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The Centers for Medicaid and Medicare Services State Innovation Models Initiative and Social Risk Factors: Improved Diagnosis Among Hospitalized Adults With Diabetes

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Abstract

Introduction: Unaddressed social risks among hospitalized patients with chronic conditions contribute to costly complications and preventable hospitalizations. This study examines whether the Centers for Medicaid and Medicare Services State Innovation Models initiative, via payment and delivery system reforms, accelerates the diagnosis of social risk factors among hospitalized adults with diabetes.

Methods: Encounter-level data were from Agency for Healthcare Research and Quality Healthcare Cost and Utilization Project State Inpatient Databases (2010–2015, N=5,040,456). Difference-in-difference logistic regression estimated the extent to which hospitalized adults with diabetes in four State Innovation Models states (Arkansas, Massachusetts, Oregon, and Vermont) had increased odds of having a social risk factor diagnosed with an ICD-9 V code compared with hospitalized adults with diabetes in four comparison states (Arizona, Georgia, New Jersey, and New Mexico) 2 years after implementation. Data were analyzed between June and December 2019.

Results: Adults with diabetes hospitalized in State Innovation Models states had a 30% greater increase in the odds of having a V code documented after implementation relative to diabetic adults hospitalized in comparison states (AOR=1.29, 95% CI=1.07, 1.56). However, V code use remained infrequent, with only 2.05% of encounters, on average, having any V codes on record in State Innovation Models states after implementation.

Conclusions: The State Innovation Models initiative slightly but significantly improved diagnosis of social risks among hospitalized adults with diabetes. State-led delivery system and payment reform may help support movement of hospitals towards better recognition and management of social determinants of health.

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INTRODUCTION

The Centers for Medicaid and Medicare Services State Innovation Models (SIM) initiative funds states to develop and test innovative delivery system and payment reforms to enhance health system performance, improve care quality, and decrease healthcare costs. The first round of funding was awarded in 2013 and granted more than \$300 million to six states. Each state created its own implementation plan, but common strategies included multi-payer value-based payment models, behavioral health and primary care integration, health information technology expansion, and workforce development.^{1–4}

One result of SIM implementation may be increased screening for social risk factors among patients with diabetes. Diabetes outcomes and their antecedents (e.g., healthy eating, physical activity, tobacco use) are impacted by social-ecological factors, such as education, economic stability, and social support.^{5,6} Clinical guidelines for diabetes care encourage providers to assess social risks for diabetic patients and use that information to adjust treatment and assist patients in resolving unmet social needs.⁶ One manner in which social risk screening can be documented in patient records is with ICD codes, the Ninth Revision of which included a subset of codes entitled V codes that capture “factors influencing health status and contact with health services” (Table 1).

Historically, V codes have been used very minimally by clinicians.^{7–10} However, many SIM reforms addressed identified barriers to their use (Appendix provides examples). Improvements in code use may have been particularly likely in hospitals: As significant drivers of high costs, unnecessary hospitalizations and readmissions were a major focus of all SIM states. Patients with unmet social needs have higher rates of hospitalization than those without unmet needs.¹¹ Screening and documenting social risks in hospitals are central to identifying high-use patients and preventing additional hospitalizations, especially considering patients with unmet needs are less likely to have regular sources of outpatient care.^{12,13}

To examine if broad-based delivery system and payment reforms can incentivize social risk factor diagnosis in hospital settings, this analysis leverages a natural experiment to estimate the impact of SIM implementation on the use of V codes for hospitalized adults with diabetes.

METHODS

Study Sample

The data were from the Agency for Healthcare Research and Quality Healthcare Cost and Utilization Project State Inpatient Databases 2010–2015, an encounter-level database that contains all discharge records for inpatient stays within participating states.¹⁴ The analysis utilized data from four SIM states (Arkansas, Massachusetts, Oregon, and Vermont) and four comparison states (Arizona, Georgia, New Jersey, and New Mexico). The sample included adults aged >18 years with diagnosed diabetes discharged in these states between January 1, 2010 and September 30, 2015 (N=5,040,456), with SIM implementation beginning October 2013. Details on sample creation and measure definition can be found in the Appendix.

Approval was obtained from the University of California, Berkeley Committee for Protection of Human Subjects.

Statistical Analysis

A difference-in-difference (DID) model was estimated using logistic regression, in which the binary outcome denoted whether or not a discharge record contained at least one V code or no V codes at all. The model controlled for the following individual-level covariates: patient age, sex, race/ethnicity, primary payer, having a psychiatric diagnosis, and admission through the emergency department.^{7,15} More detail on the model is provided in the Appendix. Data were analyzed using Stata, version 16 between June and December 2019.

The robustness of results was tested with several alternative model specifications, including a propensity score-weighted DID model, a continuous interrupted time series model, and a hospital-level model (Appendix).

RESULTS

Throughout the sample, V codes were infrequently used: Only 1.14% of encounters had V codes on record. V code use was slightly more common in SIM states than in comparison states prior to SIM implementation (1.21% of encounters vs 0.86% of encounters, respectively). V code use increased significantly in all states after SIM implementation, but the increase was more pronounced in SIM states (0.84 percentage points) than in comparison states (0.28 percentage points).

In DID analysis, SIM implementation was significantly associated with greater improvement in V codes use during hospitalizations of diabetic adults. The AOR using this specification was 1.29 (95% CI=1.07, 1.56), indicating that the change in odds of having any V code documented on a diabetic adult's hospitalization record in SIM states after SIM implementation compared with before implementation was 29% greater than the change in odds of having a V code on record for hospitalizations in comparison states during the same time period. Although the proportional increase was large, this estimate corresponded to a marginal increase of only 0.19 percentage points in the probability of having a V code on record for hospitalizations in SIM states, owing to low baseline rates of code use.

These results were robust to all alternative specifications (Appendix).

DISCUSSION

The Centers for Medicaid and Medicare Services SIM initiative was associated with significant, albeit small, improvements in the diagnoses of social risk factors among hospitalized adults with diabetes in four grantee states. These results suggest that payment and delivery system reforms aimed at improving care quality and lowering costs can, perhaps as means of achieving their broader goals, help incentivize diagnosis and documentation of social risk factors, at least among a target population with a condition known to be exacerbated by social risk factors.

It is important to note that the identified improvement represented an increase of only 0.19 percentage points in the probability of having a V code on record, which suggests more extensive changes must be made if V codes are to be used in a way that meets recommended guidelines^{6,16} and reliably captures social risk factors among hospitalized patients. This perhaps could have been accomplished with wider-reaching reforms than were possible under SIM; many states experienced challenges in recruiting payers to new payment models and some states focused programs and technical assistance only on clinicians participating in new models.⁴ Nonetheless, the improvement in code use identified here is notable in light of the extremely low rates of use and the limited existing evidence on how to improve diagnosis of social risk factors in clinical settings. Participation in reforms is often voluntary and the small effect size reflects that reforms would necessarily be coupled with other strategies to reach optimal code use rates, but these types of delivery system and payment reforms may be promising tactics to improve currently low rates, even if marginally.

Limitations

Limitations include the inability to control for relevant unobserved covariates, identify which specific SIM reforms were most influential in improving V code use, and contend with possible state-level co-occurring interventions, as is the nature of DID models. The specific analyzed states also limit broader generalizability. Additionally, given the structure of encounter data, the analysis could not assess if heightened social risk diagnosis resulted in the receipt of social services, amelioration of risks, or changes in health outcomes.

CONCLUSIONS

The delivery system and payment reforms that were implemented under the SIM initiative were associated with distinguishable increases in the use of ICD-9 V codes to document social risk factors during hospitalizations of diabetic adults in SIM states. These results highlight the potential for state-led health system reforms to support the movement of hospitals toward documenting and, ideally, addressing social determinants of health.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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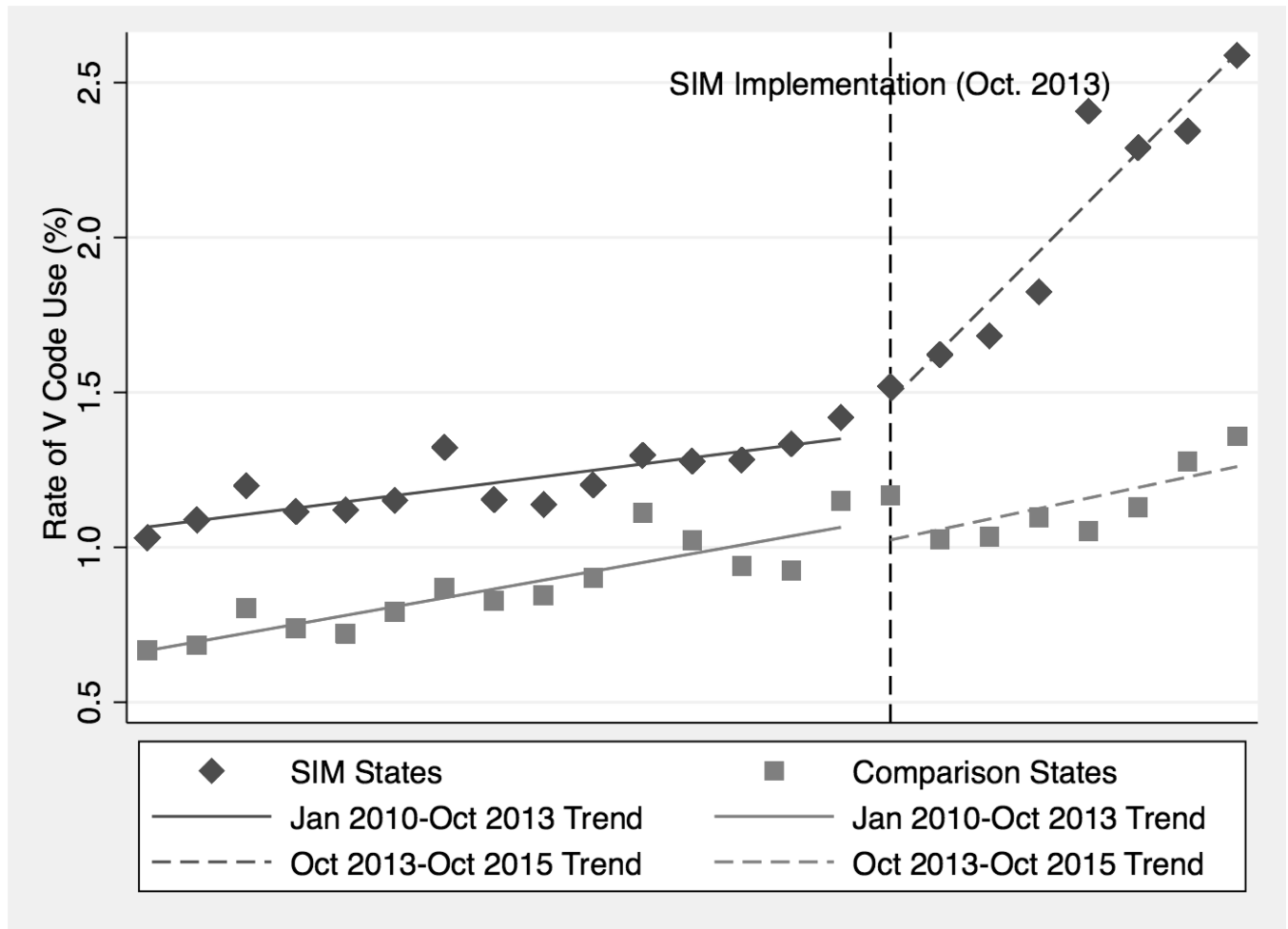


Figure 1.
Rate of V code use in hospitalizations of adults with diabetes in SIM states and comparison states.

Table 1.**ICD-9 V Codes and Diagnoses Related to Social Risk Factors**

ICD-9 code	Diagnosis
V15.4	Personal history of psychological trauma presenting hazards to health
V15.41	History of physical abuse
V15.42	History of emotional abuse
V15.49	Other psychological trauma
V60	Housing, household, and economic circumstances
V60.0	Lack of housing
V60.1	Inadequate housing
V60.2	Inadequate material resources
V60.3	Person living alone
V60.4	No other household member able to render care
V60.5	Holiday relief care
V60.6	Person living in residential institution
V60.8	Other specified housing or economic circumstances
V60.81	Foster care
V60.89	Other specified housing or economic circumstances
V60.9	Unspecified housing or economic circumstances
V61	Other family circumstances
V61.0	Family disruption
V61.01	Family disruption due to family member on military deployment
V61.02	Family disruption due to return of family member from military deployment
V61.03	Family disruption due to divorce or legal separation
V61.04	Family disruption due to parent-child estrangement
V61.05	Family disruption due to child in welfare custody
V61.06	Family disruption due to child in foster care or in care of non-parental family member
V61.07	Family disruption due to death of family member
V61.08	Family disruption due to other extended absence of family member
V61.09	Other family disruption

ICD-9 code	Diagnosis
V61.1	Counseling for marital and partner problems
V61.10	Counseling for martial and partner problems, unspecified
V61.11	Counseling for victim of spousal and partner abuse
V61.12	Counseling for perpetrator of spousal and partner abuse
V61.2	Parent-child problems
V61.20	Counseling for parent-child problem, unspecified
V61.21	Counseling for victim of child abuse
V61.22	Counseling for perpetrator of spousal and partner abuse
V61.23	Counseling for parent-biological child problem
V61.24	Counseling for parent-adopted child problem
V61.25	Counseling for parent (guardian)-foster child problem
V61.29	Other parent-child problems
V61.3	Problems with aged parents or in-laws
V61.4	Health problems within the family
V61.41	Alcoholism in family
V61.42	Substance abuse in the family
V61.49	Other health problems within the family
V61.8	Other specified family circumstances
V61.9	Unspecified family circumstances
V62	Other psychosocial circumstances
V62.0	Unemployment
V62.1	Adverse effects of work environment
V62.2	Other occupational circumstances or maladjustment
V62.21	Personal current military deployment status
V62.22	Personal history of return from military deployment
V62.29	Other occupational circumstances or maladjustment
V62.3	Educational circumstances
V62.4	Social maladjustment
V62.5	Legal circumstances

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ICD-9 code	Diagnosis
V62.8	Other psychological or physical stress, not elsewhere classified
V62.81	Interpersonal problems, not elsewhere classified
V62.82	Bereavement, uncomplicated
V62.83	Counseling for perpetrator of physical/sexual abuse
V62.89	Other psychological or physical stress, not elsewhere classified
V62.9	Unspecified psychosocial circumstance

Source: Agency for Healthcare Research and Quality Health Care Cost and Utilization Project.

Table 2.

Characteristics of Hospital Encounters in SIM and Comparison States at Baseline

Variable	SIM states (n=287,351)	Comparison states (n=595,214)
Age, years, mean	66.13	64.21
Female, %	51.74	52.41
Race/ethnicity, %		
White	81.45	60.90
Black	9.34	21.96
Hispanic	5.41	12.18
Asian or Pacific Islander	1.32	1.57
Native American	0.37	1.87
Other	2.12	1.52
Primary payer, %		
Medicare	65.54	59.51
Medicaid	9.29	9.96
Private insurance	19.29	21.46
Self-pay	2.49	5.82
No charge	0.35	0.15
Other	3.04	3.10
Psychiatric admission, %	4.29	2.85
Emergency department admission, %	70.31	72.24

Note: Estimates include encounters in 2010. Boldface indicates statistical significance ($p < 0.05$) in t -test of means compared to SIM states.

Source: Agency for Healthcare Research and Quality Health Care Cost and Utilization Project (HCUP) State Inpatient Databases 2010–2015

SIM, State Innovation Models.

Table 3.

The Impact of the State Innovation Model on Use of ICD-9 V Codes in Hospital Encounter Records for Adults With Diabetes (n=5,040,456)

Variable	OR (95% CI)
Post	1.04 (0.93, 1.16)
SIMxPost	1.29 ** (1.07, 1.56)
Age	0.98 *** (0.97, 0.98)
Female	0.77 *** (0.71, 0.82)
Race/Ethnicity	
Black	1.19 * (1.02, 1.39)
Hispanic	0.82 *** (0.74, 0.91)
Asian or Pacific Islander	0.55 *** (0.47, 0.64)
Native American	0.98 (0.82, 1.18)
Other	0.90 (0.73, 1.10)
Primary payer	
Medicaid	1.96 *** (1.81, 2.14)
Private insurance	0.73 *** (0.66, 0.80)
Self-pay	3.06 *** (2.55, 3.67)
No charge	2.67 *** (2.17, 3.27)
Other	1.34 *** (1.18, 1.53)
Psychiatric admission	13.97 *** (11.98, 16.31)
Emergency department admission	1.19 ** (1.05, 1.35)

Notes: Table presents estimates from difference-in-difference models using logistic regression. Models include year and state indicator variables. SEs are clustered at the hospital level. Reference group for race/ethnicity is white and for payer is Medicare. Boldface indicates statistical significance

*
($p < 0.05$)

**
 $p < 0.01$

 $p < 0.001$.

Source: Agency for Healthcare Research and Quality Health Care Cost and Utilization Project (HCUP) State Inpatient Databases 2010—2015.