At a Glance

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Factors Associated With Employee Participation in a Value-Based Insurance Design Initiative

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ABSTRACT

Objective: Value-based insurance design (VBID) initiatives are increasingly common, but the impact of registration requirements on program uptake is not clear. We describe program uptake and baseline characteristics of beneficiaries eligible for a voluntary VBID initiative.

Study Design: We conducted a retrospective cohort study of 858 beneficiaries who were eligible to participate in a voluntary VBID program. Enrollment required that participants complete a baseline survey, receive standardized measurements of blood pressure and laboratory tests, and provide consent for release of administrative claims for evaluation.

Methods: We compared demographic and medical characteristics and healthcare utilization patterns in the year before the program started between eligible beneficiaries did and did not choose to participate.

Results: Overall, 200 (23.3%) eligible beneficiaries enrolled in the program. Participants were more likely to have type 1 diabetes mellitus (16.5% vs 5.6%, P <.001) and a higher burden of comorbidity including complicated diabetes (46.0% vs 20.2%, P <.001) and congestive heart failure (13.0% vs 7.9%, P = .03). Participants were more likely to see an endocrinologist (43.0% vs 15.5%, P <.001) and take diabetes medications (66.5% vs 35.4%, P <.001) in the year prior to the program, and had higher overall and out-of-pocket costs for medical claims, total pharmacy claims, and diabetes-related pharmacy claims ($P \leq .001$ for all comparisons).

Conclusions: Enrollment in a voluntary VBID program that eliminated copayments for diabetes medications and supplies for individuals with diabetes was suboptimal, suggesting that barriers to enrollment may have significant implications for overall effectiveness of VBID initiatives. VBID programs should be designed to minimize barriers to participation.

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Value-based insurance design (VBID) programs are designed to reduce or eliminate cost barriers to evidence-based healthcare services. Accumulating evidence suggests that VBID initiatives are associated with modest increases in medication adherence with targeted therapies.[1-7] The ultimate impact on cost and clinical outcomes is less clear, but decision-analytic models and preliminary evidence from VBID implementations suggest that reductions in subsequent complications and comorbidity may lead to overall cost-effectiveness and possibly cost savings.[3,8-12]

VBID initiatives are featured in the Affordable Care Act of 2010 and are generating significant interest among large employers. Despite becoming increasingly common, the optimal design of VBID initiatives has not been determined. In particular, it is not clear whether these programs should be made universally available to all beneficiaries or whether more selective criteria should be used, such as requiring patients to actively enroll in order to qualify for the benefits. On one hand, requiring patients to actively participate (ie, by requiring simultaneous participation in a disease management program) may increase awareness and benefit at the individual level. However, this may have unintended consequences if the requirement to participate provides a barrier to enrollment and decreases participation in the VBID program. This may be particularly harmful if the individuals who could potentially derive the most benefit are excluded from the program.

In 2009 Christiana Care Health System (Christiana Care) implemented a VBID program that eliminated copayments for medications and supplies for glycemic control for beneficiaries with diabetes. To receive the benefit, participants were required to complete a brief baseline evaluation and provide consent for review of administrative claims data. Our objective in this paper is to determine the participation rate and describe the baseline characteristics of eligible beneficiaries who did and did not choose to enroll in Christiana

Care's voluntary VBID initiative. Our findings provide the first empiric evidence to understand how participation requirements may impact the uptake of a VBID program and will have implications for implementing VBID more broadly.

PRACTICAL IMPLICATIONS

Value-based insurance design (VBID) initiatives are increasingly common, but little is known about the impact of registration requirements on uptake of these programs. We determined the uptake and patient characteristics associated with enrollment in a voluntary VBID initiative.

- We found that enrollment in a voluntary VBID program was suboptimal.
- Enrollment was strongly associated with patient comorbidity and current healthcare utilization.
- Our findings suggest that barriers to enrollment may have significant implications for the overall effectiveness of VBID initiatives.
- VBID programs should be designed to minimize barriers to participation.

METHODS

Study Design

We conducted a retrospective cohort study of all beneficiaries who were eligible to participate in a voluntary VBID program for employees and dependents of Christiana Care Health System in Wilmington, Delaware. We compared demographic and medical characteristics and healthcare utilization patterns in the year before the program started between eligible beneficiaries who chose to participate and those who chose not to participate.

Study Setting, Program Description, and Requirements for Participation

Christiana Care is the largest healthcare provider and largest private employer in the state of Delaware. Christiana Care is self-insured with approximately 17,000 beneficiaries. Blue Cross Blue Shield of Delaware provided administrative management for Christiana Care benefits.

In March of 2009 Christiana Care implemented the Copayment Elimination Program ("the program"), an 18-month-long pilot program eliminating copayments for all diabetes medications and supplies. Details of the program have been published previously.[13] Eligible beneficiaries were identified using claims data and received invitation letters mailed out from Blue Cross Blue Shield of Delaware. Advertisements also appeared on the Christiana Care intranet portal and in key locations throughout Christiana Care facilities. Interested beneficiaries completed an online registration followed by an onsite meeting with program staff. During that meeting beneficiaries completed a baseline survey of diabetes history and health status; received standardized measurements of blood pressure, weight, and height; and had baseline laboratory tests including a fasting lipid panel and glycated hemoglobin (A1C). Participants were required to provide consent for release of administrative claims data for the purposes of evaluation. Once these steps were complete eligible copayments for participants were eliminated for 12 months. After 12 months, contingent on the participant returning for laboratory testing and survey completion, the copayment elimination extended an additional 6 months.

Identification of Study Population: This study used claims data to retrospectively identify beneficiaries who would have been eligible for participation in the program at the time it was initiated. Eligible beneficiaries included all employees and dependents with at least 1 inpatient or outpatient visit with a diagnosis of diabetes mellitus (*International Classification of Diseases, Ninth Revision, Clinical Modification* codes 250.x) in the year prior to the start of the program. Because our goal was to compare health services utilization and medication adherence among eligible beneficiaries in the year preceding program start, we excluded patients not continuously enrolled in the employer-sponsored insurance plan during the entire study period. We also excluded beneficiaries who would turn 65 years of age prior to the end of the first year of the program because the nearness of Medicare eligibility may have impacted the decision to participate.

Study Variables: We extracted demographic and clinical characteristics and utilization patterns for the study cohort from March 1, 2008, to February 28, 2009, the year prior to program initiation. All data were from administrative claims data deidentified by a third-party organization (Healthcore, Wilmington, Delaware).

Disease and comorbidity variables included diabetes type, comorbid diagnoses, healthcare utilization, laboratory testing, and costs. We classified diabetes as type 1 if there was at least 1 claim for type 1 diabetes mellitus (T1DM) (250.1, 250.3). We classified comorbidities using all primary and secondary diagnosis codes from inpatient or outpatient settings in the 2 years prior to program initiation using the composite of Elixhauser and Charlson-Deyo classifications as described by Gagne et al.[14] We measured hospitalizations and visits to an emergency department and ambulatory providers. We classified ambulatory providers as primary care, cardiology, endocrinology, nephrology, and ophthalmology based on primary designated specialty in claims files. We used

billing codes to determine the frequency of testing of A1C and lipids. We generated total paid claims and total out-of-pocket costs for medical care and pharmacy claims.

Though the copayment program eliminated copayments only for diabetes-related medications and supplies, we assessed baseline medication use for medications for diabetes, hypertension, and hyperlipidemia based on prescription claims data. Diabetes medications comprised biguanides, sulfonylureas, thiazolidinediones, dipeptidyl peptidase-4 (DPP-4) inhibitors, glucagon-like peptide 1 (GLP-1) analogues, and insulin. Hypertension medications included diuretics, beta-blockers, and angiotensin-converting enzyme inhibitors/angiotensin receptor blockers (ACE inhibitors/ARBs). Only statins were included for hyperlipidemia. We calculated medication adherence for fixed-dose medications as the proportion of days covered (PDC).[15] The PDC is the number of days for which the patient has medication available during a selected time period. Prescription medications and supplies from the 6 months prior to the study period that overlapped into the study period were included, and we used algorithms to avoid double counting pill days. Prescriptions that were filled prior to the completion of the previous prescription were assumed to start on the day following the end of the previous fill. Supplies that were still available at the end of the study period were not counted. The observation window for each patient included 90 days after the last refill, after which time the medication was assumed to be terminated. We calculated the PDC separately for biguanides, sulfonylureas, and ACE inhibitors/ARBs because these were the most commonly used medication classes. Adherence measures cannot reliably be calculated for insulin.[16] We additionally identified the proportion of beneficiaries who initiated or terminated a medication during the study period.

Data Analysis: We compared the baseline characteristics of participants and non-participants using *t* tests for continuous variables and χ^2 tests for categorical variables. We used the Wilcoxon-rank sum test for continuous variables that were not normally distributed. We also conducted a sensitivity analysis on total and out-of-pocket medical costs based on a modified inclusion criteria that required that patients had at least 2 billing codes for diabetes. All analyses were completed with SAS version 9.3 (Cary, North Carolina). The project was approved by the institutional review board at Christiana Care.

RESULTS

Program Participation: We identified 858 beneficiaries who met our administrative definition for eligibility. Of these, 200 (23.3%) enrolled in the program ("participants") and 658 did not enroll ("non-participants"). An additional 42 beneficiaries enrolled in the program but did not meet our administrative definition for eligibility because of age (8 years) or because they lacked administrative data and/or continuous coverage during the baseline year (34 years).

Population Characteristics: Demographic and disease characteristics of participants and non-participants appear in Table 1. The majority of both groups were female, with similar proportions of sex between participants and non-participants. Participants were slightly younger and much more likely to have T1DM (16.5% vs 5.6%, P <.001). Additionally, participants had a higher burden of comorbidity, with 40.5% of participants having 3 or more comorbidities compared with 29.9% of nonparticipants (v = 0.008). Participants were more likely to have complicated diabetes (46.0% vs 20.2%, P <.001) and congestive heart failure (13.0% vs 7.9%, P = .03).

Healthcare Utilization: Healthcare utilization patterns appear in Table 2. Participants were more likely to have at least 1 emergency department visit (23.0% vs 15.4%, P = .01) as well as to visit an endocrinologist (43.0% vs 15.5%, P <.001) or an opthalmologist (39.5% vs 31.3%, P = .03). Participants were also more likely to visit a primary care physician, cardiologist, and nephrologist, but these differences were not statistically significant. Participants were more likely to have documented A1C measurements (81.5% vs 69.1%, P <.001), but were no more likely to have measurements of low-density lipoprotein (81.5% vs 78.1%, P = .30). There were no differences in the proportion of patients with at least 1 hospitalization (17.5% vs 14.7%, P = .34)

Medication Use and Adherence: Table 3 shows the proportion of study subjects using medications for diabetes, hypertension, and hyperlipidemia. Participants were much more likely to use diabetes medications overall (66.5% vs 35.4%, P <.001) as well as every class of diabetes medications. Participants were more likely to use ACE inhibitors/ARBs (48% vs 37.7%, P = .009), but the overall proportion taking at least 1 antihypertensive medication was not statistically different between groups (53% vs 46.2%, P = .09). Participants were slightly more likely to use a statin (45% vs 37.2%, P = .048). There were no differences in adherence to sulfonylureas, biguanides, ACE/ARB, or statins.

Total and Out-of-Pocket Costs: Table 4 displays costs during the year prior to the program. Median costs were significantly higher for participants for overall and out-of-pocket costs for medical claims, total pharmacy

Table 1. Demographics and Comorbidities

		Participants (200)	Nonparticipants (658)	*P*
Age	Mean	49.5 + 10.4	51.3 + 10.4	.01
Gender	Male	73 (36.5%)	270 (41.0%)	.25
	Female	127 (63.5%)	388 (59.0%)	
Diabetes	Type 1	33 (16.5%)	37 (5.6%)	<.001
	Type 2	167 (83.5%)	621 (94.4%)	
Related comorbidities	Complicated diabetes	92 (46%)	133 (20.21%)	<.001
	Hypertension	160 (80%)	490 (74.5%)	.11
	Congestive heart failure	26 (13%)	52 (7.9%)	.03
	Renal failure	12 (6%)	27 (4.1%)	.26
	Peripheral vascular disease	11 (5.5%)	39 (5.93%)	.82
	Acute myocardial infarction	0	0	1
	Cerebrovascular disease	8 (4%)	36 (5.47%)	.41
	Lipid abnormalities	175 (87.5%)	573 (87.08%)	.88
Unrelated comorbidities	Alcohol abuse	2 (1%)	7 (1.06%)	.65
	Any tumor	15 (7.5%)	36 (5.47%)	.29
	Cardiac arrhythmia	15 (7.5%)	47 (7.14%)	.86
	Chronic pulmonary disease	49 (24.5%)	132 (20.06%)	.18
	Coagulopathy	8 (4%)	10 (1.52%)	.03
	Anemia	38 (19%)	173 (26.29%)	.04
	Fluid and electrolyte disorders	19 (9.5%)	48 (7.29%)	.31
	Liver disease	7 (3.5%)	25 (3.8%)	.84
	Psychosis	18 (9%)	49 (7.45%)	.47
Comorbidity count	0	15 (7.5%)	63 (9.57%)	.008
	1	53 (26.5%)	237 (36.02%)	–
	2	51 (25.5%)	161 (24.47%)	–
	3	36 (18%)	111 (16.87%)	–
	≥4	45 (22.5%)	86 (13.07%)	–

claims, and diabetes-related pharmacy claims ($P \leq .001$ for all comparisons). The differences in costs were identical when we restricted the analysis to the 546 non-participants (83.0%) with 2 or more encounters with a diagnosis of diabetes (results not shown).

DISCUSSION

VBID is increasingly identified as a mechanism for employers and payers to encourage uptake of evidence-based healthcare services by restructuring benefits to reflect the anticipated value of a given service or intervention. There is great variety in VBID programs and the optimal design and implementation of VBID to maximize benefit has not yet emerged. Our retrospective evaluation of employees and dependents who chose to enroll in a voluntary, employer-based program that eliminated copayments for diabetes-related medications and supplies is the first to systematically examine VBID uptake in a VBID program that required participants to actively enroll. Fewer than one-fourth of eligible beneficiaries chose to complete the necessary steps to participate. Importantly, the few beneficiaries who chose to participate were more likely to have higher baseline costs, including out-of-pocket costs, type 1 rather than type 2 diabetes, and a greater burden of comorbid illness. These findings suggest that barriers to enrollment in VBID programs influence uptake and may lead to enrollment of higher cost beneficiaries with higher burden of existing illness.

The association between nonadherence to evidence-based therapies and costly adverse events in diabetes is well supported.[17-20] Therefore the evidence suggesting that

VBID programs are associated with increased medication adherence and the potential for lower medical expenditures is promising.[2,6,7] However, in order for VBID programs to optimize impact they must be available to those who would benefit from the high-value services that the VBID programs are designed to promote. Therefore VBID programs need to avoid barriers on entry that may limit uptake. Importantly, our program had significant requirements for participation, including that beneficiaries have bloodwork drawn, complete a questionnaire, and release medical records to their employer. We are not able to determine which individual requirement presented the strongest barrier to participation, if any, but we acknowledge that requiring participants to release medical records to an employer could be a particularly powerful barrier due to mistrust and fear, including fear that making medical data available to an employer could influence employment.[21,22] Some VBID programs have mandated participation in disease management programs, and the relative strength of such a barrier is unknown.[23]

Table 2. Healthcare Utilization

	Participants (200)	Nonparticipants (658)	*P*
Hospitalizations (≥1 admission)	35 (17.5%)	97 (14.74%)	.34
Emergency department use (≥1 visit)	46 (23%)	101 (15.35%)	.01
Outpatient visits			
Primary care	198 (99%)	637 (96.8%)	.09
Cardiologist	52 (26%)	146 (22.2%)	.26
Endocrinologist	86 (43%)	102 (15.5%)	<.001
Nephrologist	10 (5%)	22 (3.3%)	.28
Ophthalmologist	79 (39.5%)	206 (31.3%)	.03
A1C measured			
1	64 (32%)	232 (35.26%)	<.001
2	67 (33.5%)	143 (21.73%)	
3 or more	32 (16.0%)	80 (12.1%)	
LDL measured			
1	98 (49%)	290 (44.07%)	.2958
2	53 (26.5%)	149 (22.64%)	
3 or more	12 (6.0%)	75 (11.4%)	

AIC indicates glycated hemoglobin; LDL, low-density lipoprotein.

In our population we found that those who chose to participate in our VBID program were more likely to have T1DM, have complications of diabetes and comorbidities including heart failure, and have higher medical and pharmacy costs. Although participants appear to be at higher risk for complications than those who did not participate, they also appear to be already engaged in care of their diabetes. Participants were more likely to take diabetes medication, have visited an endocrinologist, and have evidence of monitoring of AIC. Participants may therefore be choosing to participate to offset costs being incurred as opposed to providing an opportunity to access under-utilized treatments or services, which is the premise of VBID. Similarly, non-participants may choose not to enroll because current costs are lower, making the program less immediately valuable to them. However, this eliminates the possibility that the program could ultimately enhance the use of evidence-based services in this population. Taken together, it appears possible that rather than increasing the use of high-value services in our population, the program may have simply shifted the burden of costs for currently engaged patients from the beneficiary to the employer.

While a VBID design should not leave in place copayments for those already practicing appropriate prevention or treatment behaviors, to realize the greatest value VBID programs must reach those for whom the barrier of medication copayments is contributing to poor glycemic control and clinical outcomes. While cost barriers are a significant driver of underuse for many patients,[24,25] patients who experience cost-related underuse may be more likely to also face barriers other than cost, including lack of family support,[26] lack of knowledge,[27] or cultural or literacy barriers.[28,29] These non-financial constraints may make these patients particularly susceptible to barriers to entry to VBID programs; and it is important that VBID program design avoids such barriers.

Limitations

Our findings should be understood in light of study limitations. First, our program had several requirements for participation. We do not know the specific reason why each individual chose not to participate and are unable to assess the relative importance of each component of the registration process. Second, our program was implemented in a single large regional healthcare provider, and it is not clear that employees in other industries would react similarly to program requirements. Third, our administrative definition of diabetes includes an intentionally broad spectrum of patients, but may identify patients without diabetes who would therefore appropriately not participate in the program regardless of programmatic barriers. A sensitivity analysis restricted

Table 3. Medication Use

	Participants (200)	Nonparticipants (658)	*P*
Diabetes medications[a]			
Any diabetes medication	133 (66.5%)	233 (35.41%)	<.0001
Biguanide	89 (44.50%)	175 (26.6%)	<.0001
Sulfonylureas	50 (25%)	96 (14.59%)	.0006
Insulin	59 (29.5%)	54 (8.21%)	<.0001
Thiazolidinediones	41 (20.5%)	48 (7.29%)	<.0001
DPP-4 antagonist	30 (15%)	26 (3.89%)	<.0001
GLP-1 agonist	12 (6%)	7 (1.06%)	<.0001
Hypertension medications[a]			
Any BP medication	106 (53%)	304 (46.2%)	.09
Diuretic	65 (32.5%)	179 (27.2%)	.15
Beta-blocker	31 (15.5%)	89 (13.53%)	.48
ACE inhibitor/ARB	96 (48%)	248 (37.69%)	.009
Cholesterol medications[a]			
Statin	90 (45%)	245 (37.23%)	.048
Adherence measure (PDC)[b]			
Sulfonylureas	0.7	0.66	.44
Biguanide	0.72	0.67	.27
ACE inhibitor/ARB	0.75	0.73	1.00
Statin	0.73	0.68	.09

ACE indicates angiotensin-converting enzyme; ARB, angiotensin receptor blocker; BP, blood pressure; DPP-4, dipeptidyl peptidase-4 antagonist; GLP-1, glucagon-like peptide-1; PDC, proportion of days covered.
[a]The proportion that have filled at least 1 medication in each class in the year prior to program initiation.
[b]The PDC is calculated only for individuals that have filled a medication within each class.

Table 4. Medical and Pharmacy Costs

		Participants (200)	Nonparticipants (658)	*P*
Medical	Median paid (IQR)	3916 (1548-9268)	2609 (865-7297)	.01
	Median out-of-pocket (IQR)	189 (100-302)	140 (70-250)	.001
Pharmacy	Median paid (IQR)	1975 (138-3433)	726 (0-2132)	<.001
	Median out-of-pocket (IQR)	621 (88-1073)	336 (0-690)	<.001
		N = 133	N = 233	
Diabetes medications[a]	Median paid (IQR)	1118 (368-1930)	279 (93-1068)	<.001
	Median out-of-pocket (IQR)	252 (126-410)	125 (70-235)	<.001

IQR indicates interquartile range.
[a]Costs for diabetes drugs limited to those who had at least 1 claim for a diabetes medication.

to the 546 non-participants with at least 2 visits with diabetes did not change the primary results for medical costs, so we present only the primary analyses using the broad definition. Fourth, we do not include indicators of clinical control of diabetes and/or related conditions. Finally, the sample size for calculation of medication adherence was small and limits our ability to compare between groups.

CONCLUSION

We found poor uptake of an employer-initiated VBID program for diabetes that required registration, survey completion, laboratory testing, and release of medical records. Although the specific reasons for the poor uptake are not known, it is likely that the requirement for active enrollment resulted in the selection of a population that had higher costs and a higher burden of comorbidity than

the overall population with diabetes. Thus, to optimize the success of VBID programs, barriers to enrollment should be minimized.

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