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The CMS State Innovation Models Initiative and Improved Health Information Technology and Care Management Capabilities of Physician Practices

Zosha K. Kandel[1], **Diane R. Rittenhouse**[1,2], **Salma Bibi**[1], **Taressa K. Fraze**[3], **Stephen M. Shortell**[1,4], **Hector P. Rodríguez**[1,4]

[1]Center for Healthcare Organizational and Innovation Research, University of California, Berkeley, CA

[2]Department of Family and Community Medicine, University of California, San Francisco, CA

[3]The Dartmouth Institute for Health Policy and Clinical Practice, Geisel Medical School, Dartmouth College, Lebanon, NH

[4]Division of Health Policy and Management, UC Berkeley School of Public Health, Berkeley, CA

Abstract

The Centers for Medicare and Medicaid Services' (CMS) State Innovation Models Initiative (SIM) funded 17 states to implement health care payment and delivery system reforms to improve health system performance. Whether SIM improved health information technology (HIT) and care management capabilities of physician practices, however, remains unclear. National surveys of physician practices (n=2,722) from 2012/3 and 2017/8 were linked. Multivariable regression estimated differential adoption of ten HIT functions and CMPs based on SIM award status (SIM Round 1, SIM Round 2, or non-SIM). HIT and CMP capabilities improved equally for practices in SIM Round 1 (5.3 vs. 6.8 capabilities, $p<0.001$), SIM Round 2 (4.7 vs. 7.0 capabilities, $p<0.001$), and non-SIM (4.2 vs. 6.3 capabilities, $p<0.001$) states. The CMS SIM Initiative did not accelerate the adoption of ten foundational physician practice capabilities beyond national trends.

Keywords

health information technology; care management; payment reform; state health policy; delivery system reform

INTRODUCTION

The Patient Protection and Affordable Care Act (ACA) established the Center for Medicare and Medicaid Services (CMS) Innovation Center to test innovations in health care delivery

Corresponding Author Information: Hector P. Rodríguez, PhD, MPH, Professor of Health Policy and Management, School of Public Health, University of California, Berkeley, 2121 Berkeley Way #5427, Berkeley, CA 94720, hrod@berkeley.edu, 510-642-4578 Phone, 510-643-5056 Fax.

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and payment models to improve health system performance, improve the quality of patient care, and decrease health care costs for all residents, irrespective of payer (Beil, Feinberg, Patel, & Romaire, 2019; Kissam, Beil, Cousart, Greenwald, & Lloyd, 2019). The CMS Innovation Center launched the State Innovation Models Initiative (SIM) to facilitate state-based innovations. Since 2013, the Innovation Center has awarded 17 states more than $1 billion in SIM funding, and provides technical assistance, to plan, pilot test, and implement health care payment and delivery system reforms. Through a competitive application process, states proposed tailored plans to improve health system performance, resulting in wide variation in reforms and improvement strategies used by grantee states. While states varied in their approaches to delivery system and payment reform, all states were encouraged to support primary care practice transformation through technical assistance programs, expand health information technology (HIT), and implement chronic care management processes (CMPs), evidence-informed organizational strategies to support patient self-management, treatment adherence, and care coordination.

Delivery system reforms implemented by SIM states include changes in the way health care is provided and can involve HIT, financial and non-financial provider incentives, and shifts in patients' roles and responsibilities in their care (Song & Lee, 2013). For physician practices delivering care to adult patients with chronic conditions, transformation of the traditional primary care practice office relies on the expansion of HIT functions, such as interoperable electronic health records, and evidence-based CMP improvements, including registries and systems for identifying complex, high-need patients, which have been shown to be cost-effective (Smith et al., 2017). Some SIM states used grant funds explicitly to advance HIT capabilities and incentivize CMPs, such as facilitating health information exchange among providers and encouraging care management through new payment models (RTI International, 2018). In addition to capability-specific investments, the overall SIM investment in a state has the potential to influence state agency, payer, and health care delivery system stakeholder commitment and resources to advance value-based payment and expansion of practice capabilities.

Multiple factors are expected to impact practice adoption and implementation of HIT and CMPs prior to and during the SIM Initiative, including practice characteristics and differences by specific type of HIT or CMP capability being implemented. Physician practice characteristics, such as larger practice size and health care system ownership of practices, are associated with greater adoption of CMPs and expansion of HIT functions (Rittenhouse et al., 2017; Rodriguez, McClellan, et al., 2016). Recent studies indicate that, compared to CMP adoption, the rate of HIT adoption has been more rapid in hospital and physician organizations, likely due to meaningful use criteria incentivized by the HITECH Act, which provided substantial incentives for electronic health record (EHR) adoption and HIT expansion (Gold & McLaughlin, 2016). CMP adoption, however, has been more variable across practices and stagnant over time. More easily adopted are patient registries and identification of high-risk patients, while clinician feedback and patient education are less easily adopted and implemented (Miake-Lye et al., 2017). Practices face financial barriers to expanding HIT and adopting CMPs; for example, in the dominant fee-for-service environment in most geographic regions, primary care practices received insufficient reimbursement for care management, contributing to CMP implementation barriers and

reducing sustainability (Holtrop, Luo, & Alexanders, 2015). These patterns likely affected the way states chose to structure and prioritize delivery system reform efforts within the SIM Initiative.

New Contribution

The stepped implementation of SIM across states provides an opportunity to examine the extent to which SIM accelerated the adoption of HIT and CMPs by physician practices beyond national trends. Previous research finds a strong connection between HIT and CMP adoption because expanded HIT functionalities provide a strong foundation for implementing chronic care management supports and programs (L. Casalino et al., 2003; L. P. Casalino, Ramsay, Baker, Pesko, & Shortell, 2018). Historically, practices have received limited reimbursement for unlicensed primary care staff to support patient education and self-management, the ongoing use of chronic disease registries, and outreach to patients to ensure recommended care is received. Consequently, investing in CMPs and HIT has not been financially feasible for many practices.

Figure 1 presents our conceptual model for the hypothesized relationships among SIM reforms, HIT and CMP adoption, and health care utilization and health outcomes. In recent years, expanded HIT and CMP adoption by physician practices has been stimulated by the rollout of ACA-related incentives for adoption of evidence-based chronic care management. State Medicaid expansions, for example, required states to assume responsibility for managing the care of newly-insured populations. SIM was launched to test innovations in health care delivery and thus is a mechanism through which some states received extra support to meet ACA-related goals. Because the instrumental support provided by SIM is above and beyond ACA-related incentives, we hypothesize that physician practices located in SIM grantee states will have greater adoption of CMPs and HIT over time compared to non-SIM states. SIM can accelerate adoption of CMPs and HIT through direct investment in HIT and CMP capabilities and through more advanced practice capabilities stimulated by SIM implementation because CMPs and HIT are foundational to implementing other delivery system and payment reforms. For example, expanded HIT and CMPs can provide a foundation for more advanced practice capabilities such as open access scheduling (Rodriguez, Knox, Hurley, Rittenhouse, & Shortell, 2016), and other innovations to improve access, quality of care, and patients' experiences (McInnes et al., 2012). As a result, SIM may have accelerated the adoption of these capabilities even while not explicitly incentivizing their adoption. To advance understanding of SIM's impact on practice transformation, we use data from two national physician practice surveys to examine the extent to which physician practices in SIM states were more likely to adopt ten foundational HIT and CMP capabilities over time compared to practices in non-SIM states.

METHODS

Data

Two national surveys of U.S. physician practices were linked to examine changes over time in practice HIT functions and CMPs, and differential adoption by SIM award status (Round 1 awardee, Round 2 awardee, or no SIM award). The third wave of the National Study of

Physician Organizations (NSPO3) (2012-2013) served as the baseline period and the practice version of the National Survey of Healthcare Organizations and Systems (NSHOS) (2017 – 2018) served as the follow-up period. Both surveys collected information on practice-level characteristics, including practice size and ownership, and physician specialty mix.

The sampling frame for NSPO3 was determined from comprehensive listings of all physician practices and medical groups available from IQVIA and stratified samples were drawn based on practice type, size, and geographic location (Rodriguez, McClellan, et al., 2016). The NSHOS practice survey used a modified sampling of the NSPO3 survey, but the NSHOS practice survey sample was limited to practices with three or more primary care physicians practicing in the same location, while NSPO3 included small physician practices (1–2 physicians) by design. NSPO3 and NSHOS had a response rate of 50% and 47%, respectively. Because the NSHOS data from these practices were not nationally representative of practices with less than 3 physicians, we exclude these small practices from NSPO3 (n=587) and NSHOS practices with recent physician departures or changes in composition during fielding that reduced the practices' physician count below 3 (n=216). The final analytic sample included a total of 2,722 practice observations, with 811 practices at baseline and 1,911 practices at follow-up. We also conducted a secondary analysis of a cohort of practices with responses to both NSPO3 and NSHOS (n=154) surveys.

Measures

Outcome Measure

HIT Functionality and Care Management Processes Composite Measure: A composite measure was calculated using the count of seven HIT functions and three CMPs. HIT capabilities assessed at baseline and follow-up involve functions of the practice EHR system and included: physician access to hospital discharge summaries; physician access to laboratory and test results; physicians' ability to know whether patients have filled prescriptions; practice EHR direct connection to the EHR at the main hospital used by patients of the practice; decision-support tools embedded in the EHR; patients' electronic access to medical records; and patients' ability to electronically comment on their medical records. The chronic care management processes may or may not be integrated with the EHR and can potentially require separate systems to support chronic care management efforts. The CMPs assessed included: whether the practice has a system for identifying complex, high need patients and whether the practice maintained lists or registries to manage the care of patients with either of the conditions 1) diabetes, or 2) depression. Diabetes registries were included because they are generally one of the foundational investments that physician practices make when improving chronic care management (Miake-Lye et al., 2017). Depression care registries were included in the analysis because managing depression is critical for patients with chronic medical conditions (Katon, 2008), but adoption has lagged (Bishop et al., 2016). Each of the 10 questions was categorized as a binary variable with a value of 1 if the HIT function or CMP was available at the time of survey and a value of 0 if the function or care management process was not available or not widely available throughout the practice. The composite measure (α = 0.67) was calculated as a sum of individual HIT function and CMPs of each practice at both time periods.

Independent Variables

SIM Status: Practices were categorized by SIM status based on whether the practice's address was in a state that received a SIM test award. Practices in one of six states that received Round 1 Model Test Awards (Arkansas, Maine, Massachusetts, Minnesota, Oregon, and Vermont) were categorized at SIM Round 1. Practices within one of eleven states that received Round 2 Model Test Awards (Colorado, Connecticut, Delaware, Idaho, Iowa, Michigan, New York, Rhode Island, Ohio, Tennessee, and Washington) were categorized as SIM Round 2. Practices in the remaining 33 states and the District of Columbia that did not receive the SIM Test Award in Round 1 or 2 were categorized as non-SIM.

Practice Ownership: Practices were considered physician-owned if the practice was owned by individual physicians or physician-group owned, including ownership by a larger medical group or by non-physician managers. Practices considered hospital or health-system owned included academic medical centers and HMOs. Federally Qualified Health Centers (FQHCs) were categorized separately. All other practices were categorized as "other", which included practices with joint ownership and/or missing ownership information.

ACO Contract Affiliation: ACO contract affiliation was measured according to the practice's application or agreement status to become an ACO at baseline and participation in an ACO contract at follow-up. Practices at baseline were assessed on whether the practice had applied to CMS or signed an agreement with a private health insurance plan to become an ACO in 2012, applied to the advanced payment program, applied to the pioneer program, or applied to the general Medicare shared-savings program. Practices at follow-up were assessed on whether the practice was participating in Medicare ACO upside-only, risk-bearing contracts, and/or commercial ACO contracts in 2017.

Other control measures: Analyses controlled for practice size as measured using a five-part categorical variable by the number of physicians in the practice. Analyses also controlled for percent of practice physicians who were primary care physicians within three categories (100% PCP, 33%−99% PCP, and less than 33% PCP). Percent revenues from Medicaid were included and categorized as none (0%), some (1–29%), and high (30% and greater). To control for regional effects, US Census Regions were used and included Northeast, Midwest, South, and West.

Analyses

For weighted descriptive analyses, chi-square tests for categorical variables compared proportions of the baseline and follow-up samples for differences in practice characteristics. The weights account for differential sampling probabilities of physician practices. Because the weights are representative of the sampling frame, the weights for a subgroup of the organizations (e.g. FQHC respondents) are representative of the corresponding subgroup in the sampling frame. Then, HIT functions and CMPs were compared for physician practices of SIM Round 1 vs. SIM Round 2 vs. non-SIM states.

To describe changes overtime for practices within each of the three groups, the weighted percentage of practices utilizing each HIT functionality and CMP item at baseline and at

follow up were calculated by SIM status. Differences in the percent change of practices adopting each HIT function and CMP were estimated using weighted unadjusted logistic regression for each of the ten capabilities. Changes in the composite measure at baseline and follow-up periods were compared by SIM status using weighted linear regression to account for differential selection probabilities of practices in the NSPO3 and NSHOS surveys.

Multivariable linear regression models estimated the moderating effect of SIM on the adoption of HIT functions and CMPs. To improve our power to detect small differences among states and to assess overall adoption of HIT and CMP capabilities, we utilized the composite measure as the primary outcome for this analysis. This method enabled us to test for differences in adoption between SIM and non-SIM states while allowing for differences in the combinations of capabilities practices implement based on their needs and resources. We regressed the composite measure of HIT and CMP adoption on time of survey (2012/3 vs. 2017/18), SIM status (Round 1, Round 2, and non-SIM), and interaction terms for SIM status and time of the survey. Two multivariable regression models were compared: 1) a specification with SIM status, time, and SIM-time interactions and 2) a specification that builds on the first model by controlling for practice ownership, practice size, percent primary care physicians, ACO contract affiliation, Medicaid concentration, and region of the U.S.

To assess the robustness of the repeated cross sectional results, we conducted a sensitivity analysis that included only a cohort of physician practices that responded to both NSPO3 and NSHOS (n=154). Panel regression methods were used to estimate the effect of SIM on increased adoption of HIT functions and CMPs, controlling for practice fixed effects to account for repeated practice observations over time.

RESULTS

Several physician practice characteristics differed at baseline (2012/13) and follow-up (2017/18) (Table 1). Practice ownership shifted from predominantly physician owned (71.0% to 36.1%) to predominantly health system or hospital owned (22.3% to 44.3%). Compared to the baseline period, a greater proportion of practices were focused exclusively on primary care services in the follow-up period (47.4% vs. 62.5%), had high (>30%) Medicaid patient concentration (5.6% vs. 23.3%), and affiliated with one or more ACOs (30.4% vs. 57.4%). Compared to the baseline period, a lower share of follow-up practices were in the South (34.4% vs. 20.3%) and a larger share were in the Midwest and Northeast (19.4% vs. 25.4% and 17.4% vs. 25.9%, respectively). SIM Round 1 states are a greater share of the practices in the follow-up period (3.6% vs. 12.6%).

At baseline, practices of SIM Round 1 states had more robust HIT and CMP capabilities compared to SIM Round 2 states and non-SIM practices (5.3 out of 10 capabilities on average in practices of SIM Round 1 states vs. 4.7 in SIM Round 2 states vs, 4.2 in non-SIM states) (Table 2). Overall, practices increased their use of HIT and CMPs over time, irrespective of their SIM status. HIT and CMP capabilities improved equally for practices in SIM Round 1 (5.3 vs. 6.8 capabilities, $p<0.001$), SIM Round 2 (4.7 vs. 7 capabilities, $p<0.001$), and non-SIM (4.2 vs. 6.3 capabilities, $p<0.001$) states.

Of HIT functions, the largest increases were practice physicians having direct connection to the electronic health record at the main hospital, patients having electronic access to their medical records, and patients being able to electronically comment on their medical records. Physicians having access to pharmacy records to know whether patients have filled prescriptions declined over time for practices across SIM status categories. SIM Round 1 states were early adopters of decision-support tools embedded in the EHR and did not increase practice adoption over time (78.6% vs. 75.4%). In contrast, practices in non-SIM states increased adoption of decision support tools embedded in the EHR (53.5% vs. 71.0%) and the differential change over time between SIM Round 1 and non-SIM was statistically significant ($p<0.05$).

All three CMPs assessed had large increases in practice adoption over time. For example, at baseline a minority of practices had a system for identifying complex, high need patients. At follow-up, a majority of practices in SIM Round 1 (48.8% vs. 75.6%), SIM Round 2 (44.5% vs. 76.0%), and non-SIM (47.4% vs. 70.1%) states had adopted a system for identifying complex, high need patients (Table 2). In spite of the large changes in HIT and CMP capabilities over time, logistic regression analyses for each of the individual capabilities revealed that practices of SIM Round 1 and SIM Round 2 states did not adopt a single HIT or CMP capability more over time relative to practices in non-SIM states.

Multivariable linear regression results are consistent with the unadjusted results (Table 3). On average, practices adopted an additional 1.76 capabilities over time ($p<0.001$). Practices in SIM Round 1 states had approximately one more capability ($\beta=0.90$, $p<0.001$) than practices in non-SIM states at baseline, but no differential improvement ($\beta=-0.25$, $p=0.34$) (Table 3, Model 1). Practices in SIM Round 2 states had similar capabilities ($\beta=0.23$, $p=0.16$) as practices in non-SIM states at baseline and did not adopt more capabilities than non-SIM states over time ($\beta=0.04$, $p=0.83$). When practice characteristics were added to the regression model as control variables (Table 3, Model 2), the results were consistent. Practice characteristics associated with greater practice HIT functions and CMPs were ACO contract affiliation ($\beta=0.66$, $p<0.001$), larger practice size, and practice ownership by hospital/health systems ($\beta=0.36$, $p<0.001$) and federally-qualified health centers ($\beta=0.37$, $p<0.01$). Practices that exclusively provide primary care services had more HIT and CMP capabilities compared to practices with 33–99% PCPs ($\beta=-0.26$, $p<0.05$) and <33% PCPs ($\beta=-0.39$, $p<0.01$).

The cohort analyses using panel data methods resulted in findings consistent with the main repeated cross-sectional analyses (Table 4). On average, practices of the cohort adopted an additional 1.26 capabilities over time ($p<0.001$), but there was no differential adoption of CMPs and HIT for practices of SIM Round 1 ($\beta=-0.18$, $p=0.74$) or SIM Round 2 ($\beta=0.21$, $p=0.67$) states compared to practices in non-SIM states.

DISCUSSION

In a national study of the contribution of the CMS SIM Initiative on improved physician practice capabilities, we found a national HIT expansion and CMP adoption trend over the five-year study period. There was no evidence, however, that SIM accelerated the adoption

of HIT functions and CMPs of practices in grantee states. This main finding was consistent with our analysis of a cohort of practices with survey responses from both time periods which, although representing a smaller sample, reinforces our conclusion that practices in SIM states did not differentially adopt HIT capabilities and CMPs. Instead, improved capabilities of practices in SIM states are attributable to national HIT expansion and CMP adoption trends occurring over the five-year study period.

Adoption of HIT and CMPs varied according to practice characteristics that we would expect to be associated with higher adoption. These include ACO contract affiliation, which incentivizes systems for better care coordination and management, and system-ownership and larger practice size, which can invest in more resources to develop the capability to control costs of care. This is consistent with prior evidence indicating that HIT and CMP adoption is higher among system-owned and lower among high-Medicaid revenue practices (Rodriguez, McClellan, et al., 2016). External incentives should continue to be used to support the adoption and implementation of foundational HIT functions and CMPs so that patients benefit from proactive management of their chronic conditions.

There are several possible explanations for the lack of association of SIM implementation with improved practice capabilities. First, in evaluations of regional policy and practice interventions, control group practices have been found to experience improvements. For example, the Aligning Forces for Quality (AF4Q) Initiative achieved improvements in health care quality and outcomes, but improvements in AF4Q regions were no different than changes in non-AF4Q regions (Shi et al., 2016). SIM may not differentially impact the adoption of HIT and CMP capabilities because ACA's broader reforms were relatively more influential in accelerating HIT and CMP adoption among practices across all states. Even if SIM had some influence on adoption rates in participating states, states may have experienced diminishing returns to additional investments in uptake that could be better directed towards other aspects of improving HIT and CMP capabilities. If ACA-related reforms were already influencing adoption of foundational HIT functions and CMPs, SIM may instead have influenced adoption of more advanced practice capabilities that were not assessed in the study, including the use of predictive analytics for managing high cost and high need patients (Bates, Saria, Ohno-Machado, Shah, & Escobar, 2014).

Further, although SIM aims to reform the healthcare delivery system, states have great latitude over how SIM funds are invested. The adoption of HIT and CMPs are important for the transformation of physician practices and was a central goal of SIM, but we find no evidence that SIM accelerated the expansion of select practice capabilities. It is possible that SIM funds were directed at improving practice capabilities and programs that were not assessed in the current study, such as the use of community health workers, behavioral health and primary care integration, and investments in improving the capabilities of small practices, which continue to account for the majority of physician practices in the country (Beil et al., 2019; Kissam et al., 2019; Rittenhouse, Phillips, Bibi, & Rodriguez, 2019). Indeed, HITECH technical assistance efforts focused on supporting the adoption of HIT in small physician practices (Rittenhouse et al., 2017). Alternatively, SIM states may have focused most of their efforts on payment reforms, such as aligning payers (Kissam et al.,

2019), and thus expended relatively less effort on delivery system reforms, such as improved HIT functions and CMPs.

The influence of co-occurring state-based interventions may also explain why we found no evidence of SIM impact. Over the past decade, there has been a major effort to reform the U.S. healthcare delivery system and the adoption of HIT and CMPs by physician practices has been an important component of many state and federal policies and programs, particularly initiatives to manage clinically complex patients who drive a high share of health care costs. Although we controlled for changes in payer distribution during the study period, states – both SIM and non-SIM – had multiple co-occurring interventions, such as the Comprehensive Primary Care Plus (CPC+) program and/or purchaser or payer collaboratives, and diverse sources of public and private funding that provided incentives for practice expansion of HIT and adoption of CMPs (Denham & Veazie, 2019; Peikes et al., 2019). Organizational learning collaboratives, a common strategy used by SIM states to transform primary care performance efforts that has been found to stimulate CMP implementation in physician practices (Cross et al., 2019), are also a core strategy used by the CPC+ program, in addition to many state and local quality improvement programs. SIM was just one initiative related to this effort and may have had a marginal accelerating impact that we could not isolate from these other interventions. The effect of other payment reform and delivery system investments in a state is difficult to disentangle from SIM funding because other programs can influence state decision-making on how to spend SIM funds. For example, two SIM Round 1 states used SIM funds to expand upon their patient-centered primary care home models originally developed for the first CPC Initiative (RTI International, 2018). The sampling frames of the national surveys analyzed do not enable reliable state-specific analyses. If state-specific analyses of physician practices are possible in the future, integrating information about practice participation in relevant co-occurring interventions and characterizing the relative contributions of each initiative would enrich understanding of how these efforts contributed to increased HIT and CMP adoption.

Further, our analyses highlight that SIM Round 1 states were early adopters of CMPs and HIT and there was less impetus for practices in these states to further expand beyond existing capabilities. Practices in these states may have focused their SIM efforts on leveraging their *existing* HIT functions and CMPs to improve patient care. Importantly, practices of SIM Round 2 states had fewer capabilities at baseline compared to Round 1 states, and also did not adopt more HIT functions and CMPs compared to practices of non-SIM states. The consistent pattern of Round 1 and Round 2 states further supports our conclusion that HIT expansion and CMP adoption in practices in these states is not attributable to SIM but, instead, to nationally occuring trends.

Finally, SIM may not have accelerated practice adoption of HIT functions and CMPs because the infusion of SIM funds was too small to impact practice capabilities in SIM states. Recently published mixed-methods evaluations of SIM demonstrate the challenges Round 1 states encountered when engaging in multi-payer alignment for value-based payment and integrating behavioral health into primary care (Beil et al., 2019; Kissam et al., 2019). SIM deliberately allowed states great flexibility in designing their own approaches to improve health system performance; however, the resulting variation made it difficult to

generate implementation guidance and support relevant across states. The diffuse and variable nature of SIM implementation across states makes detecting a signal on any HIT capability or CMP difficult.

The CMS SIM Initiative is an example of a large-scale, broadly-defined and flexible federal program that spurred innovative tests of delivery system reform at the state level. A federal program with such broad parameters, however, can necessitate general state guidance on implementation strategies and complicate cross-state evaluations. Ideally, federal initiatives that support states would provide strong evidence about the effectiveness of specific reforms and programs to states rather than providing a lengthy menu of delivery system and payment reforms with limited evidence on the best strategies. Doing so may enable practicces to harness HIT and CMP capabilities to improve patient outcomes. Better evidence is also needed for states to make informed decisions about specific delivery system and payment reforms that fit with the unique populations, resources, and needs of individual states. While the SIM Initiative may indeed have led to improved practice capabilities for specific states, our results highlight the limited overall impact of the broadly-defined program that does not necessarily prioritize specific practice capabilities. Promoting the collaborative adoption of evidence-based delivery system and payment reforms across states holds potential for cross-state learning and also facilitates the evaluation of the impact of large-scale federal reforms on practice transformation, including improved use of HIT and CMPs among physician practices.

Our study results should be considered in light of some important limitations. First, the surveys do not have sufficient number of practices within each SIM state to conduct state-specific analyses. Each SIM intervention state selected their own bundle of delivery system and payment reform interventions, but we are unable to examine the impact of this heterogeneity in SIM effects on practice adoption of HIT and CMPs. Second, the study used two separate physician surveys that used slightly different sampling frames. As a result, survey responses with fewer than three physicians were excluded, limiting the generalizability of the findings. We conducted weighted analyses in order to account for differential selection probabilities of practices included in the surveys. Although we control for variables that differed between NSPO3 and NSHOS practices in regression analyses, compositional differences of the sampling frame and analytic samples should be considered when interpreting the results. Third, the precision of our SIM effect estimates is limited by the number of survey observations in our final analytic sample. Small effects of SIM could not be detected reliably given our sample size, although it is possible that SIM indeed had small effects on HIT and CMP adoption that we were unable to observe. Relatively wide confidence intervals on our estimates of differential adoption of capabilities overtime in SIM states suggests that there could be some non-zero effect that we were unable to detect. Fourth, as previously discussed, we could not account for all co-occurring state-based interventions that may also have been influencing or hindering practice adoption of HIT and CMP capabilities over time. Finally, we examined a subset of HIT functions and CMPs that were assessed identically across surveys. HIT and CMP capabilities that we were able to measure at both time periods may represent only a portion of the HIT and CMP capabilities that these practices may have used. Previous research indicates that physician-patient relationship dimensions and care team functioning can support patient-centered chronic care

delivery (Holtrop, Potworowski, Fitzpatrick, Kowalk, & Green, 2016, 2015; Tomoaia-Cotisel et al., 2018), which we could not assess using single informant practice surveys. In spite of this, the CMPs and HIT functions assessed are foundational capabilities for chronic care management and can be reliably measured using single informant surveys.

Conclusion

With over 1 billion dollars in funding allocated to states to implement value-based payment, engage in primary care practice transformation, and test new models of care, our findings do not support the expectation that SIM funding increases physician practice adoption of foundational HIT and CMP capabilities beyond trends attributable to national health reform.

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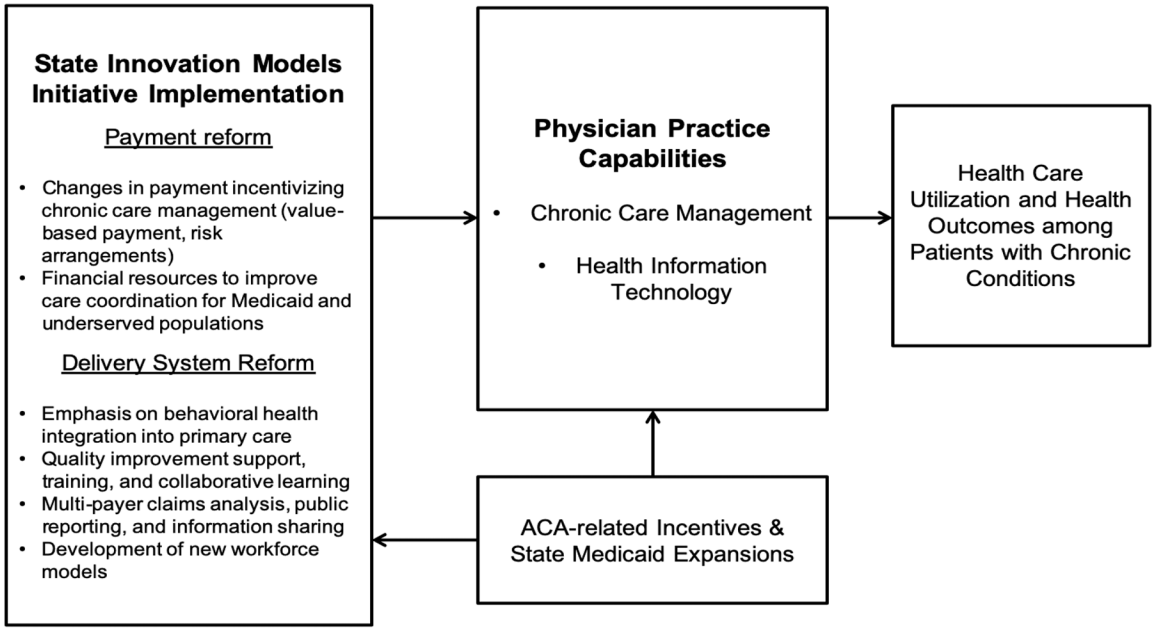

Figure 1.

Conceptual Model: CMS State Innovation Model Initiative Relationship to Improved Physician Practice Capabilities and Health Outcomes and Utilization

Table 1.

Practice Characteristics, Baseline vs. Follow-up

	Baseline (2012/13) ***n=811***	**Follow-up (2017/18)** ***n=1,911***	**p-value**
State Innovation Models (SIM) Initiative Award Status, weighted % (n)			
SIM Round 1	3.6 *(132)*	12.6 *(246)*	
SIM Round 2	25.7 (294)	23.7 *(484)*	
Non-SIM	70.7 *(385)*	63.7 *(1181)*	
Region, weighted % (n)			***
Northeast	17.4 *(152)*	25.9 *(367)*	
Midwest	19.4 *(344)*	25.4 *(562)*	
South	34.4 *(131)*	20.3 *(492)*	
West	28.8 *(184)*	28.4 *(490)*	
Practice Ownership, weighted % (n)			***
Physician-owned	71.0 *(460)*	36.1 *(675)*	
Hospital or Health System Owned	22.3 *(241)*	44.3 *(907)*	
Federally-Qualified Health Center	4.0 *(70)*	16.6 *(280)*	
Other	2.7 *(40)*	3.0 *(49)*	
Practice size, weighted % (n)			
3–7 physicians	73.0 *(399)*	61.9 *(1105)*	
8–12 physicians	7.0 *(127)*	14.4 *(330)*	
13–19 physicians	2.6 *(58)*	6.9 *(127)*	
20–99 physicians	3.8 *(138)*	13.1 *(258)*	
100+ physicians	13.6 *(89)*	3.8 *(91)*	
Percent Primary Care, % (n)			
100%	47.4 *(297)*	62.5 *(1190)*	
33–99%	38.3 *(292)*	30.8 *(594)*	
<33%	14.3 *(222)*	6.6 *(127)*	
Medicaid concentration, weighted % (n)			***
None (0%)	24.3 *(127)*	13.1 *(239)*	
Low/Moderate (1–29%)	70.2 *(580)*	63.6 *(1256)*	
High (30%+)	5.6 *(104)*	23.3 *(416)*	
ACO Contract Affiliation, *weighted % (n)*	30.4 *(225)*	57.4 *(1205)*	***

Note: Baseline practice data are from Round 3 of the National Survey of Physician Organizations (NSPO3). Follow-up practice data are from the National Survey of Healthcare Organizations and Systems (NSHOS). Results are weighted to account for differential sampling probabilities of practices for each period;

* p <0.05.

** p <0.01.

*** p <0.001, overall difference in characteristic proportions between survey samples

Table 2.

Adoption of Health Information Technology Functions & Care Management Processes Overtime by SIM Status

SIM Status	SIM Round 1			SIM Round 2			Non-SIM		
Survey Period[1]	**Baseline**	**Follow-up**	***Change***	**Baseline**	**Follow-up**	***Change***	**Baseline**	**Follow-up**	***Change***
Overall Capabilities *(Composite score, weighted, range: 0–10)*	5.3	6.8	*+1.5*	4.7	7.0	*+2.3*	4.2	6.3	*+2.1*
Health Information Technology (HIT) Capabilities (weighted % of practices)									
Physicians have access to hospital discharge summaries	88.4	84.6	*−3.8*	86.3	86.9	*+0.6*	77.1	79.7	*+2.6*
Physicians have access to laboratory and test results	92.2	91.9	*−0.3*	84	92.6	*+8.6*	85.8	86.2	*0.4*
Physicians have access to pharmacy record to know whether patients have filled prescriptions	48.6	28.4	*−20.2*	52	38.2	*−13.8*	49.7	38.3	*−11.4*
Practice EHR direct connection to the EHR at the main hospital	34.2	76.7	*+42.5*	32	64.3	*+32.3*	16.2	56.7	*+40.5*
Decision-support tools embedded in the EHR	78.6	75.4	*−3.2**	65.6	74.9	*+9.3*	53.5	71.0	*+17.5*
Patients have electronic access to medical records	32.0	84.0	*+52*	32.1	88.5	*+56.4*	22.4	84.6	*+62.2*
Patients' have the ability to electronically comment on their medical records	5.7	44.4	*+38.7*	8.5	51.6	*+43.1*	6.6	44.8	*+38.2*
Chronic Care Management Processes (CMPs) (weighted %)									
Practice has a system for identifying complex, high need patients	48.8	75.6	*+26.8*	44.5	76	*+31.5*	47.4	70.1	*+22.7*
Practice maintains lists or registries to manage the care of patients with:									
Diabetes	58.7	72.8	*+14.1*	46.9	74.9	*+28*	33.4	59.1	*+25.7*
Depression	40.4	41.9	*+1.5*	20.1	50.3	*+30.2*	24	38.5	*+14.5*

[1] Baseline period (NSPO3) 2012–2013, n=811; Follow-up period (NSHOS) 2017–2018, n=1911

* p <0.05, overall change difference within SIM Status category, compared to Non-SIM change difference

Table 3.

Multivariable Regression Results: The Effect of the CMS State Innovation Models Initiative on Improved Physician Practice Capabilities

	Model 1: Unadjusted Regression			Model 2: Regression Adjusted for Practice Characteristics		
	Coefficient	**p-value**	**95% CI**	**Coefficient**	**p-value**	**95% CI**
Follow-up period effect	1.76	***	[1.52, 2.01]	1.45	***	[1.18, 1.71]
SIM Status effect						
Non-SIM (reference)	-	-		-	-	
SIM Round 1	0.90	***	[0.48, 1.32]	0.70	***	[0.27, 1.12]
SIM Round 2	0.23		[−0.09, 0.55]	0.11		[−0.21, 0.43]
*Follow-up period * SIM Status Interactions*						
Follow-up * Non-SIM (reference)	-			-	-	
Follow-up * SIM Round 1	−0.25		[−0.76, 0.26]	−0.11		[−0.63, 0.41]
Follow-up * SIM Round 2	0.04		[−0.35, 0.44]	0.11		[−0.29, 0.49]
ACO Contract Affiliation	-	-	-	0.66	***	[0.49, 0.82]
Practice Size						
3–7 physicians (reference)	-	-	-	-	-	
8–12 physicians	-	-	-	0.42	***	[0.20, 0.64]
13–19 physicians	-	-	-	0.59	***	[0.26, 0.92]
20–99 physicians	-	-	-	0.59	***	[0.34, 0.84]
100+ physicians	-	-	-	1.17	***	[0.83, 1.52]
Practice Ownership						
Physician-owned (reference)	-	-	-	-	-	
Hospital or System-owned	-	-	-	0.36	***	[0.18, 0.54]
Federally-Qualified Health Center	-	-	-	0.37	**	[0.10, 0.64]
Other	-	-	-	0.05		[−0.40, 0.50]
Percent Primary Care Physicians (PCP)						
100% PCP (reference)	-	-	-	-	-	
33%−99% PCPs	-	-	-	−0.26	*	[−0.46, −0.06]
<33% PCPs	-	-	-	−0.39	**	[−0.66, −0.13]
Percent Medicaid Revenue						
0% Medicaid (reference)	-	-	-	-	-	
1%−29% Medicaid	-	-	-	0.40	***	[0.16, 0.63]
30%+ Medicaid	-	-	-	0.14		[−0.15, 0.44]
Region						
Midwest (reference)	-	-	-	-	-	-
Northeast	-	-	-	−0.17		[−0.38, 0.05
South	-	-	-	−0.47	***	[−0.71, −0.23]

	Model 1: Unadjusted Regression			Model 2: Regression Adjusted for Practice Characteristics		
	Coefficient	**p-value**	**95% CI**	**Coefficient**	**p-value**	**95% CI**
West	-	-	-	−0.39	***	[−0.61, −0.17]
Constant	4.32	***	[4.60, 5.02]	4.30	***	[3.99, 4.65]

Note: Baseline practice data are from Round 3 of the National Survey of Physician Organizations (NSPO3), *2012–2013, n=811*; Follow-up practice data are from the National Survey of Healthcare Organizations and Systems (NSHOS), *2017–2018, n=1911*.

* p <0.05.

** p <0.01.

*** p <0.001.

Table 4.

Cohort Analyses (n=154): The Effect of the CMS State Innovation Models Initiative on Improved Physician Practice Capabilities

	Coefficient	p-value	95% CI
Follow-up period effect	1.28	***	[0.61, 1.94]
SIM Status effect			
Non-SIM (reference)	-	-	
SIM Round 1	2.59		[−1.12, 6.30]
SIM Round 2	4.89	*	[1.19, 8.59]
*Follow-up period * SIM Status Interactions*			
Follow-up *Non-SIM (reference)	-	-	
Follow-up *SIM Round 1	−0.18		[−1.23, 0.88]
Follow-up *SIM Round 2	0.21		[−0.76, 1.19]
Constant	1.36		[−1.25, 3.98]

* p <0.05.

** p <0.01.

*** p < 0.001.