Using Medicaid and CHIP Claims Data to Support Pediatric Quality Measurement: Lessons From 3 Centers of Excellence in Measure Development

Courtney Gidengil, MD, MPH; Rita Mangione-Smith, MD, MPH; L. Charles Bailey, MD, PhD;
Mary Lawrence Cawthon, MD, MPH; Elizabeth A. McGlynn, PhD; Mari M. Nakamura, MD, MPH;
Jeffrey Schiff, MD, MBA; Mark A. Schuster, MD, PhD; Eric C. Schneider, MD, MSc

From the RAND Corporation, Boston, Mass (Drs Gidengil and Schneider); Division of Infectious Diseases, Boston Children's Hospital, Boston, Mass (Drs Gidengil and Nakamura); Harvard Medical School, Boston, Mass (Drs Gidengil, Nakamura, Schuster, and Schneider); Department of Pediatrics, University of Washington/Seattle Children's Hospital, Seattle, Wash (Dr Mangione-Smith); Seattle Children's Research Institute, Seattle, Wash (Dr Mangione-Smith); Children's Hospital of Philadelphia, Philadelphia, Pa (Dr Bailey); Research and Data Analysis Division, Washington Department of Social and Health Services, Olympia, Wash (Dr Cawthon); Kaiser Permanente Center for Effectiveness and Safety Research, Pasadena, Calif (Dr McGlynn); Division of General Pediatrics, Boston Children's Hospital, Boston, Mass (Drs Nakamura and Schuster); Office of the Medicaid Medical Director, Minnesota Department of Human Services, St Paul, Minn (Dr Schiff); and Division of General Internal Medicine, Department of Medicine, Brigham and Women's Hospital, Boston, Mass (Dr Schneider)

ABSTRACT

OBJECTIVE: We sought to explore the claims data-related issues relevant to quality measure development for Medicaid and the Children's Health Insurance Program (CHIP), illustrating the challenges encountered and solutions developed around 3 distinct performance measure topics: care coordination for children with complex needs, quality of care for high-prevalence conditions, and hospital readmissions.

METHODS: Each of 3 centers of excellence presents an example that illustrates the challenges of using claims data for quality measurement.

RESULTS: Our Centers of Excellence in pediatric quality measurement used innovative methods to develop algorithms that use Medicaid claims data to identify children with complex needs; overcome some shortcomings of existing data for measuring quality of care for common conditions such as otitis media; and identify readmissions after hospitalizations for lower respiratory infections.

CONCLUSIONS: Our experience constructing quality measure specifications using claims data suggests that it will be challenging to measure key quality of care constructs for Medicaid-insured children at a national level in a timely and consistent way. Without better data to underpin pediatric quality measurement, Medicaid and CHIP will have difficulty using some existing measures for accountability, value-based purchasing, and quality improvement both across states and within states.

KEYWORDS: CHIP; Medicaid; quality measurement; value-based purchasing

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MEDICAID AND THE Children's Health Insurance Program (CHIP), funded jointly by states and the federal government, provide health care coverage to 43 million children in the United States.[1] Quality measurement strategies, mandated by the Affordable Care Act to support value-based purchasing, pay for performance, and public reporting, are meant to drive improvements in care for a significant proportion of the nation's children. To meet the need for pediatric performance measures, the Centers for Medicare and Medicaid Services (CMS) and the Agency for Healthcare Research and Quality (AHRQ) jointly funded 7 centers of excellence (COEs) on Quality of Care Measures for Children to develop new quality measures and/or enhance existing measures.

Although the impetus to create new quality measures offers promising opportunities, measure developers face several challenges. These include reliance on claims data to measure quality and limited standardization of Medicaid claims data because of the diversity of state Medicaid programs. While some of these data-related challenges are generic to all quality measurement efforts, others are unique to Medicaid and CHIP.

Here we explore the claims data-related issues relevant to measure development for Medicaid and CHIP, illustrating the challenges encountered and solutions developed by 3 COEs that were assigned distinct performance measure topics: care coordination for children with complex needs, quality of care for high-prevalence conditions, and hospital readmissions. We first discuss the use of Medicaid and CHIP claims data in quality measurement and then describe state-level variations in those data. We present an example for each topic that illustrates the challenges of using claims

data for quality measurement. We close by recommending changes to data management to enhance the feasibility of future measure development.

USE OF MEDICAID CLAIMS DATA TO SUPPORT QUALITY MEASUREMENT

The availability of data to support quality measures is a key challenge (Table). Historically, Medicaid quality measurement has relied on state agency health plan claims data, as these tend to be relatively inexpensive to obtain and analyze. For example, as part of mandatory annual reporting on Early Periodic Screening, Diagnosis, and Treatment delivery, state Medicaid programs already use their claims data to report the percentage of children who receive medical and dental screening and are referred for diagnostic or treatment services.[2]

The use of Medicaid data becomes more challenging when applied to care constructs with higher complexity. The COEs were assigned measurement topics in several high priority measurement areas, including mental health identified by a gap analysis of Medicaid quality measurement.[3] These topics include children with complex needs, neonatal care, emergency department (ED) use for asthma, and hospital readmissions. However, in trying to develop and test these measures in the context of children enrolled in Medicaid, the use of currently available data proved to be challenging.

VARIATION IN QUALITY MEASUREMENT ACROSS STATES

Even when measures can be specified using Medicaid or CHIP claims data, state-to-state comparisons can be problematic. Medicare claims serve as a national administrative database for quality measurement for Medicare beneficiaries, but no analogous national database exists for Medicaid-insured children. Although Medicaid data are compiled into Medicaid Analytic eXtract (MAX) files for research, MAX nevertheless consists of separate state-specific data sets. The populations of children represented by these data sets vary on the basis of differing state eligibility policies.[4] The Supreme Court decision to uphold the Affordable Care Act affirmed states' discretion in implementing Medicaid, suggesting that these programs will become more rather than less diverse over time. In addition, MAX data availability lags by about 3 years, preventing timely assessment of quality.[4]

Specifications for new measures could drive some degree of standardization across state programs despite the diversity of state policies. Such a set of standardized quality measures common to all states would be ideal for several reasons. State-to-state comparisons, though not yet required at the federal level, can only be implemented fairly if similar methods are used by states to implement quality measurement. Centralized development and testing of measures is also a more efficient use of resources than requiring each state to develop its own set of quality measures. Such centralized measure development is considerably easier if uniform data are available across states.

Table. Definitions of Claims and Commercial Data

Data	Description
Claims	Billing codes that physicians, pharmacies, hospitals, and other health care providers submit to payers (eg, commercial insurance companies, Medicare, Medicaid).
Clinical	Data from patients' medical records, which can either be from a paper medical record or an electronic health record.

ADVANCING PERFORMANCE MEASUREMENT IN MEDICAID: 3 ILLUSTRATIVE EXAMPLES

CARE COORDINATION FOR CHILDREN WITH COMPLEX NEEDS

The COE on Quality of Care Measures for Children with Complex Needs was tasked with developing measures related to care coordination for children with complex chronic health conditions. Such children comprise a small proportion of the pediatric population, but experience high rates of health care utilization, particularly emergency department use, hospitalization, and intensive care unit admission.[5–7] This section describes the development of an algorithm to identify children with complex needs, focusing on the challenges encountered with using Medicaid claims data for this purpose.

In measuring care coordination for children with complex needs, a central challenge was to efficiently identify this population using Medicaid claims data.[8] In partnership with the Washington State Medicaid program, an algorithm was developed that could be useful to stakeholders at multiple levels, including health care systems, states, and health insurance plans. To minimize data costs and ensure that the algorithm can be applied consistently across different settings, *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9-CM) codes that are available in claims data were used as the basis for the algorithm. Using Medicaid claims which were then validated against medical records data from Seattle Children's Hospital, children were categorized as having 1 of 3 levels of medical complexity: complex chronic disease, noncomplex chronic disease, and no chronic disease. The algorithm was most sensitive in identifying children with complex chronic disease and least sensitive in identifying those with noncomplex chronic disease.[8]

The algorithm's lower sensitivity for correctly identifying children with noncomplex chronic disease reflects some of the data-related challenges of relying on claims data (whether Medicaid or other, such as commercial). Children who do not interact with the health care system or whose encounters do not result in claims (eg, those in managed care) do not have data to be captured by the algorithm. Furthermore, common conditions, such as developmental and mental health conditions, are underrepresented in claims data.[9] Finally, because capitated managed care plans typically are not required to include diagnostic information associated with encounters, the diagnoses needed to implement this algorithm may be lacking. Despite these limitations, the classification algorithm functioned well to identify our population of interest and may be useful to

decision-makers to segment their population and allocate resources to children with the greatest needs.

Although Medicaid claims data proved effective for identifying children with complex chronic disease, such data were insufficient for measuring care coordination. On the basis of a conceptual framework (Figure), literature review, and a Delphi panel process, the center identified 31 potential measures for development, such as "Caregivers of children with complex needs should report that their child has a designated care coordinator" and "Caregivers of children with complex needs should report having been invited to join in hospital rounds during their child's last hospitalization." However, the key care coordination concepts captured by these measures (having a care coordinator, being invited to join in hospital rounds) cannot be measured with claims data. Of the 31 measures developed by the center, only 1 uses Medicaid claims data for purposes beyond the algorithm described above. Thus, Medicaid claims data alone were inadequate to measure the quality of care coordination in this population of children with complex needs.

QUALITY OF CARE FOR HIGH-PREVALENCE CONDITIONS AMONG CHILDREN

The COE led by the Children's Hospital of Philadelphia has been exploring quality measurement for common pediatric problems, including asthma and otitis media, for which quality improvement has a significant impact at the population level.[10–12] The use of claims data for measuring quality of care for otitis media with effusion (OME) is described, along with the benefits and drawbacks of using claims data compared to clinical data.

Claims data, whether Medicaid or commercial, provide the advantage of broad-based capture of clinical utilization, but the low acuity of asthma and otitis media means that despite the high prevalence of these conditions, their footprint in claims data diverges from clinical reality. Given that these data are intended for obtaining reimbursement rather than documenting clinical reasoning,[13] claims data may have low sensitivity when appropriate care does not involve discrete billed actions. For instance, one currently available measure for OME assesses quality of care through the avoidance of antibiotic prescribing.[14] Claims data link specific diagnoses to prescriptions, and this information can be used to assess whether diagnoses other than OME could plausibly be the reason for an antibiotic prescription. However, because diagnoses are not required to support a claim for an outpatient visit, limited diagnoses may be included on a claim and may be skewed toward better-reimbursed codes. With Medicaid claims, for example, only 3 outpatient diagnosis codes are listed in MAX data.[4]

Compared with claims data, clinical records typically contain more information about concurrent problems and clinical reasoning that are important for avoidance measures. In reviewing clinical record, a substantial number of visits

Figure. *Conceptual framework for care coordination for children with complex needs.*

with diagnoses of otitis that included normal ear examinations were identified, thus casting doubt on the validity of the claims data. However, the increased granularity of the data comes at a price. Critical information may be embedded in free text rather than structured fields, requiring manual abstraction or text mining. This is particularly true of clinical findings, cognitive rather than procedural care, and interpretation of data. Although use of information from clinical records can result in a more accurate measure than from claims data, the complexity of the resulting measure specification may limit the feasibility of implementation.

Even if information is captured discretely and accurately, lack of standardization across clinical records means that data elements may differ across institutions. Furthermore, exchange of information across institutions is limited. This may cause a particularly negative bias for a measure that places weight on rarer events, such as ED visits or oral steroid use for asthma exacerbation, by undercounting adverse events that occur at a different institution. Ideally, measures combining claims and clinical data would benefit from the scope of the former and the detail of the latter. In practice, direct linkage of patient records across data sets may be impossible as a result of lack of shared patient or practice identifiers. The most feasible approach may be probabilistic matching based on demographic or similar characteristics or parallel evaluation of a particular population (eg, children with asthma).

PEDIATRIC READMISSIONS

The COE for Pediatric Quality Measurement was asked to develop pediatric readmission measures. Readmissions disrupt the lives of patients and families and are costly.[15–18] CMS publicly reports readmission rates for Medicare-insured adults and reduces payments to hospitals with excess readmissions for certain conditions. Some state Medicaid programs are working to benchmark state-level readmission rates and reduce readmissions.[19,20] However, most readmission measures have been developed for use only in adults.

The center developed 2 readmission measures: one to evaluate readmissions after hospitalization for almost all pediatric conditions, the other after hospitalization for lower respiratory infections (LRIs) (bronchiolitis, influenza, or community-acquired pneumonia). The measures are specified to rely solely on inpatient Medicaid claims data because these data are readily available. Using the LRI measure as an example, the shortcomings of Medicaid claims data for evaluating readmissions are described below.

Because coding is driven by payment rules rather quality improvement, and coding practices vary across institutions and states, claims data in general often lack clinical details needed to provide an accurate picture of LRI hospitalizations.[13] This precludes full case-mix adjustment for disease severity, as diagnosis codes used for a mild LRI could be identical to those for a severe LRI. Case ascertainment could also be influenced by coding inconsistencies. For example, the LRI case definition includes hospitalizations with a primary diagnosis of asthma and a secondary diagnosis of an LRI because many children are admitted with both conditions. However, if secondary codes are not reliably included, LRI cases could be missed. In addition, although the measure uses an algorithm to exclude readmissions for planned procedures based on primary procedure codes, accurately distinguishing planned from unplanned readmissions using any claims data remains a challenge.

Another challenge specific to Medicaid claims data that became apparent during development of the LRI measure was related to hospital identifiers. Because Medicaid is administered as 51 different state programs, each program until recently used its own system of identifiers for individual and organizational providers. Some states changed their provider identifier systems over time, and provider identifiers were not unique across states.[21] Assessing readmissions, however, requires consistent and unique hospital identifiers (including across states) in order to associate a series of hospitalizations with a particular hospital. This problem is improving as state-specific identifier systems are replaced with National Provider Identifiers.[21] Still, as of 2008 (the latest year of MAX data available when the measure was developed), several states' hospital identifiers were too incomplete or unreliable to permit readmission analyses.

The lack of a national Medicaid database also presents challenges for efforts to compare LRI readmissions performance among states. To allow fair comparisons, outcomes must be case-mix adjusted at the level at which comparisons are made (eg, national or state). LRI readmission rates calculated and standardized using data from one state cannot be compared to those using data from another state because patient populations may differ across states. Without a unified data set, an individual Medicaid program can calculate, case-mix adjust, and compare LRI readmission rates within its own state but cannot perform valid comparisons with other states.

CONCLUSION AND RECOMMENDATIONS

Our COEs in pediatric quality measurement used innovative methods to overcome shortcomings of existing data, to develop algorithms that use Medicaid claims data to identify children with complex needs, and to identify readmissions for lower respiratory infections. However, our experience constructing these specifications using currently available data suggests that it will be challenging to measure key quality of care constructs for Medicaid-insured children at a national level in a consistent and timely way. Without better data to underpin pediatric quality measurement, Medicaid and CHIP will have difficulty using some existing measures for accountability, value-based purchasing, and quality improvement both across states and also within states.

Below we highlight recommendations derived from our experience.

SELECT AND STANDARDIZE CORE DATA STANDARDS RELEVANT TO QUALITY MEASUREMENT

Creating national data standards that state Medicaid agencies can implement as a core set of data elements would facilitate state-to-state comparisons, health plan comparisons within states, and regional quality improvement programs. Because states report claims data on a quarterly

basis to CMS, which creates the MAX data files, CMS is well positioned to convene a working group of state officials to select and standardize core data elements that would support an expansion of quality measurement capabilities. Evolving standards for exchange of electronic clinical data, driven by programs such as health IT policy and standards committees convened by the Office of the National Coordinator for Health IT and CMS's Meaningful Use incentive program, provide a starting point for developing quality-oriented data standards within Medicaid.

CREATE A PROCESS FOR IMPLEMENTING CORE DATA STANDARDS

Because retooling of state Medicaid agency data systems will take several years, an interim approach to implementing data standards would be to create data dictionaries that enable the mapping of heterogeneous source data onto common variable definitions. Several states already pursue such a strategy to enable linkages across their various state agency databases. In the long term, supporting more effective quality measurement will require the convening of electronic health record (EHR) vendors, clinicians, payer representatives, and experts in data and quality measurement to implement core data standards.

In order to be useful for quality measurement, EHRs need to contain the information of interest in discrete form and using shared terminologies. Natural language processing may help to identify terms of interest but must be applicable across multiple EHR platforms and different health care systems.

CREATE A STANDARD REFERENCE MEDICAID POPULATION FOR COMPARISON ACROSS STATES

Because the federal Medicaid regulations give so much discretion to states regarding eligibility criteria and other standards, states enroll very different populations, reducing the validity of state-to-state comparisons. One option to address the state-to-state heterogeneity of beneficiary populations would be to define a standard "reference" Medicaid population specification that samples individuals with similar characteristics across states. This standard reference population would enable development and testing of quality measures and make for more accurate state-to-state comparisons. CMS is in the best position to coordinate this activity given its ownership of the MAX data and traditional coordinating role in state Medicaid programs. If needed, multiple reference populations—perhaps organized by clusters of similar Medicaid programs—could also be created. This would naturally extend the algorithm created by the Center of Excellence for Children with Complex Needs that has used Medicaid claims data from 2 states to create comparable populations of children stratified by medical complexity.

SUPPORT A QUALITY MEASUREMENT COLLABORATIVE FOR STATES TO SHARE INNOVATIVE PRACTICES, MEASURES, AND STANDARDS IN QUALITY MEASUREMENT

The current heterogeneity of programs and resulting difficulty in comparing data is only likely to be exacerbated by Medicaid expansion—or the lack thereof—in different states. A collaborative of state programs that includes states with and without well-developed quality measurement programs would allow effective exchange of ideas and best practices and narrow the set of quality measures for prioritization each year. The National Quality Form might be an excellent convener in this context. A collaborative of this type would require funding support, and evaluation of its effectiveness (particularly improvement among states with less well-developed programs and improvement in ability to share comparable data across states) would be important. Although the heterogeneity of state programs makes national comparisons challenging, it does not preclude value-based purchasing or public reporting at the state level.

Medicaid and CHIP have the opportunity to enhance the health of our nation's children through value-based purchasing, quality improvement initiatives, and use of sound quality measures for accountability applications. However, quality measurement efforts must be supported by data that are complete and consistent within a state and, ideally, across states. Efforts to standardize data and make data more available at the state and national levels will help Medicaid and CHIP programs to promote high-quality care for children.

REFERENCES

1. Medicaid. Children. Available at: http://www.medicaid.gov/Medicaid-CHIP-Program-Information/By-Topics/Benefit. Accessed July 15, 2014.
2. Medicaid. Early and Periodic Screening, Diagnostic, and Treatment. Available at: http://www.medicaid.gov/Medicaid-CHIP-Program-Information/By-Topics/Benefits/Early-Periodic-Screening-Diagnosis-and-Treatment.html. Accessed July 15, 2014.
3. Mangione-Smith R, Schiff J, Dougherty D. Identifying children's health care quality measures for Medicaid and CHIP: an evidence-informed, publicly transparent expert process. *Acad Pediatr*. 2011;11:S11–S21.
4. Medicaid Analytic eXtract (MAX) general information. Available at: http://www.cms.gov/Research-Statistics-Data-and-Systems/Computer-Data-and-Systems/MedicaidDataSourcesGenInfo/MAXGeneralInformation.html. Accessed July 15, 2014.
5. O'Mahony L, O'Mahony DS, Simon TD, et al. Medical complexity and pediatric emergency department and inpatient utilization. *Pediatrics*. 2013;131:e559–e565.
6. Simon TD, Berry J, Feudtner C, et al. Children with complex chronic conditions in inpatient hospital settings in the United States. *Pediatrics*. 2010;126:647–655.
7. Berry JG, Hall DE, Kuo DZ, et al. Hospital utilization and characteristics of patients experiencing recurrent readmissions within children's hospitals. *JAMA*. 2011;305:682–690.
8. Simon TD, Cawthon ML, Stanford S, et al. Pediatric medical complexity algorithm: a new method to stratify children by medical complexity. *Pediatrics*. 2014;133:e1647–e1654.
9. Zima BT, Murphy JM, Scholle SH, et al. National quality measures for child mental health care: background, progress, and next steps. *Pediatrics*. 2013;131(suppl 1):S38–S49.

10. Hing E, Cherry DK, Woodwell DA. National Ambulatory Medical Care Survey: 2004 summary. *Adv Data*. 2006;133:1–33.

11. Finkelstein JA, Metlay JP, Davis RL, et al. Antimicrobial use in defined populations of infants and young children. *Arch Pediatr Adolesc Med*. 2000;154:395–400.

12. To T, Dell S, Dick P, Cicutto L. The burden of illness experienced by young children associated with asthma: a population-based cohort study. *J Asthma*. 2008;45:45–49.

13. Strengths and limitations of CMS administrative data in research. Available at: http://www.resdac.org/resconnect/articles/156. Accessed July 15, 2014.

14. Otitis media with effusion (OME): percentage of patients aged 2 months through 12 years with a diagnosis of OME who were not prescribed systemic antimicrobials. Available at: http://www.qualitymeasures. ahrq.gov/content.aspx?id=28018. Accessed July 15, 2014.

15. Institute of Medicine; Committee on Quality of Health Care in America. *To Err Is Human: Building a Safer Health System*. Washington, DC: National Academies Press; 2000.

16. Institute of Medicine; Committee on Identifying Preventing Medication Errors. *Preventing Medication Errors*. Washington, DC: National Academies Press; 2006.

17. Shudy M, de Almeida ML, Ly S, et al. Impact of pediatric critical illness and injury on families: a systematic literature review. *Pediatrics*. 2006;118(suppl 3):S203–S218.

18. Friedman B, Basu J. The rate and cost of hospital readmissions for preventable conditions. *Med Care Res Rev*. 2004;61:225–240.

19. Agency for Healthcare Research and Quality. Medicaid medical directors learning network. Available at: http://www.ahrq.gov/policymakers/ measurement/quality-by-state/mmdln.html. Accessed July 15, 2014.

20. MassHealth Quality Exchange (MassQEX). Available at: http://massqex. ehs.state.ma.us/massqex/index/hqi. Accessed July 15, 2014.

21. Bencio D. Medicaid analytic extract provider characteristics (MAXPC) evaluation report, 2010. Final report: Mathematica Policy Research. Available at: http://EconPapers.repec.org/RePEc:mpr: mprres:7875. Accessed July 15, 2014.