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What Factors Influence States' Capacity to Report Children's Health Care Quality Measures? A Multiple-Case Study

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Abstract *Objectives* The objective of this study was to describe factors that influence the ability of state Medicaid agencies to report the Centers for Medicare & Medicaid Services' (CMS) core set of children's health care quality measures (Child Core Set). *Methods* We conducted a multiple-case study of four high-performing states participating in the Children's Health Insurance Program Reauthorization Act (CHIPRA) Quality Demonstration Grant Program: Illinois, Maine, Pennsylvania, and Oregon. Cases were purposively selected for their diverse measurement approaches and used data from 2010 to 2015, including 154 interviews, semiannual grant progress reports, and annual public reports on Child Core Set measures. We followed Yin's multiple-case study methodology to describe how and why each state increased the number of measures reported to CMS. *Results* All four states increased the number of Child Core Set measures reported to CMS during the grant period. Each took a different approach to reporting, depending on the available technical, organizational, and behavioral inputs in the state. Reporting capacity was influenced by a state's Medicaid data availability, ability to link to other state data systems, past experience with quality measurement, staff time and technical expertise, and demand for the measures. These factors were enhanced by CHIPRA Quality Demonstration grant funding and other federal capacity building activities, as hypothesized in our conceptual framework. These and other states have made progress reporting the Child Core Set since 2010. *Conclusion* With financial support and investment in state data systems and organizational factors, states can overcome challenges to reporting most of the Child Core Set measures.

Keywords Quality measures · Medicaid · CHIPRA · Case study · Multiple-case study

Significance

What is already known on this topic? The Child Core Set measures were first voluntarily reported by state Medicaid/CHIP agencies for the 2010 reporting year. The Centers for Medicare & Medicaid Services (CMS) and states anticipated challenges to reporting, but there have been no systematic studies of the factors that facilitate or create barriers to reporting of these measures across states.

What this study adds? State data availability, staff time and technical expertise, and demand for measures influence the state's ability to produce and report the Child Core Set of health care quality measures to CMS.

Introduction

The Children's Health Insurance Program Reauthorization Act (CHIPRA) of 2009 was hallmark legislation that focused, in part, on measuring and improving quality of care for children in Medicaid and the Children's Health Insurance Program (CHIP; Dougherty, Schiff, & Mangione-Smith, 2011; Fairbrother & Simpson, 2011; U.S.

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Congress, 2009). CHIPRA mandated, among other things, that the Centers for Medicare & Medicaid Services (CMS) identify a core set of children's health care quality measures (Child Core Set) for voluntary use by state Medicaid and CHIP agencies. CMS released technical specifications for the initial Child Core Set of 24 measures in February 2011 (CMS, 2011; Mangione-Smith, Schiff, & Dougherty, 2011). State Medicaid/CHIP agencies began voluntarily reporting the state-level measures to CMS in 2011 for the federal fiscal year (FFY) 2010 reporting period (Sebelius, 2011). CMS subsequently updated the Child Core Set by revising measure specifications annually, including retiring one measure and adding three measures for FFY 2013 reporting (Burwell, 2016).

Recognizing that states would face challenges reporting these measures, CMS also established two capacity-building activities. In February 2010, CMS established the CHIPRA Quality Demonstration Grant Program, awarding $100 million to 18 states over 5 years to identify strategies for improving health care quality and delivery systems for children enrolled in Medicaid/CHIP. Ten of the 18 states were awarded funds to help them report, assess, and/or use the Child Core Set to improve children's health care ("measure-focused demonstration states"). The Agency for Healthcare Research and Quality (AHRQ) oversaw an evaluation of the grant program, designed to learn about effective, replicable strategies for improving quality of care for children (AHRQ, 2015). In May 2011 CMS also established the Technical Assistance and Analytic Support Program to increase the number of states consistently collecting, reporting, and using the Child Core Set (CMS, 2014b).

This paper, produced as part of the evaluation of the CHIPRA Quality Demonstration Grant Program, describes facilitators and barriers to measure reporting in four measure-focused demonstration states and actions that other states can take to increase voluntary measure reporting.

Conceptual Framework

To guide our analysis, we adapted the Performance of Routine Information System Management (PRISM) framework (Fig. 1) to make it more relevant to reporting by state Medicaid agencies (Aqil, Lippeveld, & Hozumi, 2009). The PRISM framework hypothesizes that three types of inputs (data and technical, organizational, and behavioral) influence health information system performance, which in turn improves health status. In our adaptation, these three factors affect states' measure production processes and are influenced by federal capacity-building activities and the state health care delivery system context.

Methods

For the evaluation of the CHIPRA Quality Demonstration Grant Program, we conducted site visits that included semi-structured interviews with program staff and stakeholders in all 18 demonstration states in 2012 and 2014. Interviews addressed such topics as states' demonstration goals, quality improvement projects, barriers and facilitators to implementation, and perceived outcomes. Researchers cleaned interview notes, using audio recordings to fill in gaps, and coded the notes in a qualitative research software program (NVivo version 10.0, QSR International), using a coding scheme aligned with the interview protocol. The New England Institutional Review Board and the Office of Management and Budget approved this research.

For the present analysis, we conducted a multiple-case study of four demonstration states (Illinois, Maine, Oregon, and Pennsylvania) to examine how each state increased reporting of the Child Core Set to CMS from FFY 2010 to FFY 2013. To purposively select states, we reviewed site visit executive summaries, examined the number of measures each demonstration state reported to CMS, and sought input from evaluation researchers, staff from the CMS Technical Assistance and Analytic Support Program, and program leaders at AHRQ and CMS. All ten measure-focused demonstration states increased the number of measures reported over time; we selected four states that had different types of Medicaid delivery systems including varied use of managed care; were in different geographic regions; experimented with diverse strategies to report the measures; and were likely to provide actionable lessons for other states.

Our analysis followed Yin's multiple-case study methodology (Yin 2014). Guided by the conceptual framework, we used multiple data sources to explore "how" and "why" each state was able to increase measure reporting given its specific context. We used four data sources:

1. *Department of Health & Human Services' "Annual Report on the Quality of Care for Children in Medicaid and CHIP" from 2011 to 2014*. We used these publicly available reports to identify the number of measures states reported to CMS for FFY 2010 to FFY 2013 (Burwell, 2014; Sebelius, 2011, 2012, 2013).
2. *Interviews.* We used interviews (75 in 2012; 75 in 2014) conducted with grant staff and stakeholders during evaluation site visits in the four states. Case study authors (AC, RB, VF) used NVivo to retrieve coded data related to quality measurement. Authors conducted one follow-up interview with grant staff in each state to confirm and supplement these data (154 interviews total).

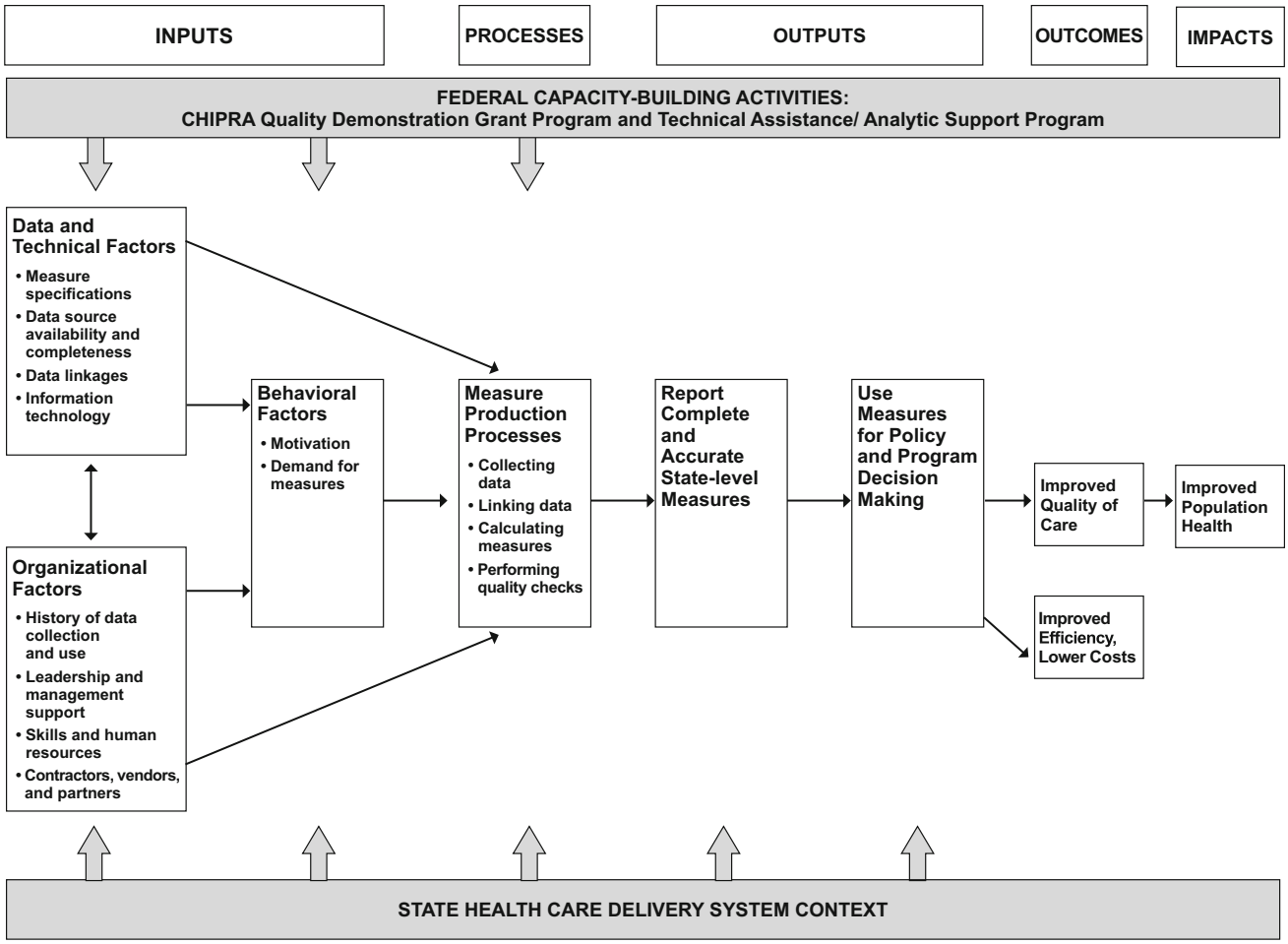

Fig. 1 Conceptual framework: state Medicaid/CHIP agencies' capacity to produce and use clinical quality measures. Modified from PRISM (Performance of Routine Information System Management) Framework (Aqil, Lippenveld, & Hozumi, 2009)

3. *Documents that grantees submitted to CMS between 2010 and 2014.* We reviewed each state's grant application, final operating plan, and semi-annual progress reports.
4. *Summary information about states' interactions with the CHIPRA Technical Assistance/Analytic Support Program provided by CMS.* We reviewed information on the number and content of technical assistance interactions per state.

Case study authors applied content and thematic analysis to the four data sources and drafted a case study for each state, using a common template that corresponded to the conceptual framework (Boyatzis, 1998; Bryman, 2004). A separate author (DP) conducted the comparative multiple-case analysis by populating matrices, using pattern recognition analysis to identify similarities and differences across the cases, and generating a list of themes present in two or more cases for each of the factors in the conceptual framework (Patton, 2015; Yin, 2014). This author shared the matrices and resulting themes with case study authors to iteratively revise and confirm the findings.

Results

The 10 measure-focused demonstration states increased the median number of Child Core Set measures reported to CMS from FFY 2010 to FFY 2013 more than the other demonstration states or non-demonstration states (Fig. 2). In 2013, measure-focused demonstration states reported a median of 23.5 of the 26 measures, versus 13 in other demonstration states and 15 in non-demonstration states. Each of the four case study states increased the number of measures reported to CMS (Fig. 3), adding between four and twenty-four measures. Table 1 lists all Child Core Set measures and indicates which measures the four states reported for FFY 2013.

While all four states increased the number of Child Core Set measures reported to CMS during the grant period, we

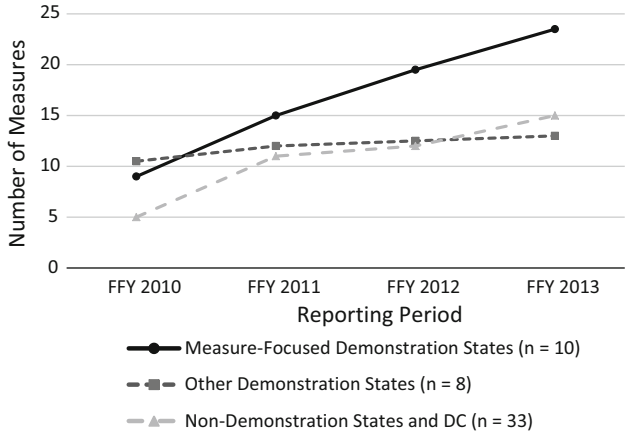

Fig. 2 Median number of Child Core Set measures reported for FFY 2010 through FFY 2013, by particiation in the CHIPRA Quality Demonstration Grant Program

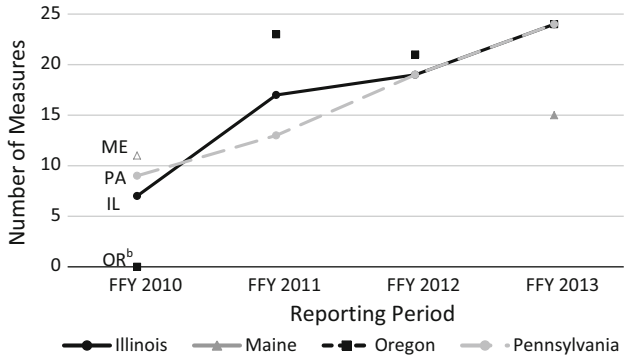

Fig. 3 Number of Child Core Set meaures reported for FFY 2010 through FFY 2013, by case study state

purposively selected states with varying Medicaid payment and delivery systems, measure production approaches, and grant activities (Table 2). Through the case studies, we determined that each state's approach was driven by its Medicaid delivery system context, goals for the CHIPRA Quality Demonstration grant, and the relative availability and strength of other inputs, specifically data and technical factors, organizational factors, and behavioral factors. The role of specific inputs varied by state (Table 3). Examining the interplay of these factors across the cases revealed several themes. Below, we discuss themes that emerged from the analysis in at least two of the case studies.

Data and Technical Factors

Complex and Insufficiently Detailed Measure Specifications Hindered Each State's Progress in Producing the Child Core Set

All four states described CMS's initial measure specifications as complex and insufficiently detailed. Each invested time and resources to interpret the specifications and apply them to state-specific data sources. Between 2011 and 2014 case study states contacted the CMS Technical Assistance and Analytic Support mailbox between four and 54 times for clarifications on measure numerators, denominators, sampling methods, use of alternative data sources, coding systems, continuous enrollment criteria, and aggregating health plan data to produce a state-level rate.

The Composition of Each State's Medicaid Delivery System Largely Defined the Data Sources Readily Available and the Measures that States Could More Easily Produce

Whether the state's Medicaid program is largely a fee-for-service (FFS), partially-capitated primary care case management (PCCM), or fully-capitated managed care program determined which Medicaid data were available. States with predominantly FFS systems—Maine and Illinois (at the time of this analysis)—had access to FFS claims data and could report most of the measures that required only administrative data. However, access to FFS claims data did not guarantee that all administrative measures could be reported. Maine had concerns about the validity of some claims-based measures, either because providers did not consistently use the billing codes included in the measure specifications or because billing codes covered additional services beyond the focus of the measure.

States with high Medicaid managed care penetration—Oregon and Pennsylvania—reported measures using managed care encounter data in one of two ways, both of which were driven by contractual relationships with their managed care plans. Oregon produced the measures within its Medicaid agency, using encounter data that managed care plans are required to submit to the state. Pennsylvania shifted the burden to the health plans by contractually requiring them to submit plan-level measures to the state via an external quality review organization (EQRO), which then created a weighted average for each measure at the state level.

States Faced Challenges Reporting Measures that Require Linking Multiple Data Sources

Maine and Oregon each planned to use data sources beyond Medicaid administrative data for measure reporting but struggled to link to these other data sources. Although Oregon was able to link to birth certificate data to report the perinatal measures, the state also wanted to link to other vital records, the immunization registry, and pharmacy claims for other measures. The state encountered privacy barriers, lack of necessary data in the pharmacy claims, and lagged immunization registry data, so instead used other

Table 1 Child Core Set measures for reporting years FFY 2010 through FFY 2013

Measure	Method(s)/data source(s)	Measures each state reported for FFY 2013			
		IL	ME	OR	PA
Access to care					
Children and adolescent access to primary care practitioners	Administrative[a]	•	•	•	•
Preventive care					
Childhood immunization status	Administrative or hybrid[b]	•		•	•
immunization status for adolescents	Administrative or hybrid	▲		•	•
Human papillomavirus (HPV) vaccine for female adolescents[c]	Administrative or hybrid	•		•	•
Well-child visits in the first 15 months of life	Administrative or hybrid	•	•	•	•
Well-child visits in the third, fourth, fifth, and sixth years of life	Administrative or hybrid	•	•	•	•
Adolescent well-care visit	Administrative or hybrid	▲	•	•	•
Developmental screening in the first 3 years of life	Administrative or hybrid	•	▲	•	▲
Chlamydia screening in women	Administrative	▲	•	•	▲
Maternal and perinatal health					
Frequency of ongoing prenatal care	Administrative or hybrid	•	[d]	•	▲
Timeliness of prenatal care	Administrative or hybrid	•	[d]	•	▲
Live births weighing less than 2500 g	State vital records	▲	[d]	•	▲
Cesarean section for nulliparous singleton vertex (NSV)	State vital records alone or merged with discharge diagnosis data	▲		•	▲
Pediatric central line-associated blood stream infections—neonatal intensive care unit and pediatric intensive care unit[e]	CDC's national healthcare safety network	[e]		[e]	[e]
Maternity care—behavioral health risk assessment[c]	EHR				
Behavioral health					
Follow-up after hospitalization for mental illness	Administrative	▲	▲	•	▲
Follow-up care for children prescribed attention-deficit/hyperactivity disorder (ADHD) medication	Administrative	▲	•	•	•
Care of acute and chronic conditions					
Weight assessment and counseling for nutrition and physical activity for children/adolescents: Body Mass Index assessment for children/adolescents	Administrative or hybrid	▲		•	▲
Ambulatory care—emergency department visits	Administrative	▲	•	•	•
Medication management for people with asthma[c]	Administrative	•		•	•
Otitis Media with Effusion (OME)—avoidance of inappropriate use of systemic antimicrobials in children (ages 2–12)[f]	Administrative or EHR	n/a; measure retired in 2013			
Appropriate testing for children with pharyngitis[g]	Administrative	▲	▲	•	•
Annual percentage of asthma patients with one or more asthma-related emergency room visits (ages 2–20)[g]	Administrative	▲	•	•	▲
Annual pediatric hemoglobin A1C testing[g]	Administrative or hybrid	▲	•	•	▲
Oral health					
Percentage of eligibles who received preventive dental services	Form CMS-416	▲	•	•	▲
Percentage of eligibles who received dental treatment services	Form CMS-416	▲	•	•	▲

Table 1 continued

Measure	Method(s)/data source(s)	Measures each state reported for FFY 2013			
		IL	ME	OR	PA
Experience of care					
Consumer assessment of healthcare providers and systems (CAHPS) health plan survey 5.0H—child version including medicaid and with children with chronic conditions supplemental items	Survey	▲	▲	•	▲

CMS centers for medicare and medicaid services, *EHR* electronic health record

• Reported for 2013; State began reporting this measure in its first year of reporting

▲ Reported for 2013; State added this measure (i.e., began reporting between its first year of reporting and the FFY 2013 reporting period)

[a] Administrative data includes Medicaid/CHIP claims or encounter data

[b] Hybrid methodology combines administrative data and manual review of a random sample of medical records

[c] CMS added measure to Core Set for FFY 2013 reporting

[d] Lags in birth certificate data availability mean measures are not reported to CMS by deadline for annual federal reports on the Child Core Set

[e] Beginning in FFY 2012, CMS obtained data for the CLABSI measure from the Centers for Disease Control and Prevention's National Healthcare Safety Network

[f] CMS did not collect measure for FFY 2012; measure was retired from FFY 2013 Core Set

[g] CMS retired measure after FFY 2013 reporting

data sources. Similarly, Maine abandoned its plan to use the state's immunization registry to report vaccination measures, given limited technical resources and challenges establishing data sharing agreements to transmit protected health information.

By contrast, Illinois has an Enterprise Data Warehouse (EDW) that matches Medicaid data and other health data such as the state's immunization registry and birth certificate data. Using the EDW, Illinois was able to report several measures that would otherwise require chart review or linkages across multiple data sources.

All Four States Struggled to Use Clinical Data from Electronic Health Records (EHR)

None of the four states produced the measure that requires EHR data (Maternity Care—Behavioral Health Risk Assessment; added to the core set in 2013), in part because states had not yet developed infrastructure, such as health information exchanges, to receive EHR data from providers. Pennsylvania used its CHIPRA grant to pilot production of a subset of other core measures using EHR data from seven health care systems. The process of producing those measures was complex and resource intensive, even for the large integrated delivery systems in the pilot. Another challenge Pennsylvania faced was that most Child Core Set measures had not yet been specified in the standardized Health Quality Measure Format language for EHR reporting (CMS, 2014a; HL7, 2009).

Child Core Set Reporting Required State-Level Information Technology (IT) Infrastructure to Store Data, Extract Data, and Calculate the Measures

In addition to data access, states also required IT systems (i.e., computer hardware, software, and other systems to organize electronic information) to store and extract the data and calculate the measures. Illinois used its grant funding to update its quality measure reporting systems: the state hired a database programmer who developed flexible reporting code and reusable templates to more efficiently extract data and calculate measures. The templates could be adapted when CMS released annual updates to the measure specifications. Oregon credited pre-CHIPRA upgrades to its Medicaid Management Information System as facilitating its ability to flexibly generate quality measures.

Organizational Factors

The History of Quality Measurement and Reporting in Each State Affected its Ability to Report the Child Core Set

States' prior experience with state-level and plan-level quality measure reporting provided infrastructure for reporting the Child Core Set. For example, Oregon participated in a Medicaid Section 1115 waiver demonstration

Table 2 Key contextual details for the four case study states

	Illinois	Maine	Oregon	Pennsylvania
Medicaid delivery system for child beneficiaries	Primarily FFS and PCCM. 6 % managed care.[a] During grant, state was preparing to shift at least 50 % of enrollees to managed care by January 2015	Entirely FFS and PCCM. No managed care[a]	Over 90 % managed care[b]	Entirely managed care by mid-2013[c]
Prior experience with and resources for measure reporting	History of reporting HEDIS measures for managed care population Has operated its Enterprise Data Warehouse (EDW) since the early 2000s. EDW contains Medicaid/CHIP claims, immunization registry data, vital records, and data from other maternal and child health programs	History of reporting quality measures at the practice-level within PCCM program Has a longstanding contract with a local public university to analyze Medicaid/CHIP claims and produce quality measures	History of reporting HEDIS measures for managed care population Strong history of quality measurement given early use of Medicaid Section 1115 waivers and more recent state health reform initiatives Contracts require Medicaid/CHIP managed care plans to submit complete and accurate encounter data to the state to facilitate measure reporting. State set high standards for encounter data quality during the past two decades	History of reporting HEDIS measures for managed care and FFS populations Medicaid managed care plans had existing contractual obligations to report on any measures the state requests, which can change year to year State has a longstanding contractual relationship with an external quality review organization (EQRO) that works with health plans to report performance measures
Measure production approach	Reported most core measures from its EDW. EDW allowed Illinois to report on several measures that would otherwise require chart review or complex data linkages	Used Medicaid/CHIP FFS claims data to report on most of the measures that require administrative data University staff produced the core measures under the existing contract, described above	Produced most core measures using managed care encounter data. Agency staff with health informatics expertise extract the encounter data, housed at the agency, to produce and report the Child Core Set	Was able to require health plans to report the core measures without modifying the existing Medicaid managed care contracts. EQRO worked with health plans to produce and validate the core measures at the plan level via administrative data or hybrid methodology (i.e., administrative data plus chart review). EQRO created a weighted state-level average for each measure
Select grant activities	Developed reporting infrastructure to complement its existing data warehouse. Updated reporting software and hired a database programmer who set up flexible programs to facilitate extraction of data from the EDW and calculation of the measures, while accommodating annual changes to the specifications	Identified data sources and produced core measures that could not be validly produced through claims data alone, including measures that required data not available in claims (as with the perinatal measures) or where claims data provided an undercount of services rendered (as with the immunization measures)	Assessed the feasibility and usefulness of the measures through collecting input from Medicaid agency staff and pediatric and family medicine practices	Piloted the production of a subset of Child Core Set measures via EHR data in seven organizations: five large pediatric-serving systems, one federally qualified health center, and a small rural health system. The pilot aimed to prepare health systems for EHR-based reporting, with the hope that in the future, EHR data could replace costly chart reviews for reporting clinical measures to the state and CMS

EHR electronic health record, *EQRO* external quality review organization, *FFS* fee for service, *FFY* federal fiscal year, *PCCM* primary care case management

[a] Source: Burwell (2014)

[b] Source: MAX 2011 eligibility anomaly Table 10

[c] Source: Interview with Dr. David Kelley, Chief Medical Officer of Pennsylvania's Medicaid program, April 20, 2015

Table 3 Factors that positively or negatively affect states' abilities to report Child Core Set measures to CMS

Measure production inputs	Cases			
	IL	ME	OR	PA
Data and technical factors				
Measure specifications	−	−	−	−
Data source availability and completeness	+	+	+	
Data linkages	+	−	−	
Information technology (IT)	+		+	
Organizational factors				
History and culture of data collection and use	+	−	+	+
Leadership/management support	+	+	+	
Skills and human resources	+	−	+	
Contractors, vendors, and partners	+	+		+
Behavioral factors				
Motivation	+	+	+	
Demand for measures		−	+	−

Key: Rating based on case study analysis. + indicates facilitator to reporting; − indicates barrier to reporting; no symbol indicates neutral, not applicable, or insufficient data to make a determination

starting in the mid-1990s that required the state to report quality measures to CMS years before most states. That experience prompted the state to require managed care plans to provide complete and accurate Medicaid encounter data, establishing a solid foundation for measure reporting. Also, Illinois', Oregon's and Pennsylvania's experiences reporting plan-level HEDIS measures (NCQA, 2015), upon which many Child Core Set measures are based, meant the states were already familiar with the measure specifications.

Maine had a history of practice-level quality measurement among practices in its PCCM program and other state initiatives. This history increased state staff and stakeholder familiarity with quality measurement, but it also shifted attention from the state-level Child Core Set measures to practice-level measures based on the core set. Many of Maine's grant activities were focused on practice-level reporting, which required modifying the measure specifications.

Having a Strong Leader to Champion the Child Core Set Facilitated States' Reporting

In the three states that used demonstration grant funding to produce state-level measures (Illinois, Maine, and Oregon), grant leaders motivated agency staff to report the Child Core Set. For example, Oregon's grant director's commitment and enthusiasm ensured that his staff prioritized the core set. As an expert in quality measurement, he also helped troubleshoot technical issues that arose while producing the measures.

Calculating and Reporting the Measures Required Significant Staff Time and Technical Expertise, Which States Drew from Various Sources

Having sufficient personnel with specialized technical skills was vital to all four states' capability to produce, quality check, and report the Child Core Set. Each state drew these skills from different combinations of sources, including Medicaid agency staff, grant-funded staff, state partners, and contractors including universities and EQROs. Illinois depended on existing EDW staff and used grant funds to hire a programmer to develop sustainable processes for data extraction and measure production. Maine relied on an existing contractual relationship (augmented with grant funds) with a local university to calculate the measures. Oregon relied primarily on existing Medicaid agency staff expertise, but also received technical assistance from a grant partner. Pennsylvania required its health plans to calculate plan-level measures, and its EQRO validated the plan-level measures and created weighted state-level averages.

Behavioral Factors

The Demonstration Grant Provided Motivation for States to Report the Child Core Set

The CHIPRA Quality Demonstration Grant was cited as a motivator for reporting the Child Core Set by the three states (Illinois, Maine, and Oregon) that used grant funding to support state-level measure reporting. The grant and the fact that the measures are sponsored by CMS motivated Medicaid agencies to participate in measure production. For example, Illinois grant staff described the grant as the "touchstone" around which they could focus attention on the measures. State staff said the grant allowed them to keep child health issues on the agenda, even with competing priorities, such as implementation of the Affordable Care Act.

Providers Expressed Demand for More Timely and Provider-Specific Measures than the Annual, State-Level Child Core Set

Although all four states noted that diverse stakeholders expressed a demand for children's health care quality measures, Oregon was the only state that reported that stakeholders were interested specifically in the Child Core Set. In Maine and Pennsylvania, providers had competing demands that did not correspond with reporting the Child

Core Set to CMS. The Child Core Set includes Medicaid/CHIP-specific measures produced annually at the state level; Maine and Pennsylvania providers wanted measures that they believed could better drive quality improvement at the point of care—specifically, provider-level measures that cover their entire patient panel (regardless of payer) and are produced monthly or quarterly. Maine, Oregon, and Pennsylvania each used grant funds to modify the reporting level of Child Core Set measures to use them in provider-level programs. Modifications included changing the measure denominator and determining how to attribute patients to providers.

Discussion

Calculating and reporting the Child Core Set measures was challenging, even for the four case study states that successfully increased the number of measures reported over time compared to non-demonstration states. The four states had multiple pathways to success, depending on their available technical, organizational, and behavioral inputs. In particular, measure reporting capacity was influenced by a state's data availability, ability to link to other state data systems, history of quality measurement, staff time and technical expertise, and demand for the measures. These inputs were influenced by the state's Medicaid delivery system (FFS, PCCM, and/or managed care) and federal capacity-building activities, including the CHIPRA Quality Demonstration Grants and Technical Assistance and Analytic Support program. Our findings align with those of an earlier case study in Florida (another measure-focused demonstration state), which described how the Medicaid/CHIP delivery system and data availability affected the state's experience reporting the Child Core Set (Knapp, Wang, & Baker, 2014).

Key findings from this analysis may help other states increase reporting of the Child Core Set to CMS. Past surveys of state Medicaid agencies show that a majority of respondents want best-practices information on how other states report quality measures (deLone & Hess, 2011). Table 4 lists actions that states might wish to consider to increase measure reporting. Many of these actions are consistent with findings from an earlier study of Medicaid/CHIP data and management tools (Welch et al., 2006). However, many of these actions require considerable state resources and could pose challenges to financially strapped Medicaid agencies (Greene-McIntyre & Caldwell, 2011). Measure-focused demonstration states benefited from the financial support of the CHIPRA Quality Demonstration Grants to supplement existing data and organizational inputs. Without the grants, states might not have had the resources or motivation to increase voluntary reporting. Indeed, demonstration states that did not focus on the Child Core Set and non-demonstration states did not increase measure reporting as much as measure-focused demonstration states. As other federal grant opportunities arise related to measurement or data systems, states might consider participating as a mechanism for capacity building.

National benchmarks could help states move from reporting the measures to actively using them to improve quality of care for children. A survey of state Medicaid agencies determined that one of states' highest priorities is having national benchmarks for the measures, a desire echoed by state staff interviewed for this analysis (deLone & Hess, 2011). However, the ability to create national benchmarks for the Child Core Set and compare measures across states could be compromised by variations in measure production approaches. Our analysis demonstrates that states produced the measures using different data systems and different methodologies, depending on technical and organizational inputs. For example, states can produce the immunization measures using Medicaid claims/encounter data, using an immunization registry, or using HEDIS hybrid methodology that includes medical chart review. Health plan-level research suggests that these variations are likely to affect comparability of the measures (Pawlson, Scholle, & Powers, 2007). Federal agencies should fund additional research to determine whether core measures produced via different methods are reliable, valid, and comparable across FFS and managed care delivery systems. Lack of comparability could, in turn, affect the ability to develop credible benchmarks and states' abilities to set quality improvement targets. Other states have described this tension between wanting measures that are flexible enough to accommodate differences across states but uniform enough be compared across states (Greene-McIntyre & Caldwell, 2011).

States and providers interested in pursuing quality improvement activities also might need federal guidance and technical assistance modifying the measures for provider-level reporting. Although state-level measures aid CMS in its mission, case study states and other demonstration states often wanted to produce the measures at the provider level to incorporate them into quality improvement initiatives, such as public reporting on provider quality and provider pay-for-performance programs (Anglin & Hossain, 2015; Ferry, Ireys, Foster, Devers, & Smith, 2013). CMS should provide standardized guidance on adapting the Child Core Set for provider-level reporting to increase uniformity while decreasing state-level burden.

Limitations

Specific case study findings might be unique to the selected states; however, the conceptual framework and lessons

Table 4 Actions states can consider to facilitate reporting of the Child Core Set

Action	Select examples from case study states
Data and technical factors	
Contact the CMS Technical Assistance and Analytic Support Program for clarifications about measure specifications	All four states contacted the program to request clarification about measure numerators and denominators, use of alternate data sources, and/or procedures for creating weighted averages across health plans
Conduct quality checks before reporting measures, particularly if using administrative data only	Illinois programmers conduct quality checks before moving the measures to testing by two separate individuals: one with a clinical background and the other with technical expertise. Also, its external quality review organization (EQRO) conducts annual data validation audits
	Pennsylvania's EQRO conducted quality checks on administrative measures produced at a health-plan level and on the weighted agency-level measures
Engage provider organizations to create buy-in and train providers on billing codes used in the measures	Maine developed a new billing code to enable reporting the developmental screening measures. The state piloted it among providers engaged in a CHIPRA learning collaborative before rolling it out statewide and training Medicaid providers
Add payer fields to state registries or link registry data to Medicaid enrollment files	Maine successfully linked Medicaid data to birth certificate data to report 3 perinatal measures. The state was unable to report immunization measures using its statewide immunization registry because it does not include detailed enough information on payers to identify continuously-enrolled children, and there were barriers to linking the immunization registry to Medicaid enrollment files
Invest in robust data warehouses	Illinois's Enterprise Data Warehouse matches Medicaid/CHIP data with data from multiple other sources (e.g., immunization records and vital statistics). That has been a major facilitator of the state's ability to report on the Child Core Set
	Oregon used enhanced Federal Medical Assistance Percentage (FMAP) matching funds available from CMS to upgrade its Medicaid Management Information System to allow the state to flexibly produce quality measures
Organizational factors	
Identify leaders in the Medicaid agency who will prioritize Child Core Set reporting	Oregon's in-house quality measurement expert ensured that the agency prioritized reporting on the Child Core Set and was able to troubleshoot technical issues
Allocate funding to IT/programming staff with expertise in quality measure reporting	Illinois used grant funds to hire a programmer who greatly improved the efficiency and sustainability of the state's systems for extracting data to report the Child Core Set
If the state agency lacks human resources with quality measurement training, contract with an external organization, such as a local university or an EQRO	Maine contracts with a local public university to produce quality measures from its Medicaid claims database. University staff have knowledge of the claims data and technical expertise with quality measure construction
	Pennsylvania's EQRO worked with health plan data and conducted quality checks to ensure that the administrative and hybrid measures were accurate
Coordinate with other state agencies/programs to align measures and data sources	Illinois convened a "Quality of Care Measures" committee to bring the state's measures into alignment with CMS's specifications and bring its various programs' measures into alignment with each other
	Maine engaged multiple state programs during the CHIPRA demonstration, which facilitated incorporation of Child Core Set measures in practice-level and provider-level programs, including a public reporting program, a pay-for-performance program, and provider-level reports from the state immunization registry

Table 4 continued

Action	Select examples from case study states
Modify Medicaid managed care contracts to enable reporting of the Child Core Set	Oregon's Medicaid managed care plans have long been required to submit complete and accurate encounter data. This enabled Oregon to generate administrative measures
	Pennsylvania's health plans were contractually obligated to report plan-level Child Core Set measures to the state agency
	In preparation for increased managed care penetration beginning in 2015, Illinois included encounter data reporting requirements in its managed care contracts
Behavioral factors	
Participate in federal grants or other capacity building initiatives to increase motivation to produce and report measures	Illinois grant staff described the CHIPRA grant as the "touchstone" around which they could focus attention on measure production, despite competing priorities in the Medicaid agency
Engage stakeholders to help generate demand for the measures and elevate reporting efforts on states' agendas	In Oregon, MCOs, policymakers, and the academic community expressed interest in the state's performance on the Child Core Set measures, which helped influence the state to prioritize generating and reporting on these measures

learned are likely to be transferrable to other states. Also, the analysis is retrospective, based primarily on extant data from interviews conducted for the evaluation; we have no data on inputs and contextual factors not covered in the initial interviews that could have influenced states' reporting capacity. We conducted supplemental interviews in 2015 to mitigate this limitation.

We cannot assume direct causal links between the CHIPRA Quality Demonstration Grant Program and improvements in measure reporting. Other ongoing federal and state health reform activities not addressed in this study are likely to affect states' measure reporting capacity.

Conclusions

States that used their CHIPRA Quality Demonstration grants to focus on the Child Core Set increased the number of measures they reported to CMS more than non-grantee states and states that used their grants for other purposes. Our analysis shows that if states invest in data quality and reporting systems over time; identify staff or contractors with quality measurement expertise; and make use of technical assistance, financial support, and other capacity building resources, they can overcome many of the challenges to reporting most of the Child Core Set measures.

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Compliance with Ethical Standards

Conflict of Interest No author has conflict of interest to disclose.

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