Effects of Global Payment and Accountable Care on Tobacco Cessation Service Use: An Observational Study

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BACKGROUND: Tobacco use is the leading cause of preventable death and disability. New payment and delivery system models including global payment and accountable care have the potential to increase use of cost-effective tobacco cessation services.

OBJECTIVE: To examine how the Alternative Quality Contract (AQC) established in 2009 by Blue Cross Blue Shield of Massachusetts (BCBSMA) has affected tobacco cessation service use.

DESIGN: We used 2006–2011 BCBSMA claims and enrollment data to compare adults 18–64 years in AQC provider organizations to adults in non-AQC provider organizations. We examined the AQC's effects on all enrollees; a subset at high risk of tobacco-related complications due to certain medical conditions; and behavioral health service users.

MAIN MEASURES: We examined use of: (1) any cessation treatment (pharmacotherapy or counseling); (2) varenicline or bupropion; (3) nicotine replacement therapies (NRTs); (4) cessation counseling; and (4) combination therapy (pharmacotherapy plus counseling). We also examined duration of pharmacotherapy use and number of counseling visits among users.

KEY RESULTS: Rates of tobacco cessation treatment use were higher following implementation of the AQC relative to the comparison group overall (2.02 vs. 1.87 %, $p < 0.0001$), among enrollees at risk for tobacco-related complications (4.97 vs. 4.66 %, $p < 0.0001$), and among behavioral health service users (3.67 vs. 3.25 %, $p < 0.0001$). Statistically significant increases were found for use of varenicline or bupropion alone, counseling alone, and combination therapy, but not for NRT use, pharmacotherapy duration, or number of counseling visits among users.

CONCLUSIONS: In its initial three years, the AQC was associated with increases in use of tobacco cessation services.

INTRODUCTION

Smoking and other tobacco use is the leading cause of preventable death and disability in the U.S.[1,2] Eighteen percent of adults aged 18 years or older smoked cigarettes in 2012.[3] Tobacco use increases the risk of lung and other cancers, cardiovascular disease, stroke, emphysema, and chronic obstructive pulmonary disease (COPD), among other diseases.[1,3,4] Multiple tobacco cessation interventions have been shown to be cost effective, or even cost saving in some cases, across a broad range of populations.[5–8] These interventions include varenicline, sustained-release bupropion, nicotine replacement therapies (NRTs, such as gums and patches), and counseling interventions. While U.S. Public Health Service guidelines on tobacco use and dependence recommend that clinicians offer brief counseling interventions to all patients who use tobacco, rates of tobacco dependence detection and treatment in primary care have historically been suboptimal.[3,5,9]

Public and private payers, including commercial insurers and Medicare, have begun experimenting with new models of financing health care services that place greater accountability on large provider organizations for lowering the cost and improving the quality of care. One promising model involves paying accountable care organizations a global payment, or fixed budget, for all services used by a population. One of the earliest initiated models, the Alternative Quality Contract (AQC), was implemented by Blue Cross Blue Shield of Massachusetts (BCBSMA) in 2009. Under the AQC, BCBSMA pays provider organizations a global risk-adjusted prospective budget for all primary and specialty care provided to a defined population for a five-year period. Under initial contracts, organizations were eligible for annual quality bonuses of up to 10 % of their budget, based on performance on 64 outpatient and hospital measures (Online Appendix A).

Global payment and accountable care could improve rates of tobacco dependence detection and treatment in ambulatory

care settings. Since AQC organizations face a fixed budget for all care received by their enrollees, these organizations have an incentive to improve the coordination and efficiency of care and to try to avert high cost care. The five-year AQC contracts (as opposed to traditional annual contracts) provide incentives for efforts to prevent tobacco-related complications, which can lead to significant morbidity and high health care expenditures over time, through screening and cost-effective tobacco cessation interventions. Under these models, primary care physicians (PCPs) play the central role in a patient's care, and PCPs are generally given greater flexibility to coordinate the health of the population in their panels with attention to reducing the burden of disease over a longer time horizon relative to traditional fee-for-service models. While previous research documented that the AQC was associated with slower growth in total health care spending,[10–12] no studies have assessed the effects of the AQC or similar models on tobacco cessation service use.

Importantly, AQC contracts did not include ambulatory tobacco cessation performance measures (Online Appendix A). The contracts did include three hospital performance measures related to cessation treatment for enrollees who receive inpatient care for acute myocardial infarction, heart failure, or pneumonia. Despite the lack of outpatient cessation measures, we hypothesize that the strong emphasis on care coordination aimed at lowering the overall disease burden in the primary care setting under the AQC would lead to greater provision of cessation services as a strategy to reduce spending and improve health over a five-year period.

This study employs a quasi-experimental research design to assess the effect of the AQC on use of BCBSMA-reimbursed tobacco cessation therapies delivered in ambulatory settings from 2006 to 2011, comparing enrollees of AQC organizations with BCBSMA enrollees of organizations that did not participate in the AQC during periods before and after the contracts were established.

METHODS
Data and Study Population

We used 2006–2011 BCBSMA claims and enrollment data. Our study population included adults aged 18–64 years who were enrolled in a BCBSMA health maintenance organization (HMO) or point of service (POS) plan, all of whom (both AQC and comparison group members) were required to select a PCP upon enrollment. An enrollee was eligible for the AQC group if his/her PCP belonged to an organization that participated in the AQC. During our study period, AQC organizations initiated participation in 2009, 2010, or 2011.

To account for differences in the characteristics of enrollees across AQC and non-AQC organizations as well as secular trends in service utilization unrelated to the AQC, we utilized a difference-in-difference design that includes in the comparison group enrollees in organizations that, in a specific calendar

year, had not yet entered the AQC but would in a future year, plus enrollees in organizations that never entered. The unit of observation was the person-calendar year. An individual's data for a given year was used if the individual was continuously enrolled in medical, behavioral, and pharmacy benefits during all 12 months.

We examined the AQC's effects on tobacco cessation service use in three groups: 1) all enrollees; 2) a subset at particularly high risk of tobacco-related complications (due to the presence of certain medical conditions), and 3) behavioral health (i.e., mental health or substance use disorder) service users, who are more likely to smoke than the general population.[13–15] We identified individuals at high risk of smoking-related complications using the Chronic Condition Warehouse algorithms for the following conditions: acute myocardial infarction (AMI), atrial fibrillation, chronic obstructive pulmonary disease (COPD), diabetes, heart failure, hypertension, ischemic heart disease, or stroke.[16] Behavioral health service users were identified based on a well-established algorithm that considered an individual a user if during the year she had: 1) an inpatient claim with a behavioral health diagnosis as the last primary diagnosis and the majority of all primary diagnoses during the stay; 2) an outpatient claim with a mental health primary diagnosis (ICD-9 codes 290, 293–302, and 306–316); or 3) an outpatient claim with any substance use disorder (SUD) diagnosis (291, 292, 303–305.0, and 305.2-305.9), as SUDs are often under-reported in claims data.[17,18]

Measures

We examined use of: 1) any tobacco cessation treatment (varenicline, bupropion, NRTs or counseling); 2) varenicline or bupropion; 3) NRTs; 4) cessation counseling visits; and 5) combination therapy (pharmacotherapy plus counseling). BCBSMA plans cover cessation medications and NRTs for two 90-day treatments per calendar year when prescribed by a clinician. Bupropion prescriptions were counted as cessation pharmacotherapy only if the enrollee had a diagnosis of tobacco dependence (305.1 or 649.0) during the year. Among pharmacotherapy users, we examined the probability of receiving at least 90 days of supply within 118 days of the first prescription fill during the year.[19,20] Among those receiving counseling services, we examined the probability of receiving more than one visit.[21] A counseling visit could be either a "brief" visit of 3–10 min (CPT/HCPCS codes 99406, G0375, and G0436) or an "intensive" visit of 11+ minutes (99407, G0376, and G0437). We focused on treatments covered by BCBSMA and observable in claims; therefore, we were unable to examine use of NRTs sold over the counter and obtained without a prescription.

Statistical Methods

We used logistic regression models to estimate changes in the probability of using tobacco cessation treatments attributable

to the AQC in the overall population, the subset at particular risk for tobacco-related complications, and behavioral health service users. All models controlled for sex, age category (18–27, 28–37, 38–47, 48–57, 58–64), the interaction of sex and age, risk score [calculated by BCBSMA from current-year diagnoses, claims, and demographic information using the diagnostic-cost-group (DxCG) scoring system (Verisk Health)], AQC group cohort dummies (i.e., whether the enrollee's provider organization entered the AQC in 2009, 2010 or 2011), and calendar year dummies. Calculation of standard errors accounted for dependence among patients due to their clustering within provider groups. The magnitude of the results can be interpreted as the average annual change in the outcome over the study period if all enrollees were subject to the AQC versus if no enrollees were.

We estimated a second set of models that replaced the overall treatment indicator with three treatment variables indicating the number of years the enrollee's provider organization had been subject to the AQC. For example, in 2010, some AQC organizations had been in the AQC for a single year while others had been in the AQC for two.

The AQC and non-AQC groups were very similar on observed characteristics, and thus regression adjustment was used to control for the small differences, rather than propensity score weighting or matching. The significant findings below are generally robust to adjustment for multiple comparisons using the Benjamini-Hochberg approach to control the false discovery rate.[22] Cases where inferences change are noted below. We did not observe differences in pre-intervention baseline levels or trends in the probability of cessation use between the AQC cohort and the comparison group.

RESULTS

Overall unadjusted rates of tobacco cessation treatment use were 1.80 % for AQC and 1.90 % for comparison enrollees (Table 1). Rates were higher among enrollees at particular risk for tobacco-related complications due to the presence of specific medical conditions (4.53 and 4.73 %, respectively) and enrollees who used behavioral health services (3.24 and 3.32 %). Across the three groups, two-thirds or more of tobacco treatment users received only pharmacotherapies. In the overall population, 75.30 % of enrollees who used pharmacotherapies used varenicline, 20.70 % used bupropion, and 9.31 % used NRTs (Fig. 1). Only 10.20 % of pharmacotherapy users received 90 or more days supplied during the year. Among enrollees who received counseling services, 82.80 % received only brief visits, and 76.54 % received a single visit (Fig. 2).

Table 2 summarizes adjusted annual changes in cessation service use attributable to the AQC. For all three groups, the probability of receiving cessation services was higher under the AQC. For the overall population, the probability of any cessation service use was 2.02 % under the AQC relative to

1.87 % in the comparison group ($P < 0.0001$). The probability of using varenicline or bupropion under the AQC was higher (1.60 vs. 1.51 %, $p < 0.0001$), as was the probability of any counseling visits (0.43 vs. 0.33 %, $p < 0.0001$) and the probability of combination therapy (0.13 vs. 0.10 %, $p < 0.0001$). We found no statistically-significant difference in the probability of NRT use (0.14 vs. 0.15 %, $p = 0.26$), of receiving 90 or more days of pharmacotherapy among users (10.42 vs. 10.11 %, $p = 0.54$), or of receiving more than one counseling visit among users (21.82 vs. 19.89 %, $p = 0.21$).

Similar increases in cessation treatment use were detected for those at risk of tobacco-related complications (4.97 vs. 4.66 %, $p = 0.03$), although this finding moves to marginally significant with adjustment for multiple comparisons ($p = 0.07$). For this group, the probability of counseling visits was higher under the AQC (1.17 vs. 0.86 %, $p < 0.0001$), as was the probability of combination therapy (0.39 vs. 0.28 %, $p = 0.03$). There was no significant difference in the probability of varenicline or bupropion use (3.85 vs. 3.67 %, $p = 0.19$), of NRT use (0.47 vs. 0.52 %, $p = 0.28$), of 90 or more days of pharmacotherapy among users (11.85 vs. 12.73 %, $p = 0.41$), or of receiving more than one counseling visit among users (28.53 vs. 27.79 %, $p = 0.81$).

For behavioral health service users, the probability of any cessation treatment was also higher under the AQC (3.67 vs. 3.25 %, $p < 0.0001$). The probability of varenicline or bupropion use was higher (2.98 vs. 2.61 %, $p < 0.0001$), as was the probability of any counseling visits (0.78 vs. 0.55 %, $p < 0.0001$) and of combination therapy (0.27 vs. 0.16 %, $p < 0.0001$). There was no statistically significant difference for the probability of NRT use (0.34 vs. 0.33 %, $p = 0.76$), of receiving 90 or more days of pharmacotherapy among users (16.94 vs. 17.40 %, $p = 0.70$), or of receiving more than one counseling visit among users (25.32 vs. 22.82 %, $p = 0.42$).

In models that included cohort indicators, we found that AQC-related differences were statistically larger in Years 2 and 3 relative to Year 1 for all three groups in many cases (Online Appendices B-D).

DISCUSSION

The AQC was associated with greater use of tobacco cessation services among all enrollees, among the subset at greater risk for tobacco-related complications, and among behavioral health service users, relative to the comparison group. Higher use rates were seen for varenicline or bupropion and for counseling visits, but not for NRTs. The AQC also led to higher rates of combination therapy, an important finding, given evidence suggesting that combination therapy can be more effective than medication or counseling alone.[5] In addition, we found evidence that, in many cases, the AQC's effects on cessation service use were larger with additional years of experience with the AQC. Greater use of tobacco cessation services under the AQC is encouraging given that 69 % of

Table 1. Unadjusted Descriptive Statistics for Enrollees in the AQC and the Comparison Groups Across Person-Years, 2006–2011

	All Enrollees		Enrollees at Risk for Smoking-Related Complications		Enrollees Using Behavioral Health Services	
	AQC	Comparison	AQC	Comparison	AQC	Comparison
N (person-years)	533,568	2,999,221	57,391	337,070	90,766	455,914
Female (%, n)	52.75 % (281,461)	51.67 % (1,549,815)	45.38 % (26,045)	45.15 % (152,193)	61.29 % (55,629)	61.23 % (279,161)
Age (%, n)						
18–27	17.26 % (92,100)	17.08 % (512,179)	4.55 % (2,610)	4.27 % (14,400)	19.29 % (17,510)	18.58 % (84,721)
28–37	17.84 % (95,174)	17.58 % (527,340)	7.46 % (4,281)	7.67 % (25,837)	19.49 % (17,692)	18.64 % (84,997)
38–47	23.96 % (127,844)	24.96 % (748,507)	17.39 % (9,981)	18.75 % (63,200)	25.00 % (22,691)	26.53 % (120,955)
48–57	26.17 % (139,624)	26.15 % (784,232)	35.90 % (20,601)	36.07 % (121,595)	24.60 % (22,325)	25.03 % (114,115)
58–64	14.77 % (78,826)	14.24 % (426,963)	34.71 % (19,918)	33.24 % (112,038)	11.62 % (10,548)	11.21 % (51,126)
Risk score (mean)	1.26	1.24	3.12	3.12	2.05	2.11
Tobacco cessation treatment use in calendar year						
Any tobacco cessation treatment use (%, n)	1.80 % (9,584)	1.90 % (57,049)	4.53 % (2,598)	4.73 % (15,943)	3.24 % (2,943)	3.32 % (15,142)
Bupropion or varenicline only (%, n)	1.14 % (6,086)	1.47 % (44,204)	2.69 % (1,543)	3.55 % (11,974)	2.11 % (1,917)	2.55 % (11,647)
Nicotine replacement therapies* only (%, n)	0.10 % (519)	0.12 % (3,483)	0.30 % (175)	0.36 % (1,230)	0.20 % (181)	0.24 % (1,096)
Counseling services only (%, n)	0.43 % (2,313)	0.22 % (6,574)	1.15 % (661)	0.56 % (1,899)	0.67 % (611)	0.36 % (1,663)
Combination therapy (pharmaco-therapy† plus counseling) (%, n)	0.13 % (717)	0.10 % (2,985)	0.42 % (242)	0.28 % (929)	0.27 % (248)	0.18 % (802)

*Nicotine replacement therapies include nicotine patches, gum, sprays, lozenges, and inhalers
†Pharmacotherapy includes varenicline, bupropion, and nicotine replacement therapies

smokers report that they are willing to quit, and rates of successful quit attempts are higher among smokers who receive assistance from evidence-based counseling or pharmacologic interventions.[5,23–27] However, we detected no effect of the AQC on measures of duration of use, including receipt of 90 or more days of pharmacotherapy among users or receipt of more than one counseling visit among users, despite evidence that higher-intensity treatments are often more effective than lower-intensity treatments.[5,28]

Our findings that the AQC increased the probability of cessation treatment use relative to a comparison group of BCBSMA enrollees suggest that the incentives inherent in a multi-year global payment contract for providers to prioritize use of services with the potential to lower the future disease burden within a population such as tobacco cessation therapies led to greater provision of these services. These incentives drove changes in utilization patterns even in the absence of specific outpatient cessation performance metrics.
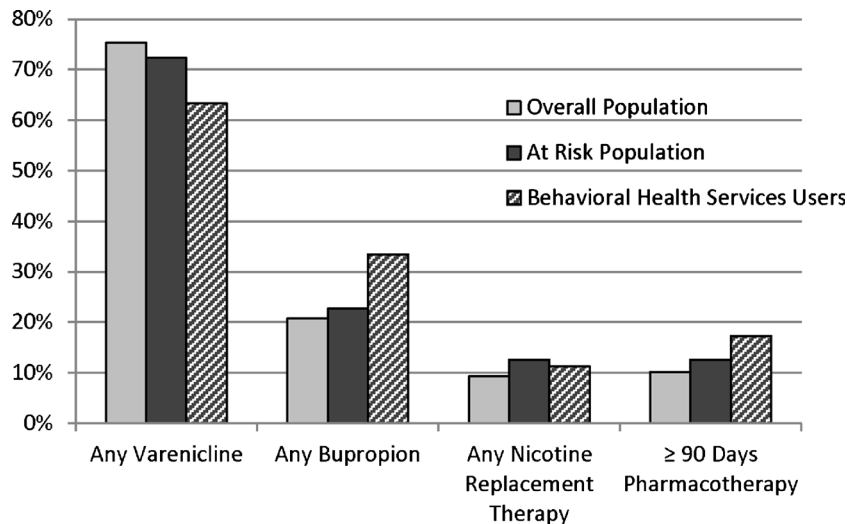

Figure 1. Unadjusted descriptive statistics on tobacco cessation pharmacotherapy use among tobacco cessation pharmacotherapy users, 2006–2011. Percent of tobacco cessation pharmacotherapy users.
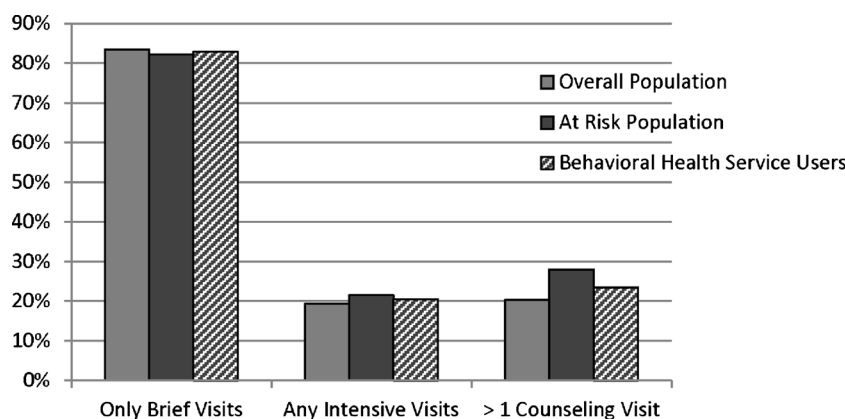
Figure 2. Unadjusted descriptive statistics on tobacco cessation counseling visit use among tobacco cessation counseling visit users, 2006–2011. Percent of tobacco cessation counseling users.

While there is likely not much overlap in the clinicians delivering these services in inpatient versus ambulatory settings, it is possible that the presence of inpatient cessation measures in the contract had spillover effects onto the provision of ambulatory services, with AQC provider organizations perhaps encouraging clinicians to focus on both inpatient and outpatient provision of these services as part of their efforts to carefully manage the care of high-cost enrollees.[29] It is also possible that greater provision of cessation services could have resulted from greater emphasis on care coordination in the primary care setting under the AQC.

While these constitute important increases in cessation service use attributable to the AQC, only a small proportion of enrollees—2.02 %—used any pharmacotherapies and/or counseling after the AQC's implementation. Use rates were higher among enrollees at risk for tobacco-related complications and among behavioral health service users relative to the overall population. However, use of cessation interventions was low, given smoking prevalence rates of 16 % in Massachusetts and guidelines recommending brief interventions for all tobacco users.[3,5,30] While smoking rates are lower among privately insured individuals (15 % nationally) than among Medicaid enrollees (30 %) and uninsured individuals (30 %),[31] the majority of tobacco users did not receive cessation services post-AQC. However, these treatment rates are consistent with national rates, and reflect, in part,

Table 2. Probability of Tobacco Cessation Treatment Use With and Without AQC Across Person-years, 2006–2011

	With AQC	Without AQC	Difference	p value	[95 % Conf. Interval]
Overall Population					
Probability of any tobacco cessation treatment use (%)	2.02 %	1.87 %	0.13 %	**<0.0001**	0.09 to 0.21
Probability of varenicline or bupropion use (%)	1.60 %	1.51 %	0.09 %	**0.001**	0.04 to 0.15
Probability of nicotine replacement therapy use (%)*	0.14 %	0.15 %	−0.01 %	0.26	−0.03 to 0.01
Probability of tobacco cessation counseling visit use (%)	0.43 %	0.33 %	0.10 %	**<0.0001**	0.07 to 0.12
Probability of combination therapy use (%)	0.13 %	0.10 %	0.03 %	**<0.0001**	0.01 to 0.04
Probability of ≥90 day supply of tobacco cessation pharmacotherapy,[†] among users (%)	10.42 %	10.11 %	0.31 %	0.54	−0.70 to 1.34
Probability of >1 counseling visit, among counseling visit users (%)	21.82 %	19.89 %	1.93 %	0.21	−1.05 to 4.86
Population at Risk for Smoking-Related Complications					
Probability of any tobacco cessation treatment use (%)	4.97 %	4.66 %	0.31 %	**0.03**	0.02 to 0.58
Probability of varenicline or bupropion use (%)	3.85 %	3.67 %	0.18 %	0.19	−0.09 to 0.43
Probability of nicotine replacement therapy use (%)*	0.47 %	0.52 %	−0.05 %	0.28	−0.15 to 0.04
Probability of tobacco cessation counseling visit use (%)	1.17 %	0.86 %	0.31 %	**<0.0001**	0.16 to 0.41
Probability of combination therapy use (%)	0.39 %	0.28 %	0.11 %	**0.003**	0.03 to 0.17
Probability of ≥90 day supply of tobacco cessation pharmacotherapy,[†] among users (%)	11.85 %	12.73 %	−0.88 %	0.41	−3.05 to 1.25
Probability of >1 counseling visit, among counseling visit users (%)	28.53 %	27.79 %	0.74 %	0.81	−5.37 to 6.83
Behavioral Health Service Users					
Probability of any tobacco cessation treatment use (%)	3.67 %	3.25 %	0.42 %	**<0.0001**	0.22 to 0.60
Probability of varenicline or bupropion use (%)	2.98 %	2.61 %	0.37 %	**<0.0001**	0.17 to 0.53
Probability of nicotine replacement therapy* use (%)	0.34 %	0.33 %	0.01 %	0.76	−0.54 to 0.07
Probability of tobacco cessation counseling visit use (%)	0.78 %	0.55 %	0.23 %	**<0.0001**	0.13 to 0.29
Probability of combination therapy use (%)	0.29 %	0.17	0.12 %	**<0.0001**	0.05 to 0.14
Probability of ≥90 day supply of tobacco cessation pharmacotherapy,[†] among users (%)	16.94 %	17.40 %	−0.46 %	0.70	−2.84 to 1.91
Probability of >1 counseling visit, among counseling visit users (%)	25.32 %	22.82 %	2.50 %	0.42	−3.58 to 8.51

All significant findings are robust to adjustment for multiple comparisons using the Benjamini-Hochberg (1995) approach to control the false discovery rate, except for the increase in the probability of any tobacco cessation treatment use among the at risk population, which moves to a p-value of 0.07
Nicotine replacement therapies include nicotine patches, gum, sprays, lozenges, and inhalers
† Pharmacotherapies include varenicline, bupropion, and nicotine replacement therapies

the complex set of challenges and barriers associated with implementing evidence-based cessation interventions in routine practice.[32–35]

While outpatient cessation treatment use increased under this global payment contract without specific outpatient cessation metrics, adding outpatient metrics could create even stronger incentives for prescribing these treatments, particularly to high-risk groups such as those with behavioral health conditions or chronic medical conditions such as COPD and cardiovascular disease. Medication and counseling have been shown to be effective in both of these high-risk groups.[20] Existing measures endorsed by the National Committee for Quality Assurance, the National Quality Forum, and the American Medical Association include measures of the percentage of adult tobacco users who were advised to quit, who discussed or were recommended cessation medications, or who discussed or were provided cessation strategies.[36–38] The Medicare ACO demonstration program, which passes financial risk for total health care spending onto ACOs, includes a measure for the percentage of adults who have been screened within 24 months and who received counseling if identified as a tobacco user. Provider organizations subject to global payment and accountable care models could also consider the use of patient financial incentives for smoking cessation treatments, which have proven effective at increasing tobacco abstinence rates.[39]

There are several limitations to our analyses. First, we studied a single global payment and accountable care model affecting enrollees of one large insurer. Consequently, our findings may not be generalizable to other populations. Second, AQC contract participation is voluntary, so one must consider the extent to which AQC providers or enrollees differed from those in non-AQC organizations. However, we found very few differences in observed characteristics between individuals in AQC organizations and those not in AQC organizations, and we did not observe differences in pre-intervention trends in the probability of cessation use between AQC and comparison groups. In addition, the analysis adjusts for any differences in trends during the pre-AQC period, using an assumption that any pre-period differences would have persisted over time. Third, we examined data through 2011, so we were unable to study the effects through the end of the initial five-year contracts. This choice was necessary to preserve a viable BCBSMA comparison group. Fourth, claims data do not provide rates of current tobacco use, so we were unable to accurately estimate the proportion of current smokers who receive cessation services; we focused instead on service use before vs. after the AQC. Fifth, while insurance claims provide rich detail about an enrollee's service use, they are limited in their ability to convey important clinical detail and do not provide information on outcomes such as mortality. Finally, we did not have access to information about over-the-counter cessation therapies that were not reimbursed by BCBSMA or treatments delivered in inpatient settings.

Our study provides the first evidence on the effect of new global payment and accountable care models on use of tobacco cessation treatments. The AQC resulted in increased use of both prescription medications and counseling interventions that have been proven cost-effective at reducing tobacco use. Our finding that the AQC's effects on cessation service use appeared to become larger over time suggests that the longer this type of model is in place, the larger the potential benefit may be, as measured by use of evidence-based practices such as tobacco cessation services. As more delivery systems adopt contracts based on global payment models, it will be important to assess on an ongoing basis whether the inclusion of payment incentives more explicitly tied to use of these evidence-based treatments can further improve treatment rates.

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Compliance with Ethical Standards:

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