patients (56% to 80%) and smaller among all non-P4P-eligible patients (48% to 71%).

The mean documentation by provider among those who saw no P4P-eligible patients increased from 30% be-

fore P4P implementation (median 20%; range 0%-100%) to 59% after P4P implementation (median 66%; range 0%-100%). Among providers who saw any P4P-eligible patients, the change in mean documentation increased by the proportion of P4P-eligible patients seen (lowest tertile: 55% before [median 67%; range 1%-100%] to 68% after [median 77%; range 15%-100%]; middle tertile: 52% before [median 50%; range 0%-100%] to 70% after [median 82%; range 13%-100%]; highest tertile: 54% before [median 59%; range 0%-100%] to 74% after [median 84%; range 17%-100%]).

In multivariable logistic regression models, both P4P-eligible and the similar but non-P4P-eligible patients were more likely to have a documented smoking status after the P4P was implemented. We compared smoking status

■ **Table 1.** Adult Patients Visiting a Partners Practice Before Implementation of Pay-for-Performance

Characteristics	P4P-Eligible Patients (n = 5671)		All Non-P4P-Eligible Patients (n = 201,800)			Non-P4P-Eligible Subset <sup>a</sup> (n = 1209)		
	No.	%	No.	%	P <sup>b</sup>	No.	%	P <sup>b</sup>
<b>Patient characteristics</b>								
Age at visit, mean (SD), y	54	(10)	49	(16)	<.001	55	(11)	<.001
Female	2412	42.5	124,983	61.9	<.001	512	42.3	.91
Race/ethnicity					<.001			.71
White	3919	69.1	144,303	71.5		831	68.7	
Black	797	14.1	16,045	8.0		179	14.8	
Hispanic	454	8.0	21,838	10.8		99	8.2	
Asian	245	4.3	8479	4.2		45	3.7	
Other race/ethnicity	31	1.4	1589	0.8		11	0.9	
Unknown	225	4.0	11,217	5.5		44	3.6	
English speaker	5281	93.1	181,360	89.9	<.001	1108	91.6	.07
Visits per year, median (IQR)	11	(6-19)	8	(4-15)	<.001	11	(6-19)	.64
<b>Insurance<sup>c</sup></b>								
P4P commercial payers	5671	100.0	101,324	50.2		—	—	
Non-P4P commercial payers	—	—	19,921	9.9		1209	100.0	
Medicaid	—	—	19,116	9.4		—	—	
Medicare	—	—	36,970	18.3		—	—	
Uninsured	—	—	6596	3.3		—	—	
Other/missing	—	—	5705	2.8		—	—	
<b>Provider characteristics</b>								
Female provider	2151	37.9	68,282	33.8	<.001	449	37.1	.89
Provider age at start of study, mean (SD), y	49	(10)	48	(10)	<.001	48	(10)	.32

IQR indicates interquartile range; P4P, pay-for-performance; SD, standard deviation.  
<sup>a</sup>Subset of the non-P4P-eligible group with a commercial insurer that did not participate in the P4P contract and a chronic condition (diabetes mellitus, hypertension, or coronary artery disease).  
<sup>b</sup>P value based on *t* test for continuous variables, Wilcoxon rank sum for count, and  $\chi^2$  for categorical variables compared with the P4P-eligible group.  
<sup>c</sup>Differences not tested.

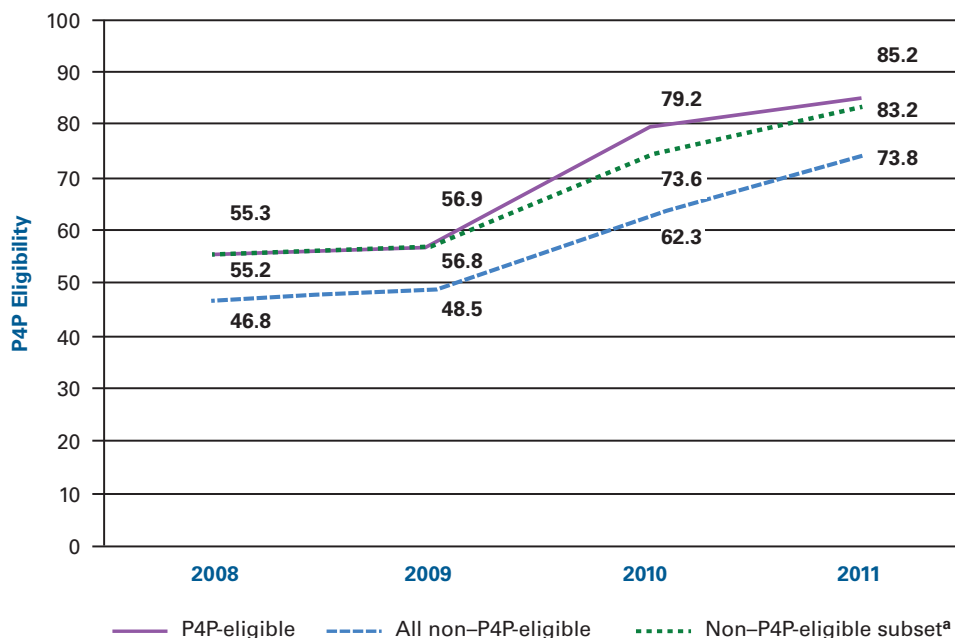
documentation before and after the P4P was implemented among P4P-eligible patients (AOR 3.6; 95% confidence interval [CI], 2.9-4.5;  $P < .001$ ) and the similar subset of non-P4P patients (AOR 3.0; 95% CI, 2.3-3.9;  $P < .001$ ) (Table 3). Before the P4P intervention, there was no difference in documentation between the P4P-eligible patients and the similar subset of non-P4P-eligible patients (AOR 1.0; 95% CI, 1.0-1.1;  $P = .45$ ). After the P4P intervention, documentation was higher among the P4P-eligible patients compared with the subset of non-P4P-eligible patients (AOR 1.3; 95% CI, 1.1-1.4;  $P = .009$ ). The difference-in-differences between P4P-eligible and non-P4P-eligible was significant ( $P < .001$ ). Other characteristics that were independently associated with an increase in smoking status documentation were older age, female sex, black or Hispanic race, non-English speaking, having a younger primary care physician, and having a female primary care physician.

## DISCUSSION

A targeted P4P incentive from insurers that stimulated adoption of a systemwide EHR reminder significantly improved smoking status documentation in a large multipayer integrated healthcare delivery system. Although the P4P incentive applied to only a minority of patients in the system, smoking status documentation rates increased among all patients.

Among patients targeted by the P4P incentive, the improvement in documentation could be attributable to the performance incentive, the EHR reminder, or both. That the effect was slight but statistically significant among P4P-targeted patients compared with nontargeted patients suggests that the financial incentive added to the effect of the EHR reminder alone. Our findings are consistent with prior work in single-payer systems or physician group practices that demonstrated the effectiveness of performance incentives for

■ **Figure 2.** Unadjusted Smoking Status Documentation by Pay-for-Performance Eligibility and Year



<sup>a</sup>Patients with commercial insurer that did not participate in the P4P contract and a chronic condition (diabetes mellitus, hypertension, or coronary artery disease).

improving smoking status documentation.<sup>7,9,17,18</sup> In our own system, a decision support program for chronic disease management had the greatest improvement in measures that were also incentivized with a P4P contract.<sup>22</sup> Our data suggest that combining a P4P incentive with an EHR reminder may be an effective way for integrated healthcare delivery systems to promote provider behavior change and reach meaningful use goals for smoking status documentation. However, the reminders may account for a large share of documentation improvement. A healthcare system could achieve improvement in documentation with a reminder alone.

A unique feature of this study was the opportunity to observe the effect of a P4P incentive on patients in the same practices who were not targeted by the incentive. The increase in smoking status documentation among these patients could be attributed to the EHR reminder that was implemented for all patients. Had the EHR reminder not been implemented, providers might still have responded to the targeted P4P incentive by altering their smoking status documentation practice for all patients, rather than trying to figure out which patients were eligible. While we cannot determine whether this “spillover” effect occurred in this observational study, we suspect this behavior would occur if providers believe a performance target is important.

In general, P4P programs that promote documentation improve process measures but have not demonstrated effects

on quality of care or patient outcomes.<sup>23</sup> Screening patients for tobacco use has been associated with increased treatment delivery in some settings, but increased cessation rates have not been demonstrated.<sup>24-27</sup> However, the evidence base linking brief clinician interventions with smoking cessation outcomes is strong.<sup>1</sup> Furthermore, smoking status documentation may have additional benefits in that it enables healthcare systems to implement chronic disease management tools to help smokers achieve cessation outside the clinical encounter.<sup>28</sup>

We acknowledge several limitations to this study. First, we cannot exclude secular trends as an explanation for the increase in documentation in 2010. Notably, meaningful use standards for EHRs were announced in 2010,<sup>4</sup> which created an incentive for healthcare systems to improve documentation. During the time period of this study, our healthcare system was still engaged in planning activities and had not yet implemented interventions to meet the standard. Second, unmeasured confounders may be associated with specific insurers. Insurers might be targeting their members who smoke in other ways that prompt patients to discuss smoking with their provider, or insurers might be contacting high-volume providers to promote assessment of smoking status. Third, we used EHR data to identify patient diagnoses, whereas the P4P incentive was administered with claims data. Accurate diagnoses depend on providers maintaining up-to-date prob-



■ **Table 2.** Unadjusted Tobacco Use Documentation by Pay-for-Performance Eligibility Before and After Implementation of Pay-for-Performance

P4P Eligibility	Documented Tobacco Use Status		Documented Current Smoker	
	No.	%	No.	%
<b>All P4P-eligible patients</b>				
Before P4P (2008-2009)	3186	56.2	521	9.2
After P4P (2010-2011)	8462	82.7	1080	10.6
<b>Non-P4P-eligible patient subset<sup>a</sup></b>				
Before P4P (2008-2009)	680	56.2	126	10.4
After P4P (2010-2011)	1697	80.0	227	10.7
<b>All non-P4P-eligible patients</b>				
Before P4P (2008-2009)	96,030	47.6	17,237	8.5
After P4P (2010-2011)	153,223	70.5	22,859	10.5

P4P indicates pay-for-performance.  
<sup>a</sup>Patients with commercial insurers that did not participate in the P4P contract and a chronic condition (diabetes mellitus, hypertension, or coronary artery disease).

■ **Table 3.** Multivariable Logistic Model Before (2008-2009) and After (2010-2011) the Pay-for-Performance (P4P) Program by Eligibility

P4P Eligibility	Adjusted OR <sup>a</sup>	95% CI	P
<b>P4P-eligible patients</b>			
Before 2008-2009	Reference		
After 2010-2011	3.6	2.9-4.5	<.001
<b>Non-P4P-eligible subset<sup>b</sup></b>			
Before 2008-2009	Reference		
After 2010-2011	3.0	2.3-3.9	<.001

CI indicates confidence interval; OR, odds ratio; P4P, pay-for-performance.  
<sup>a</sup>Odds ratios were calculated using first-order interaction term between P4P eligibility and time (before vs after P4P implementation). Adjusted for patient age, sex, insurance, English speaking, race/ethnicity, number of visits per year, clinician age, and clinician sex, accounting for clinic-level clustering using generalized estimating equation techniques.  
<sup>b</sup>Subset of non-P4P-eligible patients with a commercial insurer that did not participate in the P4P contract and a chronic condition (diabetes mellitus, hypertension, or coronary artery disease).

lem lists and may be underreported in our data. We chose to use EHR data, which were readily available and reflected the information available for clinicians in deciding whether to screen patients. If patients with comorbidity were identified in administrative claims but not in our EHR data, they would have been included in our non-P4P-eligible group. This would have made our groups more similar and biased our results toward no effect. A fourth limitation is that the P4P incentive mandated that smoking status be documented at the visit or at some earlier time. It was unknown whether smoking status entries from the past were still accurate. The increase in smoking status documentation also identified more never smokers than current smokers. While the utility of documenting smoking status lies in the system's ability to identify a population of smokers who can be targeted for treatment and care management, increasing overall documenta-

tion increases accuracy of smoking prevalence estimates and encourages healthcare system action and investment.

## CONCLUSION

In conclusion, a limited P4P incentive targeting only a minority of a healthcare system's patients stimulated the system to adopt a universal EHR reminder to prompt smoking status documentation. The combination improved smoking status documentation among all patients, although improvement was greater among patients targeted by the P4P incentive than among those who were not. It appears that the P4P incentive added value beyond its prompting of a systemwide EHR reminder. These findings suggest that combining a P4P incentive with an EHR reminder could help healthcare systems striving for meaningful use goals to improve treatment

for tobacco use and enable population health interventions for their patients who smoke.

### Acknowledgments

We acknowledge Elizabeth Mort, MD, MPH, and Partners HealthCare System's High Performance Medicine for sponsorship of the project and Elizabeth S. Duncan of Partners Community Healthcare Inc for her assistance with the project.

An earlier version of this study was presented at the Society for General Internal Medicine, New England Regional Meeting, March 9, 2012, Portland, ME; the Society for Research in Nicotine and Tobacco 18th Annual Meeting, March 16, 2012, Houston, TX; and the Society for General Internal Medicine 35th Annual Meeting, May 11, 2012, Orlando, FL.

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**Funding Source:** Dr Kruse was supported by grant T32HP12706-03-00 from the Health Resources and Services Administration for the Harvard General Medicine Fellowship. Dr Rigotti was supported by grant K24-HL08880. The funders of these grants had no role in study design, conduct, data analysis, interpretation, or manuscript preparation, review, or approval.

**Author Disclosures:** The authors (GRK, YC, JHKK, JAL, JSE, NAR) report no relationship or financial interest with any entity that would pose a conflict of interest with the subject matter of this article.

**Authorship Information:** Concept and design (GRK, JAL, JSE, NAR); acquisition of data (GRK, JHKK, JSE); analysis and interpretation of data (GRK, YC, JAL, JSE, NAR); drafting of the manuscript (GRK, JAL); critical revision of the manuscript for important intellectual content (GRK, YC, JAL, NAR); statistical analysis (GRK, YC, JAL); provision of study materials or patients (JHKK); administrative, technical, or logistic support (GRK, JHKK, JAL); and supervision (JAL).

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