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The impact of financial incentives and a patient registry on preventive care quality: increasing provider adherence to evidence-based smoking cessation practice guidelines☆

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Abstract

Background. This study tested the effects of two organizational support processes, the provision of financial incentives for superior clinical performance and the availability of a patient (smoker) registry and proactive telephone support system for smoking cessation, on provider adherence to accepted practice guidelines and associated patient outcomes.

Methods. Forty clinics of a large multispecialty medical group practice providing primary care services were randomly allocated to study conditions. Fifteen clinics each were assigned to the experimental conditions “control” (distribution of printed versions of smoking cessation guidelines) and “incentive” (financial incentive pay-out for reaching preset clinical performance targets). Ten clinics were randomized to receive financial incentives combined with access to a centralized patient registry and intervention system (“registry”). Main outcome measures were adherence to smoking cessation clinical practice guidelines and patients’ smoking cessation behaviors.

Results. Patients’ tobacco use status was statistically significant ($P < 0.01$) more frequently identified in clinics with the opportunity for incentives and access to a registry than in clinics in the control condition. Patients visiting registry clinics accessed counseling programs statistically significantly more often ($P < 0.001$) than patients receiving care in the control condition. Other endpoints did not statistically significantly differ between the experimental conditions.

Conclusions. The impact of financial incentives and a patient registry/intervention system in improving smoking cessation clinical practices and patient behaviors was mixed. Additional research is needed to identify conditions under which such organizational support processes result in significant health care quality improvement and warrant the investment.

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Keywords: Practice management; Quality of health care; Preventive medicine; Smoking cessation; Practice guidelines; Guideline adherence

Background

The recent Institute of Medicine Report, *Crossing the Quality Chasm: A New Health System for the 21st Century* [1], issued a broad call for redesigning the health care

system, in order to better meet patients’ needs and improve outcomes. To accomplish this goal health care organizations are charged with identifying managerial strategies that facilitate the creation of care environments or organizational support systems that ensure optimal care delivery by, for example, increased provider adherence to accepted clinical care guidelines.

The lack of organizational support systems may be one of the reasons why some of the most cost-effective preventive care maneuvers available to clinicians, the consistent

☆ Surveys available upon request from corresponding author.

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identification of tobacco users and provision of advice to quit [2], are still not performed at satisfactory levels in most medical settings [3]. As evidence-based smoking cessation practice guidelines are available [4], it is important to identify managerial or clinical strategies that create the necessary system orientation within a care setting that can promote preventive care quality by increased adherence to these guidelines.

One feature of an effective care support system in health care might be the presence of reward/incentive structures for superior or improved clinical performance [5]. Payment of financial incentives or bonuses for achieving high-quality performance is common in other industries but still remains a rare practice in the health care industry [6]. While some evidence is available documenting the positive impact of payment method or financial incentives for reducing cost and utilization of health care resources [7], the impact of financial reward mechanisms on health care quality and guideline adherence has not been carefully studied in controlled trials [8–11].

In addition, underusage, or lack of implementation, of available information technology has also been recognized as a detractor from more swift progress in improving preventive care quality [11]. For example, suboptimal management of patient data may lead to missed opportunities in instituting clinical maneuvers or interventions known to improve patients' health. The value of automated, electronic patient registries in closing this gap has been specifically recognized [12]. The information contained in such registries (i.e., presence of risk factors, services needed) typically serves as a trigger for a coupled intervention system. Such an intervention system might serve as a clinic or physician extension for the consistent provision of appropriate preventive care services such as smoking cessation education and counseling. Proactive telephonic smoking cessation counseling might constitute a promising delivery modality within the context of such an intervention system [13, 14]. Moreover, it has been suggested that the positive impact of proactive telephonic smoking cessation counseling could be enhanced if such services were more tightly integrated with face-to-face contacts with health care providers [15].

This study evaluates the differential effects of two promising but understudied features of an organizational support system on provider adherence to the evidence-based PHS guidelines for smoking cessation [4]. The organizational support processes tested in this project are represented by the provision of financial incentives for superior clinical performance and the integration of a patient registry and proactive telephone support system into clinic-based practices. We evaluated the impact of these system features on improving clinicians' tobacco user identification and advice practices and associated patient outcomes in a large medical group practice in the upper Midwest.

Methods

Design

A three-condition group randomized efficient (unbalanced) evaluation design was employed. The three experimental conditions are represented by (1) no intervention/control (distribution of printed versions of the smoking cessation guidelines) ("control"), (2) financial incentives for reaching preset clinical performance targets ("incentive"), and (3) financial incentives for reaching preset clinical performance targets combined with access to a centralized smoker registry and intervention system ("registry"). Clinic practice endpoint changes were assessed in a before–after intervention design. Changes in patient endpoints were evaluated in a postintervention measurement-only design. This research was approved by Allina Health System's Institutional Review Board. Fig. 1a and b illustrates this study's design and employed evaluation tools and their timing.

Sample

Forty clinics providing primary care service (family practice, internal medicine, obstetrics/gynecology) of a large midwestern multispecialty group practice were randomly assigned to one of these three conditions. Fifteen clinics each were allocated to the experimental conditions control and incentive and 10 clinics were assigned to the experimental condition registry. The potential influence of several clinic-level covariates including the proportion of low-income patients, patients' gender distribution, and clinic size (number of providers, average number of patient visits) was controlled by forming groups of similar clinics and their subsequent block randomization into the three conditions. Ob/gyn clinics were evenly distributed among study conditions.

During the course of this study the leadership of the medical group practice decided for business-related reasons to close two and merge a third clinic with another clinic participating in the study. Those decisions affected two clinics which had been assigned to the experimental condition incentive and one clinic assigned to condition registry. These three clinics were excluded from the final data analysis.

Endpoints

The impact of the tested organizational support processes on two types of endpoints, smoking cessation clinical practice patterns (e.g., tobacco user identification, providing advice to quit to current smokers) and patient outcomes (e.g., sustained quit attempts, use of any medication for quitting, intention to quit within 30 days), was evaluated.

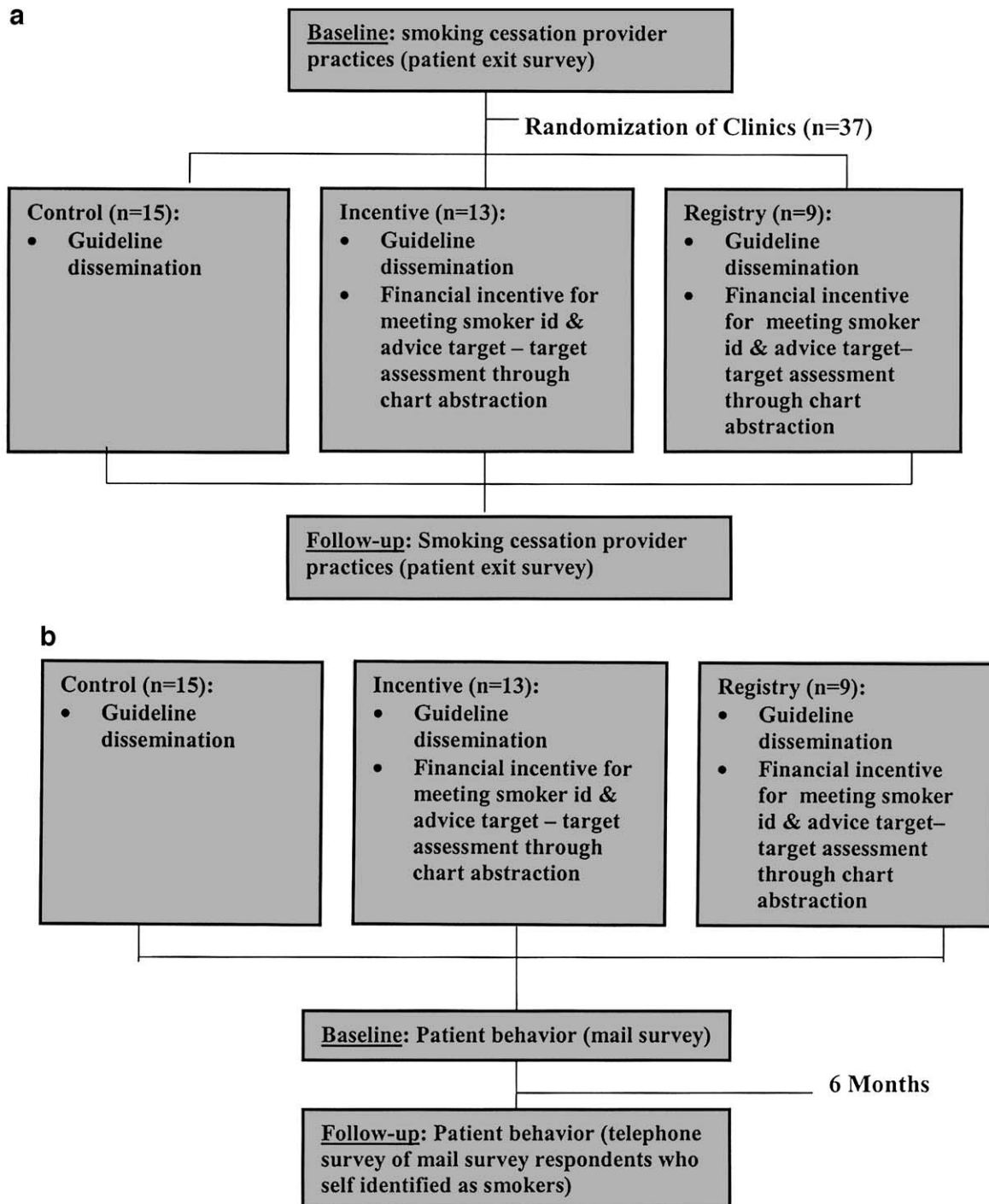


Fig. 1. (a) Study diagram — Assessment of clinical practice outcome changes. (b) Study diagram — Assessment of patient outcome changes.

Endpoint assessment

Clinical practice pattern endpoints

Clinic practice pattern endpoints were measured in two rounds of brief, one-page cross-sectional patient pen-and-pencil exit surveys [1]. The exit surveys assessed whether, during their visit, patients were asked whether they smoked and, if so, whether they were advised to quit.

Baseline and follow-up exit surveys were conducted in

May 1999 and June 2000, respectively. In order to efficiently and effectively administer the survey we prorated the necessary survey volume by clinics, as determined by statistical power calculations, based on patient flow in those clinics. In total, we collected 4,813 baseline and 4,734 follow-up exit surveys.

Of those patients exiting the clinics who were approached to complete a survey, we were able to achieve response rates of 72 and 86% for the baseline and follow-up

exit surveys, respectively. Despite this difference in response rates, key characteristics of the two respondent populations including age, gender, education, marital status, and smoking prevalence did not differ statistically significantly. It was therefore concluded that the two cross-sectional populations of survey respondents are comparable.

Patient tobacco use endpoints

Patients with clinic visits subsequent to the introduction of the organizational support processes received a baseline mail survey in July/August 2000. Approximately 66,000 surveys were mailed to patients in all 37 clinics remaining in the study. Survey recipients were identified from clinic records as being 18 years of age or older, having telephone numbers noted in their records, and having had an office visit (e.g., not a lab visit) with a provider 90 days prior to July 10, 2000. A final response rate of 37% ($n = 21,777$) of the original sample was achieved, with 6,500 surveys being returned as nondeliverable. A 13.9% ($n = 2,799$) prevalence of smoking was found for $n = 20,150$ respondents to the smoking section of the survey. This self-reported smoking prevalence for this clinic population rate is lower than statewide (19.8%) or national averages (23.3%) reported in 2001 [16].

Six months following the administration of the mail survey, we performed a follow-up telephone survey of patients who had self-identified as smokers or recent ex-smokers on the mail survey. We classified recent ex-smokers as smokers who indicated that they quit in the 12 months prior to receiving the mail survey, approximately the time that the organizational support processes began to be implemented in the clinics. The main goal of the telephone survey was to determine the proportion of ex-smokers who quit during the time period that the organizational support processes were implemented.

A total of $n = 3,436$ current smokers and recent ex-smokers were identified via the mail survey and were eligible for the telephone survey. An acceptably high response rate to the telephone survey of 80.5% was achieved. Of potential respondents, 414 could not be reached for telephone follow-up primarily due to disconnected or out-of-service phone numbers. Of the 3,022 subjects who were reached via telephone, 257 did not complete the survey. The most common reasons for not completing the survey were that the respondent indicated that they had quit more than 18 months prior to the telephone survey ($n = 117$) or that they had never smoked ($n = 63$) or they refused to complete the survey ($n = 44$). Twelve subjects died prior to the phone survey and 3 respondents were too ill or hospitalized at the time of the phone survey. Response rates did not differ by experimental condition. An additional 36 respondents were excluded from analysis due to their quit date being more than 570 days in the past ($n = 34$) (and thus could not be attributed to the intervention) or if their survey missed the required clinic identifier ($n = 2$).

Analysis

Sample size estimation followed the method suggested for a clustered design [19]. The study was designed with 80% statistical power to detect differences of 2.6% in patient quit rates between the control and incentive conditions and a 6.5% difference between the control and registry conditions after allowance for multiple testing. Analysis employed mixed model analysis of covariance with clinics serving as the unit of analysis. Results were adjusted for statistically significant covariates including patient gender and age distribution in clinics. Analyses of practice pattern changes (identification, offer of advice to quit) and patient outcomes (quitting) made use of clustered logistic regression (GLIMMIX macro, Statistical Analysis System (SAS, Version 6.12)).

Interventions

Organizational support process I: Financial incentives for reaching preset clinical performance targets

The medical group's management decided to set and communicate clinical performance targets that would trigger a pay-out of financial incentives if reached. Management decided that 75% of all patients over 18 should have their tobacco status clearly identified at each visit and documented in their medical records for their last; and 65% of smokers should have provision of advice to quit smoking documented in their medical record for the last visit to trigger incentive payout for a clinic. Performance targets were set at approximately 15 percentage points above the average performance for these clinic practices as assessed by the medical group 2 years prior to the effort described here [18]. Moreover, the National Committee on Quality Assurance has reported that health plan providers' advice to quit rate as measured through patient self-report averaged 66.2% in 2000 [19]. Incentive amounts were based on the number of providers per clinic. Specifically, clinics with one to seven providers could receive a \$5,000 award, and clinics with eight or more providers were eligible for a \$10,000 bonus. Clinics who reached or exceeded only one of the two performance goals were eligible for half the amount.

Performance expectations and the availability of incentives were communicated to clinics in a series of written and verbal formats (i.e., letters and e-mail for individual clinics' management and clinical staff, manager/staff meetings, personal communication) beginning in May of 1999. Clinics were provided with suggestions on how to spend earned incentive payments (i.e., travel and registration for educational courses). Ultimately, clinics decided how to allocate incentive payments.

Clinics received some performance feedback regarding their adherence to smoking cessation practice standards in a variety of formats prior to incentive distribution. In June of 1999 results of a chart abstraction program that captured

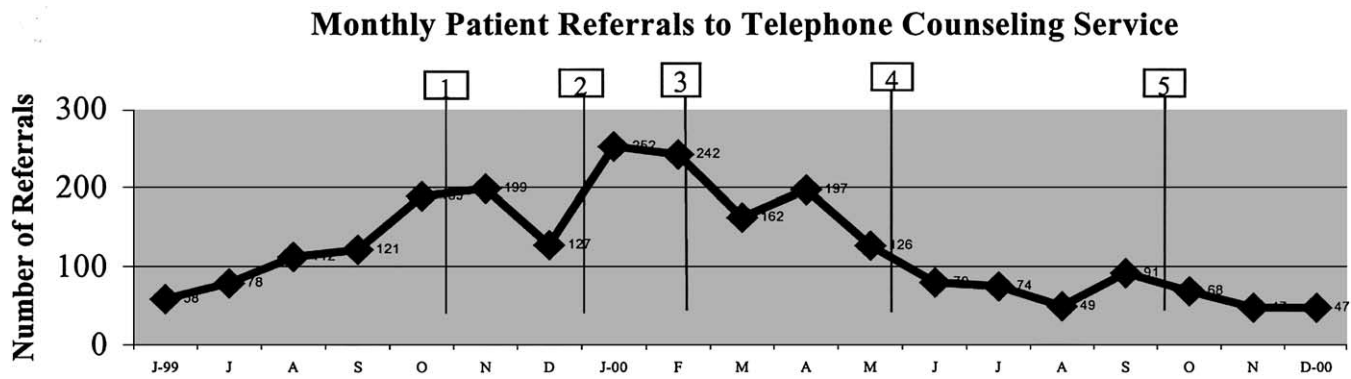


Fig. 2. Monthly referrals to telephone smoking cessation counseling service. 1, Pizza incentive for clinics achieving 15 referrals in 1 week and/or reaches 100 referrals. 2, Holiday season. 3, Weekly referral tips included in quantitative referral feedback to clinics. 4, Medical director challenges clinics to refresh and refocus on smoking cessation practices. 5, Financial incentives distributed.

performance information on smoking cessation practice standards for patient visits in 1998 were provided to all clinic sites. In November 1999 clinics in the experimental conditions incentives and registry were provided with results of the baseline exit surveys.

Performance measurement of clinic practice patterns to trigger incentive payment was conducted via medical record abstraction by trained medical record abstractors in May/June 2000 from randomly selected medical records of patients who had an encounter with a provider between 1/1/2000 and 3/31/2000. Chart abstractors reviewed a minimum of 70 medical records per clinic to determine rates of tobacco use identification and 175 medical records to determine rates of providing cessation advice. Twenty-two clinics received incentive payments for the identification of smoking status. Twelve clinics received incentive payments for providing advice to quit smoking. Individual clinics were notified in August 2000 of the amount of their incentive payment.

Organizational support processes II: Access to a centralized smoker registry and intervention system

The smoker registry and telephonic smoking cessation counseling activities commenced in June of 1999. The service was staffed with six part-time (2.4 FTEs) counselors and one doctor-level prepared full-time supervisor. All counselors held a baccalaureate or Masters degree in counseling, psychology, psychiatric social work, or a related field. All staff participated in a 6-week training program in preparation for their role.

An extensive and efficacious telephonic smoking cessation counseling protocol was implemented for the conduct of an initial screening call and approximately seven potential subsequent counseling calls placed during a 2-month period following referral to the service [20]. The intervention targeted smokers ready to quit within 30 days, the group of smokers most likely to benefit from the counseling protocol [21].

In order to refer patients to this counseling service clinic staff or providers asked patients to fill out a referral postcard once a patient had been identified as a current tobacco user and interested in quitting smoking within 30 days during their clinic visit. Patients were informed that by filling out the card they gained access to a telephonic smoking cessation program free of cost to them. These cards were collected by clinic staff and mailed in to the registry once a week. Patients could also take the card home, fill it out, and mail it to the service. Alternatively, they were provided with a toll-free telephone number allowing them access to the service.

All clinics with access to the service received weekly updates on their referral activity during the past week and their referral activity to that date. As this information was provided in the same graph to all nine clinics in the registry experimental condition, clinics were able to identify the referral patterns of their site compared to other clinics. This form of feedback was intended to facilitate a friendly competition among clinic sites to surpass the performance of their fellow sites in referring more smokers to the service. Tips and news about providing smoking cessation services to patients accompanied quantitative feedback to clinics in an attractively laid out and easy-to-read format.

As of July 17, 2000, referral cards were received for $n = 1,834$ smokers over the age of 18 and ready to quit within 30 days. Counseling staff was unable to establish any telephone contact with 20.1% ($n = 369$) of those patients. Upon contact 317 (17.3%) clients refused to continue with the telephonic counseling program. Thus, overall, the program has delivered smoking cessation counseling services to 1,148 clients from nine clinics over the course of approximately 1 year. Weekly referrals to the registry initially increased over time, peaking in March 2000 with 82 referrals/week. Subsequently referral rates dropped back to baseline levels.

Figure 2 outlines the monthly referral activity for the registry from commencement of activities through Decem-

Table 1
Clinical practice pattern outcomes

Condition	Percentage of patients, tobacco use status identified at last visit			Percentage of smokers who received advice to quit at last visit			Percentage of smokers who were offered assistance to quit at last visit		
	Baseline	Follow-up	Difference	Baseline	Follow-up	Difference	Baseline	Follow-up	Difference
Control	40.5	46.7	6.2	35.4	53.7	18.3	19.7	34.0	14.3
Total <i>n</i> valid responses	1700	1718		357	329		357	329	
Incentive	39.9	54.0	14.1	31.0	55.5	24.2	22.6	31.4	8.8
Total <i>n</i> valid responses	1608	1639		322	352		322	352	
Registry	40.3	48.4	8.1	40.2	57.3	17.1	22.1	36.7	14.6
Total <i>n</i> valid responses	1127	1020		194	182		194	182	
<i>P</i> value ($F_{2, 37}$)			0.009			0.426			0.451
Overall	40.2	49.8	9.6	34.8	55.1	20.2	21.3	33.5	12.2
Total <i>n</i> valid responses	4435	4377		873	863		873	863	

Note. At last visit, identification of tobacco use status, smokers receiving advice to quit, and smokers offered assistance to quit. Percentages are adjusted for age and gender differences between clinics; clinic is treated as a random effect.

ber 2000 including some critical markers potentially having an impact on the referral activity.

Results

Practice pattern end points

At baseline no differences were found between the experimental conditions with respect to identification of tobacco use, provision of advice to quit, and assistance in quitting (i.e., information about or prescription for smoking cessation aids) at the most recent clinic visit. Rates of these practice patterns improved dramatically between Summer 1999 and Summer 2000. Overall, identification of smokers at the most recent visit, advising smokers to quit, and providing assistance to quit improved by 9.6, 20.2, and 12.2 percentage points, respectively. Identification of patients' tobacco use status statistically significantly improved in the incentive (by 14.4%) and registry (by 8.1%) conditions over improvements in the experimental condition control (by 6.2%). Clinical practice rates for advising smokers to quit and providing smokers with assistance to quit did not differ statistically significantly between the experimental conditions. Table 1 provides comparisons of clinical practice rates for tobacco user identification, provision of advice to quit, and assistance with smoking cessation by condition and time. Rates are adjusted for patients' gender and age distributions in clinics.

Patient tobacco use endpoints

This study's main outcome variable was defined as 7-day sustained abstinence from smoking. In addition, we calcu-

lated smoking cessation behavior rates for the 2,729 smokers and recent ex-smokers identified through the mail survey.

Multiple self-reported smoking cessation behavior rates are reported by treatment condition in Table 2. Overall, 21.0% of self-reported smokers at baseline self-identified as nonsmokers (7-day point prevalence) at the time of the telephone follow-up survey. This represents a quitting rate of 19.2, 22.4, and 21.7% for patients seen in clinics in the control, incentive, and registry experimental conditions, respectively. Quitting rates did not differ statistically significantly between the experimental conditions. Overall, 10.8% of current smokers reported an intent to quit smoking within 30 days, 21.4% of patients reported using one or more types of smoking cessation assistance, 20.8% reported using pharmaceutical aids (nicotine patch, Bupropion SR, nicotine gum), and 1.6% reported use of a counseling program. None of these rates differed statistically significantly between experimental conditions with the exception of the use of counseling programs. Patients in the experimental condition registry statistically significantly reported using counseling programs more often.

Discussion

This study evaluated the effects of two promising but understudied organizational support processes hypothesized to impact improvement in preventive care quality. The organizational support processes are represented by financial incentives for meeting preset clinical practice targets and coupling a patient (smoker) registry and telephone intervention system with targeted clinical practices. Specifically, their impact on the improvement of clinical smoking cessation practices and associated patient smoking cessation

Table 2

Patient smoking cessation behavior outcomes: Cohort of respondents to a telephone survey initially identified as smokers through a mail survey 6 months earlier

	Total number of valid responses	Current nonsmoker (7-day sustained abstinence from smoking)	Respondents reporting having used any aids for smoking cessation	Respondents reporting having used any medication for smoking cessation	Respondents reporting having used any counseling services for smoking cessation	Current smokers (7-day point prevalence)	Current smokers reporting intending to quit within next 30 day
Condition							
Control							
%		19.2	22.3	21.6	1	80.8	9.4
<i>N</i>	1065	205	237	230	11	860	81
Incentive							
%		22.4	20.7	19.8	1.3	77.6	11.1
<i>N</i>	1024	229	212	203	13	795	88
Registry							
%		21.7	21.3	20.9	3.3	78.3	12.8
<i>N</i>	640	139	136	134	21	501	64
<i>P</i> value ($F_{2,37}$)		0.20	0.68	0.60	0.001	0.20	0.15
Overall							
%		21.0	21.4	20.8	1.6	79.0	10.8
<i>n</i>	2729	573	585	567	45	2156	233

behaviors was estimated. To our knowledge this study is the first of its kind employing a controlled, randomized trial to examine such organizational support mechanisms intended to facilitate health care improvement. The potential critical importance of these support processes in fostering improvement in health care was recently emphasized by the latest report of the Institute of Medicine on Healthcare Quality [1].

This study found promising but limited support for the use of financial incentives as offered here to improve clinician practice. Tobacco user identification rates in the incentive clinics increased over the identification rates of clinics in the control condition. However, identification rates did not increase to the same extent in the registry clinics, even though these clinics were offered the same financial incentives. Registry clinics, in addition to the financial incentives for meeting quality targets for identification and advice, were provided access to referral system to deliver telephone support for smoking cessation. However, they received no additional financial incentives to refer patients to this service.

We considered several reasons why financial incentives were not effective in bringing about more substantial practice pattern change relative to control clinics. First, lack of knowledge or awareness of the incentive program might be one possible explanation for the lack of an effect on clinical practices. However, the medical group leadership undertook substantial efforts to inform clinics about the incentive program. In addition, informal reports from medical directors, clinic managers, and staff in participating clinics indicated a high level of awareness of the incentive program during and after its availability.

Second, the attention of all physicians and staff in the participating clinic sites may have been diverted in multiple ways from implementing robust office systems to enable

practice pattern change stimulated by the availability of incentives. For example, during the course of this study the medical group experienced serious pressures to increase productivity and decrease cost as well as significant turnover in senior management. These concerns could be sensed at all levels of the organization and may have contributed to the inability of clinics to implement effective systems and processes that facilitate practice pattern change.

Third, it is not clear whether significantly higher incentive payments would have been able to focus clinic sites' attention more strongly on the need to provide smokers with advice and assistance to quit. On the other hand, substantial higher incentive payments for changes in targeted clinical practices might have threatened the generalizability of this study.

Overall, we observed a strong positive secular trend over the course of 1 year for the practice patterns of interest across all experimental conditions. It is not immediately clear what factors affected the dramatic improvement in tobacco user identification at last visit (40.2 to 49.8%), advice to quit at last visit (34.8–55.1%), and offering assistance at last visit (21.3–33.5%) rates. Several explanations appear plausible.

First, the introduction of practice monitoring systems by performing chart audits and the introduction of the exit interviews may have had a Hawthorne effect on all clinics regardless of their randomization status. The introduction of incentives and the registry may not have been able to improve sufficiently on the secular trend to be statistically detectable during the first year of introduction of the organizational support systems.

Second, time-concordant with this project, the state of Minnesota had recently settled its multi-billion-dollar lawsuit against the tobacco industry. Clinicians and patients

alike may have become sensitized to the importance of addressing tobacco dependence and adjusted their clinical practice or care-seeking behavior accordingly.

While we were able to statistically significantly increase the use of smoking cessation counseling programs for patients seen in the incentive and registry conditions, we were not able to detect differences in patient outcomes such as quitting smoking between the experimental conditions. It was originally hypothesized that the availability of the telephone program would improve patient outcomes. However, this program was not successful in reaching a majority of smokers who could have benefited from the counseling services. We estimated that even at the peak months of clinics' referral activities only about 25–30% of targeted smokers (ready to quit within 30 days) visiting the nine clinics in the experimental condition registry were referred to the telephonic smoking cessation counseling service. This estimate was calculated based on the known patient volume in the nine clinics, an assumed 20% regional smoking prevalence rate, and a 30% prevalence rate of readiness to quit within 30 days among smokers (smokers mainly targeted by telephone smoking cessation intervention). Since initial statistical power analyses were based on the optimal capture of eligible smokers visiting clinic sites during the course of this study, the study design may have simply not been robust enough to detect any statistically significant differences in quit rates between the study conditions.

At first it appears puzzling that only a seemingly small fraction ($n = 3.3\%$) of respondents in the registry clinics reported having used any counseling services. While 640 valid responses to the patient follow-up survey were received from smokers having visited a registry clinic during April, May, or June 2000, approximately 400 smokers were referred to the counseling program during that time period. However, the fact that only those smokers interested in quitting within 30 days ($\sim 30\%$ of smokers) were referred to the counseling service and the lack of complete capture of potential smokers benefiting from the counseling service ($\sim 25\text{--}30\%$) may have limited survey respondents' ability to endorse that survey item.

We considered whether contamination between our experimental conditions may have been a factor in failing to detect additional statistically significant improvement differences between the experimental conditions. While theoretically possible, it appears unlikely that effective change mechanisms could have been instituted at clinic sites in the control condition by simply listening to accounts of, or observation of, newly implemented change activities in clinic sites randomized to the incentive or registry experimental conditions. Attributing the dramatic change in provider behavior in the control condition to such minimal levers would be inconsistent with research indicating that more sophisticated and intensive interventions are required for sustained clinical practice change [22].

This study provides timely evidence gained in a con-

trolled, randomized trial regarding the benefits of two organizational support processes currently widely regarded as critical in improving health care quality. This study was able to detect a modest positive impact of these processes on clinicians' adherence to smoking cessation practice guidelines (identification of tobacco users). It is not clear whether these support processes might be more effective if other clinical conditions had been targeted or if the conditions for implementation in the medical group or clinic sites had been different. Clearly, more research is needed to provide health care managers with information regarding under what conditions the potentially costly implementation of incentives for meeting clinical care targets or patient registries with coupled intervention systems yields sufficiently large gains in health care quality to justify the investment.

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