



Evaluating the Use of New York State Medicaid Data to Assess Medication Adherence for Hypertension

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List of Acronyms

ACE:	Angiotensin Converting Enzyme Inhibitors
AHM:	Anti-Hypertensive Medications
ARB:	Angiotensin Receptor Blockers
ASTHO:	Association of State and Territorial Health Officials
BCDER:	Bureau of Chronic Disease Evaluation and Research
CDC:	Centers for Disease Control and Prevention
CMS:	Center for Medicare and Medicaid Services
DCDP:	Division of Chronic Disease Prevention
EHR:	Electronic Health Record
ESRD:	End-Stage Renal Disease
FQHC:	Federally Qualified Health Center
HCNNY:	Health Center Network of New York
HTN:	Hypertension
IPRO:	New York State's Quality Improvement Organization
JNC:	Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure
MFI:	Model for Improvement
MMCP:	Medicaid Managed Care Plan
MPR:	Medication Possession Ratio
NDC:	National Drug Classification
NPI:	National Provider Identification Number
NQF:	National Quality Forum
NYC:	New York City
NYSDOH:	New York State Department of Health
OHIP:	Office of Health Insurance Programs
OQPS:	Office of Quality and Patient Safety
PDC:	Proportion of Days Covered
PDSA:	Plan, Do, Study, Act
PMN:	Primary Medication Non-Adherence
PQA:	Pharmacy Quality Alliance
QI:	Quality Improvement
QIO:	Quality Improvement Organization
RAS:	Renin-Angiotensin System
RHIO:	Regional Health Information Organization
US:	United States
VDH:	Vermont Department of Health

Measure Definitions:

Proportion of Days Covered: The percentage of adult patients with hypertension with two or more Medicaid pharmacy claims for an anti-hypertensive medication (AHM) who had $\geq 80\%$ of the days covered for at least one AHM class from the initial fill date to the end of the covered period.

Primary Medication Non-Adherence Measure: The percentage of adult patients with hypertension who were prescribed an AHM and did not have a Medicaid pharmacy claim for that drug.

Executive Summary

In 2014, the New York State Department of Health (NYSDOH) received a seven-month grant from the Association of State and Territorial Health Officials (ASTHO) to examine adherence to anti-hypertensive medications (AHMs). The goal of this pilot project was to provide feedback to clinicians about adherence to AHMs among the members of their patient populations diagnosed with hypertension and enrolled in the Medicaid program. To achieve this goal, NYSDOH partnered with IPRO (formerly Island Peer Review Organization), the state's External Quality Review Organization, and Health Center Network of New York, a health center network that consists of nine Federally Qualified Health Centers (FQHCs) and the Community Health Care Association of New York State.

In the pilot project, AHM adherence was examined using two measures: Proportion of Days Covered (PDC) and Primary Medication Non-Adherence (PMN). This report summarizes the results of an evaluation performed on the AHM pilot project using project documentation. It also advises on whether the medication adherence work should be continued as part of public health efforts to promote high blood pressure control in New York State (NYS) and provides recommendations for the target audience for this report: external agencies involved in medication adherence calculations, including state health departments and Medicaid programs, the Centers for Disease Control and Prevention (CDC), and FQHCs.

The key findings and recommendations from the pilot project evaluation are listed below:

- A diverse project team is necessary to carry out evaluations of medication adherence using Medicaid data.
- It is necessary to develop a complete list of medications used to treat hypertension during the measurement period to carry out PMN and PDC measure calculations.
- The PDC measure is useful for statewide surveillance purposes (i.e. track adherence over time for the entire state and various subsets of the population and identify factors associated with medication adherence).
- The PDC measure does not provide actionable data that can be used by FQHCs due to the lag time for receiving claims data.
- The PMN measure is not feasible unless an interoperable system for prescribing and dispensing information exists within the state.

Intended Use and Users

This report evaluates the pilot medication adherence project completed by the NYSDOH and project partners in the latter part of 2014. The goal of the report is to communicate the work that was accomplished through the pilot project and advise on whether the medication adherence work should be continued as part of public health efforts to promote high blood pressure control in NYS. The intended audience for this report is ASTHO (the project's funder), the CDC, decision makers in the NYSDOH, and state health departments and Medicaid programs.

Program Description

Background

In 2012, there were 117 million noninstitutionalized adults living with at least one chronic condition in the United States (US), and this number is projected to reach 157 million by 2020.^{1,2} Medication is a key component of the treatment for these chronic conditions.³ Unfortunately, 20-30% of the medication prescriptions are never filled. When the prescriptions are filled, the medication is not taken as prescribed; patients are not adherent 50% of the time.^{4,5}

Medication adherence is “the extent to which patients take medications as prescribed by their health care providers.”⁶ More specifically, it refers to whether or not the patient follows the provider’s recommendation with respect to the timing, dosage, and frequency with which the medication is taken.⁷ For those living with chronic disease, non-adherence to the medication regimen outlined by the physician is associated with higher costs of care and adverse outcomes such as increased risk of morbidity and mortality.⁸ With chronic diseases responsible for over 75% of health care costs in the U.S. and non-adherence to medication regimens resulting in increased costs of care, medication adherence is of concern to health systems and health system partners including providers, insurance plans, employers, patients, and health departments.^{9,3}

One example of a chronic disease associated with high health care costs is cardiovascular disease. In 2010, costs associated with cardiovascular disease reached \$444 billion nationally. Cardiovascular disease accounted for \$1 of every \$6 spent on health care in the U.S.¹⁰ One reason for these high costs is patients with cardiovascular disease are often not adherent to medications, resulting in adverse outcomes.⁸ Proper adherence to medications that treat risk factors associated with cardiovascular disease can result in significant cost savings. For example, Roebuck, et al. found that medication adherence in patients with hypertension resulted in an overall savings of \$3,908 per patient in total health care spending due to fewer inpatient hospital days per year for those adherent to their medication regimen. This is a benefit-cost ratio of 10.1:1.³

Project

In 2014, the NYSDOH received a seven-month grant continuation from ASTHO to carry out a pilot project to examine adherence to AHMs. The pilot project’s innovative strategy was to integrate information on medication adherence from Medicaid claims and encounters into quality improvement (QI) initiatives to improve blood pressure control among New Yorkers, specifically around patients diagnosed with hypertension at three FQHCs. The evidence base for this strategy included a paper published in the peer-reviewed literature by Kyanko, et al. examining medication adherence for New York City residents using Medicaid claims data.¹¹

The Model for Improvement (MFI) (see Attachment A) was the method used to test if a state health department can use Medicaid data to provide practice and clinician specific information about the rates of AHM adherence.¹² The project partners consisted of individuals from multiple organizations. The project team and their roles in the AHM pilot project are described below. In

addition to the project team, other stakeholders (such as the CDC and ASTHO) contributed to the project.

Project Team and Roles

IPRO

IPRO is NYS's External Quality Review Organization. Those individuals from IPRO on the project team included pharmaceutical and medical subject matter experts and SAS programmers. IPRO developed a comprehensive list of AHMs, participated in the development of the adherence measure definitions and technical specifications, and programmed the adherence measures.

Health Center Network of New York (HCNNY)

HCNNY is a health center controlled network that consists of nine FQHCs and the Community Health Care Association of New York State. Those individuals from HCNNY on the project team included a health information technology and electronic health record (EHR) expert, a QI expert, and an EHR data analyst. HCNNY participated in the development of the adherence measure definitions and technical specifications, submitted aggregated EHR data to the NYSDOH, and provided clinical support to the three member FQHCs that participated in the project. The FQHC team members consisted of care providers and either a quality improvement or project leader. The FQHCs provided clinical expertise and also mapped AHMs in their EHRs to enable the HCNNY data analyst to provide data to the NYSDOH.

NYSDOH

The NYSDOH team consisted of members from the Division of Chronic Disease Prevention (DCDP) and the Office of Quality and Patient Safety (OQPS). The DCDP team members included subject matter experts in chronic disease surveillance, a person with experience in cardiac nursing, and experts in projects such as the AHM pilot project. The DCDP team participated in the development of the adherence measure definitions and technical specifications and was responsible for project oversight. The OQPS team members consisted of a QI measure and Medicaid data expert and a data analyst. The OQPS team participated in the development of the adherence measure definitions and technical specifications and was responsible for calculating the adherence rates at an FQHC and statewide level.

The primary goal of the AHM pilot project was to provide feedback to clinicians about the adherence to AHM regimens among the members of their patient populations diagnosed with hypertension and enrolled in the Medicaid program. To achieve this goal, the project deliverables included measure definitions and technical specifications for a Primary Medication Non-Adherence measure and a Proportion of Days Covered medication adherence measure; SAS code to calculate the two measures using Medicaid data; and AHM adherence rates at statewide, practice, and provider levels.

Evaluation Design

The medication adherence pilot project was evaluated to determine whether the project should be continued as part of public health efforts in NYS to promote high blood pressure control. The evaluation investigated whether the change outlined in the MFI was an improvement, if the measures could be adopted as a routine information source for clinicians to use to assess medication adherence among Medicaid enrollees, and if the medication adherence measures in the pilot project could be used for quality improvement initiatives at the FQHCs. The evaluation questions focused on three areas: measure development; calculation and interpretation of the

AHM adherence metrics; and dissemination, use and sustainability. This document summarizes the results of the evaluation.

Data Sources and Methods

The data source for this evaluation was the medication adherence project documentation including meeting notes, project documents such as the measure specifications, and project deliverables. An analysis of the documentation was carried out to answer the evaluation questions. The project documents, and the meeting notes in particular, recorded the thoughts and actions of the project team; therefore, the project documentation was a credible data source to use for the project evaluation.

The meeting notes archived the medication adherence project meetings that were held with personnel from DCDP, OQPS, HCNNY, and IPRO from June 2014 through October 2014. The purpose of these meetings was to help reach consensus on measurement definitions and technical specifications and address any outstanding issues related to the medication adherence project. DCDP personnel distributed meeting notes after each meeting, and these notes were updated throughout the remainder of the month to include up-to-date information about any action items assigned to members of the project team. The meeting notes, measure specifications, and any documents containing project outputs were reviewed to determine if milestones were met, project deliverables were delivered, and for additional evidence to support the project evaluation.

Results, Conclusions, and Interpretation

Development of Measures

A primary component of the AHM pilot project evaluation sought to answer questions about the success of the project team in developing adherence measure definitions and technical specifications. Key questions included:

- Was consensus reached on measurement definitions and technical specifications for hypertension medication adherence metrics?
- What modifications to existing specifications were required?
- What major challenges did the project team confront? How were those challenges resolved?

As mentioned in the program description section of this document, the innovative strategy tested in the pilot project was the use of Medicaid data, including prescription claims data, to determine AHM adherence for the population of interest. Three measures of medication adherence that can be calculated using prescription claims data include: (1) Primary Medication Non-Adherence (PMN), (2) the Proportion of Days Covered (PDC), and (3) the Medication Possession Ratio (MPR). The first two measures were selected for the AHM adherence project.

The PMN measure was selected because it was requested by the participating FQHCs and was a primary measure of adherence in that it reflected those individuals with hypertension who were given a prescription and never had the prescription filled. The measure also was endorsed by the Pharmacy Quality Alliance (PQA).¹³ The PDC, a secondary measure of adherence, was selected because of its endorsements by the PQA, the National Quality Forum (NQF), and use in the Center for Medicare and Medicaid Services' (CMS's) Medicare Quality and Performance Ratings.^{13,14,15} The PDC measure was also selected because it was in the data measurement plan for the CDC's State Public Health Actions to Prevent and Control Diabetes, Heart Disease, Obesity and Associated Risk Factors and Promote School Health (1305) Grant.

While the PMN and PDC measures were not common performance measures used in public health, they were well-specified because of their endorsements by quality organizations such as the PQA and NQF. As a result, the project team was able to modify existing definitions and technical specifications for use in the project. The AHM adherence project team began with the PQA's Primary Medication Non-Adherence measure specification and the CDC's operationalized PDC performance measure, i.e. the "performance measure profile" distributed to those states required to report medication adherence rates for the CDC State Public Health Actions (1305) grant. The operationalized performance measure included a description of the purpose of the PDC measure, recommended data sources, term definitions, and information about how to calculate the measure based on the CDC's requirements. Monthly meetings were held to make the necessary modifications to the measurement definitions and technical specifications for the two measures and to reach a team consensus on the final AHM adherence measures.

PMN Measure

The major change made to PQA's PMN measure was the decision to include any person diagnosed with hypertension and not just those individuals who were newly diagnosed. This change was made by adopting part of the denominator specification from NQF-18, the National Quality Forum's measure that determines the percentage of patients diagnosed with hypertension who have their blood pressure under control. More specifically, the PMN measure specifications were updated so that the denominator included individuals between 18 and 85 years of age who were diagnosed with hypertension. The denominator of the NQF-18 measure restricted the diagnosis to the first six months of the measurement year. The project team did not include this restriction because the FQHCs indicated that they were interested in anyone diagnosed with hypertension during the measurement year. Any individuals who were pregnant or diagnosed with end-stage renal disease (ESRD) in the measurement year were excluded from the calculation. Individuals with dual enrollments in Medicaid and Medicare were also excluded from the calculation because there was no guarantee that the Medicaid database contained a complete set of claims for these patients. The unit of analysis for the final PMN measure was adult patients aged 18 to 85 with high blood pressure who were prescribed an AHM and did not have a claim for that medication. The PMN measure definition and specifications (see Attachment B), which were finalized in August 2014, are summarized below.

PMN Measure Description: The percentage of Medicaid recipients aged 18 to 85 who were diagnosed with hypertension and prescribed an AHM during the measurement period who did not have a Medicaid claim for that drug.

PMN Measure Denominator: The number of Medicaid recipients aged 18 to 85 who were diagnosed with hypertension (based on diagnosis codes for outpatient visits during the measurement year) and were prescribed an AHM during the measurement year.

PMN Measure Numerator: The number of Medicaid recipients in the denominator who did not have a Medicaid claim for payment for the specific AHM that the recipient was prescribed.

PMN Measure Excluded Cases: Medicaid recipients diagnosed with end-stage renal disease or pregnancy during the measurement year were excluded from the calculation. In addition, those recipients with dual enrollments in Medicaid and Medicare were excluded from the calculation.

PDC Measure

No major changes were made to the PDC measure other than rearranging the operationalized performance measure and clarifying technical details to create the technical specifications for the measure. The project team decided to adopt part of the denominator specification from NQF-18 to be consistent with previous work in this area and to be consistent with the PMN measure. As with the PMN measure, the denominator specification was updated to include individuals between 18 and 85 years of age who were diagnosed with hypertension at any point in the measurement year. Any individuals who were pregnant or diagnosed with ESRD in the measurement year were excluded from the calculation, as were those individuals with dual enrollments in Medicaid and Medicare. Adjustments were also made for in-hospital admissions or stays within long-term care facilities. The specifications were modified to remove any non-acute inpatient stays because the patient may have received medications from the inpatient facility and these days should not count against the patient for the medication adherence measure.

The unit of analysis for the final PDC measure was adult patients aged 18 to 85 with high blood pressure who had either the same AHM or AHMs in the same class filled on at least two separate occasions. The PDC calculation counted as adherent those individuals who had a supply of a single class of medication for 80% or more of the days between when they were first prescribed the AHM class and either the end of the measurement year or the end of Medicaid enrollment.

One technical issue that had to be addressed for the PDC measure was how to address gaps in coverage because an individual was considered continuously enrolled in Medicaid if he/she had 11 or 12 months of coverage in a given year. As a result, the measure specifications had to be modified to allow for up to a 30-day gap in coverage. For those individuals enrolled for 11 months out of the year, the 30-day gap in coverage was ignored in the PDC calculation. For those individuals enrolled for less than 11 months, those days in which the recipient was not covered by Medicaid were removed from the numerator and denominator in the PDC calculation. The final measure definition and specifications for the PDC (see Attachment C), which were agreed on in July 2014, are summarized below.

PDC Measure Description: The percentage of Medicaid recipients aged 18 to 85 who were diagnosed with hypertension and prescribed an AHM during the measurement period who had 80% or more of the days in the eligibility period covered by prescription claims for the same medication or another medication in the same AHM class.

PDC Measure Denominator: The number of Medicaid recipients aged 18 to 85 who were diagnosed with hypertension (based on diagnosis codes for outpatient visits during the measurement year) and were prescribed an AHM in the same AHM class on at least two unique dates of service during the measurement year.

PDC Measure Numerator: The number of Medicaid recipients in the denominator who met or exceeded the PDC threshold (80%) for adequate AHM adherence.

PDC Measure Excluded Cases: Medicaid recipients diagnosed with end-stage renal disease or pregnancy during the measurement year were excluded from the calculation. In addition, those recipients with dual enrollments in Medicaid and Medicare were excluded from the calculation.

Major Challenges

In addition to reaching consensus on the measure definitions and technical specifications, the project team had to address two technical issues before the measures could be programmed.

These two technical issues included the development of a process for attributing patients to FQHCs and a comprehensive AHM drug list.

Attribution

As stated above, the goal of the medication adherence project was to provide feedback to clinicians about the adherence to AHM regimens among the members of their patient population diagnosed with hypertension and enrolled in the Medicaid program. In order to achieve this goal, the project team had to develop a process to attribute patients to the participating health centers. HCNNY provided a list of national provider identification numbers (NPIs) for each FQHC and those providers working within each FQHC during the given measurement year. The clinic NPIs provided by HCNNY were linked with the provider NPI on the claim and encounter records in the Medicaid database to identify those patients who were diagnosed with hypertension at any of the participating FQHCs during the measurement year. Those patients who were seen at more than one of the participating health centers were attributed to the health center where the patient was last diagnosed with hypertension within the measurement year.

Drug List

In addition to developing a process for attributing patients to FQHCs, the project team had to develop a comprehensive list of AHMs in order to identify those patients who were diagnosed with hypertension who were prescribed and dispensed AHMs. Developing a complete list of medications that were used to treat hypertension during the measurement period was the most time-consuming and resource intensive technical issue that arose during the project. This list was required in order to identify the pharmacy claims records associated with AHMs for those patients diagnosed with hypertension and also for the FQHCs to use for mapping medications within their EHR systems.

Based on the advice of the IPRO medical director, the project team started with an unduplicated list of AHMs from the 2014 HEDIS measures; specifically the drug code sets from the following three measures: CDC-L, PBH-B, and MPM-C. This initial list was modified to include renin-angiotensin system (RAS) medications, the combination therapy drugs as both combination- and mono- therapies where appropriate, and any drugs that were missing based on the JNC-8 recommendations. The drug list generated in this way appeared to be missing a large number of AHM drugs; therefore, this list was abandoned and the team started fresh with help from the IPRO pharmacy team.

The final list of AHM drugs used for the medication adherence project was generated by members of the IPRO pharmacy team using the Lexi-Data Basic Database. Any drugs in the 2012 Lexicon list that contained active ingredients listed in the 2014 Evidence-Based Guideline for the Management of High Blood Pressure in Adults or the list of additional active ingredients identified by the IPRO pharmacy team were included on the AHM drug list.¹⁷ The drugs were identified using the active ingredient in lieu of the national drug classification (NDC) code because NDC codes can be reassigned and the IPRO pharmacists felt that using the active ingredients to identify the drugs was more sustainable in the long term.

For the medication adherence project, the AHM drug list had to include both the NDC code and trade name for each drug. The NDC code was required because it was an indexed field in the Medicaid data and allowed for more efficient queries. The trade name was required because it was the only way the FQHCs could access the drugs in their EHRs to group them and assign an AHM class to those drugs on the AHM list. In addition to the NDC code and trade name, the list had to include active ingredient(s), whether it was a combination therapy drug, and the AHM class for each drug. There were nine AHM classes used for this project – angiotensin converting

enzyme inhibitor / angiotensin receptor blocker (ACE/ARBs), alpha blocker, antiadren, beta blocker, calcium channel blocker, loop diuretic, potassium sparing, thiazide, and vasodilator. The drugs were classified by IPRO using the Lexi-Data scheme.

IPRO proposed a final AHM list which was reviewed by the FQHCs and updated to include any additional medications that were used to treat hypertension at the FQHCs. The list of drugs was completed and distributed at the end of July 2014; however, minor modifications were made to the list throughout the entire project period and the list was not frozen until the end of September 2014. The frozen list contained 13,142 different NDC codes for 285 drugs and was used in the calculation of the statewide and FQHC level medication adherence rates.

Calculation and Interpretation of the AHM Adherence Metrics

A second component of the evaluation sought to answer questions about rates generated as part of the project. Key questions included:

- Was the metric calculated using Medicaid recipients?
- Was the metric calculated for specific practices and clinicians?
- Were the rates produced in line with estimates from past pilots?

PMN Measure

The PMN rate was calculated at the FQHC level using data from 2012. Two different data sources, eClinicalWorks (eCW) EHRs and the NYSDOH's Medicaid Data Mart, were used to calculate this measure because the project team did not have access to a single database with medication prescribing and dispensing information. The EHR data was pulled by HCNNY using a data extraction tool maintained by the network (BridgeIT for eCW). The extracted EHR data was used to calculate the denominator for the PMN measure. The numerator was calculated using data from the Medicaid Data Mart, an electronic administrative data source that contains information on eligibility; claims, encounter, and pharmacy records; provider characteristics; site of care; and member-specific demographic information for each Medicaid enrollee. The data used in this project included records from January 1, 2012 to December 31, 2012.

The PMN measure was formally defined as the percentage of adult patients with hypertension who were prescribed an AHM in 2012 and did not have a Medicaid pharmacy claim for that drug during 2012. The denominator was the number of patients with Medicaid as the primary payer who were diagnosed with hypertension (HTN) at each FQHC in 2012 (based on the problem list or visit assessment) and who were subsequently given a prescription for an AHM. This data came directly from the EHR system at each FQHC. The numerator was the number of patients who were diagnosed with hypertension at each FQHC in 2012 and had a pharmacy claim for an AHM in the same year based on Medicaid Data Mart records. Due to the lack of a data exchange agreement, there was no way to determine if those individuals in the denominator with prescriptions for AHMs were the same individuals in the numerator identified as having pharmacy claims for AHMs. As a result, any calculations performed using this data were unreliable. A rough estimate of the PMN rate was calculated as one minus the fill rate, i.e. one minus the numerator divided by the denominator. A detailed list of the steps used to calculate the PMN measure are shown in Attachment D.

The results for the PMN measure are shown in Table 1. HCNNY was only able to access prescription data grouped to AHM classes for two of the three FQHCs within the project time frame. Data mapping was not completed at the third health center by the time the project ended; therefore, the denominator was not available and PMN rates could not be calculated for the third FQHC.

Table 1. PMN Rate by FQHC

Health Center	Number of Patients With a Claim for at least 1 AHM (filled)	Number of Patients Diagnosed with HTN Prescribed At Least 1 AHM (prescribed)	PMN Rate* 1-(filled/prescribed)
Health Center 1	198	327	39%
Health Center 2	2,694	3,276	18%
Health Center 3	582	Not Available	—
Overall Rate (HC1 and HC2)	2,892	3,603	20%

* Note that this rate is unreliable due to the fact that the numerator and denominator come from different data sources and there is no guarantee that those individuals with AHM prescriptions in the denominator are the same individuals with AHM fills in the numerator.

The overall PMN rate calculated across the two FQHC's for which the project team had denominator data was 20%. This rate was consistent with the CDC reported PMN Rate of 20-30% for medication prescriptions.⁴ The individual FQHC rates both fell outside of the CDC reported range. Health Center 2 had a PMN rate of 18%, which was below 20%. Health Center 1 had a PMN rate of 39%, which was above 30%. The differences between the PMN rates at the two health centers was explained by differences in location within the state which resulted in differences in patient demographics and the basic patient makeup at the two health centers.

Since there was no single system capturing both medication prescribing and dispensing data, the pilot project required a parallel process of identifying individuals with diagnosed hypertension using both the FQHC EHR and Medicaid data. Since NYSDOH did not have access to EHR data for all Medicaid recipients in New York State, the PMN measure was not calculated at the statewide level.

PDC Rate

A statewide and FQHC level PDC rate was calculated using Medicaid data from 2012. The data came from the NYSDOH's Medicaid Data Mart which was described in the PMN Measure results section (see page 8). The data used in this project included records from January 1, 2012 to December 31, 2012.

The PDC rate was formally defined as the percentage of adult patients with hypertension with two or more Medicaid pharmacy claims for an AHM in 2012 who had $\geq 80\%$ of the days covered for at least one AHM class from the initial fill date to the end of the covered period. The denominator was the total number of patients aged 18 to 85 diagnosed with hypertension and dispensed AHMs on two unique dates of service during 2012. The numerator was the number of patients in the denominator who had $\geq 80\%$ of the days covered (based on the days supplied field on the pharmacy claims record) between when they were first prescribed the AHM class and either the end of the measurement year or the end of Medicaid enrollment. A value of 80% was used as the cutoff for the numerator to be consistent with previous work in this area.⁶ The PDC rate was calculated by dividing the numerator by the denominator. A detailed list of the steps used to calculate the PDC are shown in Attachment D.

The statewide and FQHC level PDC rates for AHMs are shown in Table 2. This was the percentage of people diagnosed with hypertension (and attributed to each FQHC for the FQHC level rates) who had one or more medications in an AHM class filled on at least two days during 2012 and who had a supply of a single class of medication for 80% or more of the days. The overall PDC rate, aggregating across all three health centers, was 58% compared to 62% for the

statewide rate. The individual FQHC's PDC rates ranged from 55% to 59%. The PDC rates reported in Table 2 did not take the time patients spent in a non-acute inpatient setting in 2012 into consideration; however, the inclusion of these days was expected to have a minimal impact on the final PDC rate.¹⁶

Table 2. PDC Rate by FQHC and Statewide

Health Center	Number of Patients with 80% or more days covered for at least one AHM (num)	Number of Patients With a Claim for AHM on at least 2 different service dates(denom)	PDC Rate (num/denom)
Health Center 1	110	187	58.8%
Health Center 2	1,437	2,475	58.1%
Health Center 3	286	521	54.9%
Statewide Rate	217,523	350,259	62.1%

The statewide PDC rate of 62% calculated in this pilot project was consistent with the 63% MPR adherence rate reported by Kyanko, et al. using 2008-2009 data for Medicaid recipients in New York City (NYC) aged 18 to 64 with medication prescriptions to treat high cholesterol, diabetes, and/or hypertension.⁹ This made sense since a majority of the Medicaid recipients in NYS live in NYC and the NYC adherence rates drive the statewide rate. The overall clinic rates were between 55% and 59% which was less than that found in the Kyanko study. These rates were not comparable to the NYC rates because the population characteristics were different.

Statewide and FQHC level PDC rates were also calculated by AHM class to satisfy the requirements of the State Public Health Actions to Prevent and Control Diabetes, Heart Disease, Obesity and Associated Risk Factors and Promote School Health (1305) Grant. The results of these calculations are shown in Table 3. The FQHC level PDC rates were lower than the statewide rates for each AHM class for Health Centers 1 and 2. The PDC rates for Health Center 3 were also lower for each AHM class except for the Alpha Blocker class which was higher than the statewide rate.

Table 3. PDC rate by AHM class and FQHC for 2012 Medicaid recipients

AHM Class	Statewide	Health Center 1	Health Center 2	Health Center 3
ACE/ARB	55%	50%	51%	45%
Alpha Blocker	49%	25%*	48%*	55%*
Antiadren	42%	22%*	39%	40%*
Beta Blocker	55%	53%	51%	46%
Calcium Channel Blocker	54%	41%*	49%	48%
Loop Diuretic	42%	39%*	35%	31%*
Potassium Sparing	45%	33%*	44%	30%*
Thiazides	48%	38%	43%	42%
Vasodilator	43%	--	30%*	41%*

*Fewer than 30 events in the numerator; therefore, the rate is unstable

Statewide, the Loop Diuretic and Antiadren classes had the lowest PDC rates at 42% and the ACE/ARB and Beta Blocker classes had the highest PDC rates at 55%. The Antiadren (22%), Loop Diuretic (35%), and Potassium Sparing (30%) classes had the lowest PDC rates at Health Centers 1, 2, and 3, respectively. The Beta Blocker (53%), ACE/ARB and Beta Blocker (51%) and Alpha Blocker (55%) classes had the highest PDC rates at Health Centers 1, 2, and 3,

respectively. The ACE/ARB and Thiazide classes were the most frequently prescribed at a statewide level and had PDC rates of 55% and 48%, respectively. Consistent with the statewide data, the ACE/ARB and Thiazide classes were prescribed most frequently in 2012 at the three participating FQHCs. The overall PDC rates (aggregating across all three health centers) for these two classes were 50% and 42%, respectively. The overall PDC rates at the FQHCs for these two classes were lower than the statewide rates.

The AHM class adherence rates calculated in the pilot project were all less than the adherence rates calculated in an electronic pill box AHM adherence study carried out by Moise, et al.¹⁷ The results of the Moise, et al. study showed a 71% adherence to beta blockers, 75% adherence to ARBs, 78% adherence to both ACEs and Calcium Channel Blockers, and a 76% adherence to diuretics.¹⁷ One reason for the difference in the adherence rates between the two studies was the assumption made in the pilot project that, once a patient was prescribed an AHM in a given class, he/she remained on medications in that class for the remainder of the measurement period. If the patient was moved to another class, then the patient was considered not adherent (PDC < 80%) for the original class in the current PDC rate calculation. As a result, the PDC rates from the pilot project were most likely conservative, i.e. low estimates of adherence, for individual AHM classes. This was a limitation of the study.

Clinician Level Rates

Clinician level rates were not produced for either adherence measure in this pilot project. It was decided during the technical specification phase of the project that the clinician level PMN and PDC rates were too large a scope to undertake for the time-frame specified for the pilot project. The primary reason is that clinic NPI was frequently listed in the Data Mart claims and encounter records in lieu of the individual provider ID. For those records that had the provider ID listed instead of the clinic NPI, there was no guarantee that the patient was seen at the FQHC. As a result, the goals of the pilot project were adjusted to focus on the generation of AHM adherence rates for the two measures at the statewide and FQHC levels.

Dissemination, Use, and Sustainability

A final component of the evaluation sought to answer questions about dissemination, use, and sustainability. Key questions included:

- Were adherence rates distributed via reports to physicians participating in this QI project?
- Can the process for generating and sharing the reports be repeated?

The statewide and FQHC level adherence rates were given to HCNNY to distribute to the participating FQHCs at the ASTHO Million Hearts Learning Collaborative Meeting in December 2014 (see Attachment E). It was not clear if HCNNY distributed the reports to the participating FQHCs because no feedback loop existed in the pilot project. Since clinician level reports were not generated due to limitations of the data used in the pilot project, individual clinicians were not provided with reports containing a list of non-adherent patients.

PMN Measure

The process for generating the PMN measure report was replicable at the FQHC level; however, it was a resource intensive process that required the involvement of multiple organizations. The measure required a large number of resources because the denominator came from the EHR system for each FQHC. In order to provide the number of patients who were diagnosed with hypertension and prescribed an AHM in a given measurement period, the FQHCs had to map

each drug on the AHM list in their EHRs for the measurement period. Once the FQHCs mapped their AHM drugs, then HCNNY pulled the denominator data from the EHR system, cleaned the data, and sent the information to the NYSDOH. The numerator data was compiled separately using the Medicaid Data Mart by DOH personnel. This was not an ideal use of resources because the final PMN rate calculated in the pilot project was not reliable due to the lack of a single system that captured both prescribing and dispensing medication data.

Another reason the final PMN rates were unreliable was the lack of a data exchange agreement between NYSDOH and HCNNY that allowed DOH to receive identifiable patient data. As a result, there was no guarantee that those individuals counted in the numerator were from the same population that was included in the denominator. The pilot project tested whether it was plausible to estimate the number of patients with hypertension at each FQHC from the Medicaid data. The number of patients with hypertension attributed to the FQHCs using Medicaid data was 12% lower than the number of hypertension patients identified using the EHRs. Since the PMN measure calculation included a mix of Medicaid and EHR data, the actual PMN rate most likely varied considerably from the rate calculated in this project.

PDC Rate

The process for generating the PDC measure report was replicable at both the statewide and FQHC level for any measurement year from 2004 to the present. In order to repeat the PDC calculation for measurement years other than 2012, a comprehensive list of AHMs has to be created for each measurement year. In order to create this list, the NYSDOH either has to purchase a license to the Lexicon pharmacy data service, contract with IPRO to generate the list, or find another source from which the AHM list can be obtained on a regular basis. NYSDOH also has to work with HCNNY to generate a list of clinic level NPIs associated with the FQHCs for each additional FQHC added to the project team in the future. Once the AHM list and clinic level NPIs are available, the major resources needed to calculate the PDC are computational in nature. The PDC measure is useful for surveillance purposes.

Conclusions

The pilot AHM adherence project was undertaken by the NYSDOH and project partners in 2014 to examine the PDC and PMN rates for Medicaid recipients diagnosed with hypertension and prescribed AHMs using 2012 data. Based on a review of the project documentation, the project team was able to reach consensus on measurement definitions and technical specifications for both AHM adherence metrics. The project team also successfully calculated statewide PDC rates and FQHC level PDC and PMN rates for Medicaid recipients using 2012 data. The estimates were in line with past pilots and the adherence rates were distributed to HCNNY in December 2014. The processes used to calculate and report on both measures were repeatable; however, they were also resource intensive. The PMN rate required considerable time and effort at multiple organizations to calculate, and the PDC measure required a great deal of effort to create a comprehensive list of AHMs for the measurement year before the PDC rate could be calculated.

One of the goals of the pilot medication adherence project was to provide feedback to clinicians about the adherence to AHMs among the members of their patient population diagnosed with hypertension and enrolled in the Medicaid program. More specifically, a goal of the project was to provide each clinician with a list of patients who were diagnosed with hypertension, prescribed an AHM, and never picked up their medication. The project team was not able to achieve this goal due to the limitations of the available data and lack of a data exchange agreement between OQPS and HCNNY.

Based on the pilot project evaluation, it was recommended that work on the PMN measure be discontinued until additional options (see Lessons Learned, Next Steps, and Recommendations) were explored for gaining access to a common source for medication prescribing and dispensing data. The PDC measure was useful for surveillance purposes; therefore, the recommendation was to continue working with the Medicaid Data Mart to calculate the statewide PDC rate for additional measurement years. Unfortunately, the PDC rate did not provide the FQHCs with a routine information source for clinicians to use to assess medication adherence among Medicaid enrollees nor did it provide actionable data to use for quality improvement at the FQHCs. Additional measures should be explored (see Lessons Learned, Next Steps, and Recommendations) to determine if they better meet the FQHC's need for routine information to assess medication adherence and for actionable data for quality improvement purposes.

Lessons Learned, Next Steps and Recommendations

Based on the results of the AHM pilot project evaluation, the recommendation was to discontinue work on the PMN measure using the current process and to expand the work on the PDC measure. The major lessons learned in the AHM pilot project, as well as the next steps, are outlined below.

Lesson Learned # 1: Viability of the PMN Measure

The results of the pilot project suggested it was not feasible to pursue calculating the PMN measure using the method tested. It also highlighted the need to use more direct methods for calculating non-adherence in a defined patient population, such as obtaining a list of patients who were prescribed AHMs to link to the Medicaid data.

Next Steps of NYSDOH Team

While the recommendation from the pilot project was to discontinue work on the PMN measure, some work will continue to determine if it is possible to obtain a list of patients who were prescribed AHMs to link to the claims and encounters data. The NYSDOH team will investigate whether the ISTOP prescription data can fill this need. DCDP personnel will also utilize a prior collaboration with the Health Information Xchange of New York (HIXNY) to pursue a future project exploring the use of a Regional Health Information Organization's (RHIO's) e-prescribing data to calculate the PMN measure.¹⁸

Recommendations for Other Organizations/Agencies

Pursue a partnership with a single health plan that has both medication prescribing and dispensing data to calculate the PMN rate and provide the required data to the FQHCs. Vermont's Department of Health (VDH) carried out a similar study in 2014, and the VDH project serves as an evidence base for this strategy.¹⁹ (State Health Departments)

Lesson Learned # 2: Need for interoperable systems for prescribing and dispensing information

In the AHM pilot project, the providers had the prescription information and the payer (in this case Medicaid) had the information on which patients filled their prescriptions. These two systems were not interoperable so it was impossible to produce a statewide rate for the PMN measure. The project team was able to estimate the PMN measure for the participating FQHCs using an approximated number of patients with prescription fills from the EHR data and the number of prescriptions dispensed from the Medicaid pharmacy claims data.

Next Steps of NYSDOH Team

The State Medicaid Program does not routinely interact with providers and give them access to claims data. Currently OQPS is working with Medicaid to release claims and encounter data to the RHIOs. With consent, the RHIOs could provide a provider interface allowing the health care providers to identify those patients who failed to fill a prescription.

Recommendations for Other Organizations/Agencies

Individual providers have data use agreements with individual managed care health plans, but they want to be able to go to one place and access information about their full panel. (State Health Departments)

Lesson Learned # 3: The PDC measure is useful for statewide surveillance purposes

Preliminary results from the pilot project suggested that the PDC measure was well-suited for use in public health surveillance. The recommendation from the pilot project was to expand the work on the PDC measure.

Next Steps of DOH Team

Future work with this measure includes investigating overall statewide AHM adherence, i.e. calculating the percentage of people who have 80% or more of the days covered with any AHM. NYSDOH personnel also plan to calculate the PDC measure by subgroup (age, gender, previous hypertension diagnosis, region or county in NYS, disability status, race/ethnicity, etc.). The original PDC code can also be updated to exclude non-acute inpatient stays. This was not done during the pilot project because the number of patients at each FQHC was being compared with the EHR data from HCNNY to see if the denominator for the PMN measure could be calculated using the Medicaid Data. Since the FQHCs do not always have inpatient information in the records, they could not exclude these patients so the project team decided not to exclude them for any calculations in the pilot project.

Recommendations for Other Organizations/Agencies

Work in this area should investigate overall AHM adherence as opposed to AHM adherence by class. Looking at AHM adherence by class penalizes the rate calculation for those individuals who were switched to another AHM class by their physicians during the measurement year. For example, someone who took one AHM class for 6 months and was switched to another AHM class for the remaining 6 months was considered not adherent in this pilot project even though the patient was taking an AHM for the entire measurement period. (CDC)

Lesson Learned # 4: Neither the PDC nor the PMN measure provides actionable data for quality improvement purposes at the FQHC level.

Neither measure examined in the pilot project provided a routine information source for clinicians to use to assess medication adherence and use for quality improvement purposes. The PDC measure was not appropriate for supporting QI in care practices due to the lag time for receiving the claims and lack of patient level data, and the unreliable nature of the PMN measure made it unsuitable for QI purposes.

Next Steps of DOH Team

To meet the needs of the FQHCs, NYSDOH will explore additional measures to determine if there are other adherence measures that the providers find to be more actionable for quality improvement purposes. Three of the new measures examined in the next stage of the medication adherence project include tracking AHM adherence self-management goals, exploring the feasibility of using electronic pill boxes to track medication adherence, and using a self-reporting adherence measure, such as the Morisky scale, during provider visits.

Recommendations for Other Organizations/Agencies

Develop adherence measures with shorter lags more suitable for QI purposes. (CDC, State Health Departments)

Develop EHR workflow processes that capture self-reported medication adherence data. (FQHCs)

Lesson Learned # 5: The importance of having a comprehensive list of AHMs prior to undertaking the medication adherence calculations.

In order to carry out the PMN and PDC measure calculations, it was necessary to develop a complete list of medications that were used to treat hypertension during the measurement period. This was the most time-consuming and resource intensive technical issue that arose during the AHM pilot project.

Next Steps of DOH Team

DCDP and OQPS plan to work on collaborating with PQA to get a list of comprehensive AHMs which will greatly reduce the resources needed to calculate the adherence measures.

Recommendations for Other Organizations/Agencies

Provide a comprehensive medication list (including NDC codes, trade and generic name, and drug class) to those individuals required to carry out medication adherence calculations. (CDC)

Lesson Learned # 6: Project Team.

In order to successfully carry out medication adherence calculations using Medicaid data, it is necessary to have the following members on the project team: a pharmacist; health care providers; chronic disease subject matter experts; a project manager; a health informatician; an EHR vendor, a QI specialist; QI measure and Medicaid data experts; SAS programmers; and EHR, Medicaid, and chronic disease data analysts. (State Health Departments)

Recommendations for Other Organizations/Agencies

Provide a list of suggested project team members as part of the Technical Assistance Guide for Medication Adherence. (CDC)

Next Steps of DOH Team Related to Pilot Project

There is evidence that the 90-day pharmacy benefit improves medication adherence.²⁰ The NYSDOH Office of Health Insurance Programs (OHIP) allows Medicaid Managed Care Plans (MMCPs) to adopt a 90-day pharmacy benefit for Medicaid recipients, but there are barriers that prevent the MMCPs from adopting the benefit. NYSDOH will meet with internal partners to assess the adoption of the pharmacy benefit across all MMCPs; review evidence and identify areas for improvement; and meet with OHIP and MMCPs to promote adoption of the 90-day pharmacy benefit.

Use, Dissemination, and Sharing Plan

The results of this evaluation will be used to communicate lessons learned about the project, to provide feedback to the project funders (ASTHO) and the CDC on the adherence measures, and to provide internal guidance to the project team members for future medication adherence work. The report will be distributed electronically to all stakeholders. This report will also be made available to other states and the general public via the NYSDOH website.

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List of Attachments

Attachment A: PDSA Document for AHM Adherence Project

Attachment B: Primary Medication Non-Adherence Measure Definition and Technical Specifications

Attachment C: Proportion of Days Covered Measure Definition and Technical Specifications

Attachment D: List of Steps to Calculate Both AHM Adherence Measures

Attachment E: Using ASTHO Project Summary Document Distributed at ASTHO Million Hearts Learning Collaborative Meeting in 2014

Attachment A. PDSA Document for Medication Adherence Project

PDSA WORKSHEET

	<p>Organization name(s): New York State Department of Health (BCDER/OQPS) IPRO (NYS Quality Improvement Organization)</p>	<p>Date of test: February 2014</p>	<p>Test Completion Date: June 2014</p>																					
<p>Lead contact(s): Ian Brissette, Rachael Ruberto, Lindsay Cogan</p>																								
<p>Overall organization/project aim: Provide feedback to clinicians about the rates of medication adherence for medications prescribed for controlling hypertension among members of their patient population enrolled in the Medicaid program</p>																								
<p>What is the objective of the test? Develop an routine information source clinicians can use to assess medication adherence among Medicaid enrollees and use as a data source for quality improvement initiatives.</p>																								
<p>Briefly describe the test: This PDSA will test whether it is possible for a state health department to use its Medicaid data to provide practice and clinician specific information about the rates of adherence for medication prescribed for controlling hypertension</p> <p>How will you know that the change is an improvement?</p> <ul style="list-style-type: none"> • Consensus is reached on measurement definitions and technical specifications for HTN medication adherence metric • Metric is calculated using Medicaid recipients and produces rates of HTN medication adherence that are in line with estimates from past pilots • Metric is calculated for specific practices and clinicians • Adherence rates are distributed via reports to physicians participating in this QI project • Process for generating and sharing reports can be repeated <p>What system (driver) does the change impact? Use of claims data to drive quality improvement around medication adherence.</p> <p>What do you predict will happen? Developing and implementing the technical specifications for calculating medication adherence will take time, and may need to be refined repeatedly before the data can be used effectively for quality improvement.</p> <p>PLAN</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;">List the tasks necessary to complete this test (what)</th> <th style="width: 20%;">Person responsible (who)</th> <th style="width: 20%;">When</th> </tr> </thead> <tbody> <tr> <td>1. Finalize definition for measuring Rx fill rates/ medication adherence among HTN patients</td> <td>BCDER/OQPS</td> <td>Feb 2014</td> </tr> <tr> <td>2. Develop/implement technical specifications for calculating metric using NYS Medicaid data</td> <td>BCDER/OQPS/IPRO</td> <td>Feb – Apr 2014</td> </tr> <tr> <td>3. Produce relevant quality metrics associated with the measure</td> <td>IPRO/OQPS</td> <td>Apr 2014</td> </tr> <tr> <td>4. Calculate rates of the HTN pharmacy indicator for Medicaid patients seen at PCP sites participating in the ATHO CQI project</td> <td>IPRO/OQPS</td> <td>Apr – Jun 2014</td> </tr> <tr> <td>5. Evaluate whether rates can be calculated by provider or by other key variables relevant to the clinical teams</td> <td>IPRO/OQPS</td> <td>May-Jun 2014</td> </tr> <tr> <td>6. Generate lists of HTN patients at identified PCP locations who are identified as non-adherent</td> <td>BCDER/IPRO/OQPS</td> <td>Jun 2014</td> </tr> </tbody> </table> <p>Plan for collection of data: Monthly report and biweekly feedback at team meetings with ASTHO QI Team and IPRO/Medicaid team.</p>		List the tasks necessary to complete this test (what)	Person responsible (who)	When	1. Finalize definition for measuring Rx fill rates/ medication adherence among HTN patients	BCDER/OQPS	Feb 2014	2. Develop/implement technical specifications for calculating metric using NYS Medicaid data	BCDER/OQPS/IPRO	Feb – Apr 2014	3. Produce relevant quality metrics associated with the measure	IPRO/OQPS	Apr 2014	4. Calculate rates of the HTN pharmacy indicator for Medicaid patients seen at PCP sites participating in the ATHO CQI project	IPRO/OQPS	Apr – Jun 2014	5. Evaluate whether rates can be calculated by provider or by other key variables relevant to the clinical teams	IPRO/OQPS	May-Jun 2014	6. Generate lists of HTN patients at identified PCP locations who are identified as non-adherent	BCDER/IPRO/OQPS	Jun 2014	<p>DO: Test the changes.</p> <p>Was the cycle carried out as planned? Yes No</p> <p>Record data and observations.</p> <p>What did you observe that was not part of the plan?</p> <p>STUDY: Did the results match your predictions? Yes No</p> <p>Compare the result of your test to your previous performance:</p> <p>What did you learn?</p> <p>ACT: Decide to Adopt, Adapt, or Abandon.</p> <p><input type="checkbox"/> Adapt: Improve the change and continue testing plan. Plans/changes for next test:</p> <p><input type="checkbox"/> Adopt: Select changes to implement on a larger scale and develop an implementation plan and plan for sustainability</p> <p><input type="checkbox"/> Abandon: Discard this change idea and try a different one</p>	
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Attachment B. Primary Medication Non-Adherence Measure Definition and Technical Specifications

HTN MEDICATION ADHERENCE METRICS FOR ASTHO COLLABORATIVE

Medication non-adherence measure

Definition	The percentage of patients who are prescribed an anti-hypertensive medication who have a Medicaid claim for that drug during the measurement period (and, the inverse: those who do not have a claim for the prescribed drug during the measurement period)
Type	Percentage/rate
Data Requirements	Medicaid claims data
Measurement Period	One year
Unit of Analysis	Adult patients age ≥ 18 with high blood pressure who have been prescribed antihypertensive medication and have a claim for that Medication
Eligibility	Eligibility starts when an AHM prescription is filled during the measurement period. Eligibility ends when the measurement period ends or the patient is no longer accounted for within the surveillance system, whether this is because they died or switched to an outside health plan, health system and/or pharmacy. <i>Measure will be programmed with and without conditions for continuous enrollment in Medicaid during the measurement period.</i>
Denominator	The number of Medicaid patients prescribed an anti-hypertensive medication within the measurement period. <i>(use in combination with denominator criteria from NQF18 measure to limit medication use to HTN – patients 18-85 with at least one outpatient encounter with a diagnosis of HTN during the measurement year, excluding all patients with ESRD, pregnancy and admission to a non-acute inpatient setting during the measurement year)</i>
Numerator	The number of patients in the denominator who have a claim for payment for the specific antihypertensive medication within the Medicaid claims.
References	Measure loosely based on PQA primary non-adherence measure . Unlike primary non-adherence, this measure includes all prescriptions for AHMs, not just new prescriptions. Potential to stratify by existing and new-to-treatment patients. Other publications related to primary medication adherence: Fischer et al, 2010 , Botts et al, 2005 ;

Attachment C. Proportion of Days Covered Measure Definition and Technical Specifications

HTN MEDICATION ADHERENCE METRICS FOR ASTHO COLLABORATIVE

Proportion of days covered

Definition	Proportion of days in the eligibility period “covered” by prescription claims for the same medication or another in its therapeutic category.
Type	Proportion (adequate adherence defined as ≥80%)
Data Requirements	Medicaid claims data
Measurement Period	One year
Unit of Analysis	Adult patients age ≥18 with high blood pressure who have been prescribed antihypertensive medication (at least 2 fills for either the same AHM or AHM(s) in the same drug class during the measurement period).
Eligibility	Eligibility starts when the initial AHM prescription is filled during the measurement period. Eligibility ends when the measurement period ends or the patient is no longer accounted for within the surveillance system, whether this is because they died or switched to an outside health plan, health system and/or pharmacy. <i>Measure will be programmed with and without conditions for continuous enrollment in Medicaid during the measurement period.</i>
Denominator	Total number of adult Medicaid patients who were dispensed antihypertensive medications on two unique dates of service during the one year measurement period (<i>use in combination with denominator criteria from NQF18 measure to limit medication use to HTN – patients 18-85 with at least one outpatient encounter with a diagnosis of HTN during the measurement year, excluding all patients with ESRD, pregnancy and admission to a non-acute inpatient setting during the measurement year</i>)
Numerator	<p>The number of patients who met the PDC threshold for adequate adherence (≥80%) for AHMs during the one year measurement period. Follow the steps below for each patient to determine whether the patient meets the PDC threshold:</p> <ol style="list-style-type: none"> 1. Determine the patient’s measurement period, defined as the index prescription date to the end of the calendar year, disenrollment, or death. 2. Within the measurement period, count the number of days the patient was covered by at least one drug in the class based on the prescription fill date and days of supply. If prescription fills for the same drug overlap (defined at the generic level), then adjust the prescription start date to be the day after the previous fill has ended. 3. Divide the number of covered days found in Step 2 by the number of days found in Step 1. Multiply by 100 to obtain the PDC as a percentage for each patient. 4. Count the number of patients who had a PDC ≥80% <p>An example of SAS code for steps 1-3 is available here. Modifications to the code would need to be made based on the surveillance system it is being applied to.</p>
References	<p>Nau, DP: Pharmacy Quality Alliance: Medication Adherence NQF Medications Management Measures</p> <p>CDC Materials on Medication Adherence</p>

Attachment D. Detailed List of Steps to Calculate the PMN and PDC Measures.

Note – These are sequential steps. Each step builds on the data pulled in earlier steps.

The Following Data Steps are Run in SQL Developer to Pull Data from the Medicaid Data Mart

- Step 1. Create a table with all people between 18 and 85 years of age who were enrolled in Medicaid for one or more months during the measurement year. The output is stored in a table called eligpop1.
- Step 2. Identify those individuals in the eligpop1 table who were covered by both Medicare and Medicaid during the measurement year. The output is stored in a table called dual1.
- Step 3. Remove those individuals who are in the dual1 table from the eligpop1 table because there is uncertainty about the completeness of the Medicaid data for those individuals covered by both Medicaid and Medicare since Medicare is the primary payer. The output is stored in a table called eligpop. The eligpop table includes the Medicaid recipient id, insurance plan id, age, and the first month the person was eligible for Medicaid during the measurement year.
- Step 4. Create a list of unique recipient ids from the eligpop table. This step is necessary to increase the speed with which the remaining queries are run, i.e. to increase efficiency. The output is stored in a table called eligpop2.
- Step 5. Identify those individuals from the eligpop2 table who were diagnosed with hypertension in the measurement year. This step looks for those individuals with claims or encounter records that have an ICD-9 diagnosis code equal to 401, 4010, 4011, or 4019 or a procedure code equal to 99201, 99202, 99203, 99204, 99205, 99211, 99212, 99213, 99214, 99215, 99241, 99242, 99243, 99244, 99245, 99384, 99385, 99386, 99387, 99394, 99395, 99396, or 99397. The output is stored in a table called opdx_htn.
- Step 6. Create a table of unique ids from the opdx_htn table to run more efficient queries in the next steps. The output is stored in a table called step1a.
- Step 7. Identify those individuals from the step1a table who were diagnosed with end-stage renal disease or who were pregnant during the measurement year. These individuals are excluded from the medication adherence calculations. The value set directory is used to create a set of tables to identify the excluded individuals.
 - 7a. Create a table called excl_cpt which contains a list of recipient ids for those individuals who have one or more procedure code(s) in the claim and encounter records from the measurement year that indicate the individual has end-stage renal disease.
 - 7b. Create a table called excl_dx which contains a list of recipient ids for those individuals who have one or more diagnosis code(s) in the claim and encounter records from the measurement year that indicate the individual has end-stage renal disease.

- 7c. Create a table called `excl_ub` which contains a list of recipient ids for those individuals who have one or more revenue code(s) in the claim and encounter records from the measurement year that indicate the individual has end-stage renal disease.
 - 7d. Create a table called `excl_pos` which contains a list of recipient ids for those individuals who have one or more place of service code(s) in the claim and encounter records from the measurement year that indicate the individual has end-stage renal disease.
 - 7e. Create a table called `excl_dc` which contains a list of recipient ids for those individuals who have one or more claim or encounter type code(s) in the claim and encounter records from the measurement year that indicate the individual has end-stage renal disease.
 - 7f. Create a table called `excl_dxp` which contains a list of recipient ids for those individuals who have one or more diagnosis code(s) in the claim and encounter records from the measurement year that indicate the individual was pregnant.
 - 7g. Create a table called `esrd` which combines the recipient ids from the `excl_cpt`, `excl_dx`, `excl_ub`, `excl_pos`, and `excl_dc` tables and adds a column called `esrd` with a value of 1 for each recipient id.
 - 7h. Create a table called `both_exclusions` which includes the common recipient ids between the `esrd` table and the `excl_dxp` table and adds `esrd` and `pregnancy` columns with a value of 1 in both columns for each recipient id.
 - 7i. Create a table that contains a list of recipient ids for those individuals who should be excluded from the medication adherence calculations for the measurement year along with the reason for the exclusion, i.e. whether they have end-stage renal disease, were pregnant, or both. The output is stored in a table called `exclusions` and contains the recipient id, a column called `esrd` with a 1 or 0 indicator where 1 indicates end-stage renal disease, and a column called `pregnancy` with a 1 or 0 indicator where 1 indicates the individual was pregnant during the measurement year.
- Step 8. Join the `exclusions` table with the `opdx_htn` table. The new table contains a list of recipient ids for those individuals who were enrolled in Medicaid and diagnosed with hypertension in the measurement year, the date of service, the provider NPI and zip code, and indicators for whether the individual was diagnosed with end-stage renal disease or pregnancy. The output is stored in a table called `opdx2_htn`.
- Step 9. Create a table containing all of the pharmacy claim records for medications on the AHM list with dates during the measurement year for those individuals in the `eligpop2` table. This table includes the recipient id along with the provider NPI and the medication fill dates, NDC code, trade name, and days supplied. The output is stored in a table called `pharm_new`.

These Data Steps are Run in SAS

- Step 10. Read the final AHM drug list into SAS. The output is stored in a table called htn_ndc.
- Step 11. Determine whether each recipient in the opdx2_htn table should be attributed to a participating FQHC using the list of clinic and provider NPIs provided by HCNNY and stored in a separate file called hc_npi. When the provider NPI from the opdx2_htn table matches a clinic or provider ID in the hc_npi table then the clinic name or provider name is assigned to the recipient for that record. The output is stored in a table called opdx and contains the recipient id, the service date, the indicators for end-stage renal disease and pregnancy, the provider NPI, the clinic name, and the provider name.
- Step 12. Create a table with indicators (1=yes and 0=no) to identify whether each recipient in the opdx table is attributed to an FQHC and whether the individual is counted in the denominator for the PMN calculation (esrd≠1 and pregnancy≠1). The output is stored in a table called step1.
- Step 13. For each FQHC, create a summary table that counts the total number of people attributed to the FQHC in the measurement year who were diagnosed with hypertension based on the Medicaid Data Mart, the number of people excluded from the calculation because of a diagnosis of end-stage renal disease or pregnancy, and the total number of people in the PMN measure denominator for that FQHC if AHMs were prescribed in the measurement year. These counts were compared with the data pulled from the EHRs at each FQHC by HCNNY. For 2012, the count of recipients attributed to the participating FQHCs using the data from the Medicaid Data Mart was 12% lower than that pulled from the EHRs at the participating FQHCs.
- Step 14. Update the pharmacy_new table to include AHM class and to identify whether or not the AHM is a combination therapy drug. The output is stored in a table called pharm_updated.
- Step 15. Identify those individuals in the step1 table who were dispensed an AHM during the measurement year. The output is stored in a table called step2. The step2 table contains the recipient id, the denominator indicator, an indicator for whether or not the individual had a prescription filled, and the AHM class for the prescription.
- Step 16. Identify the total number of Medicaid recipients attributed to each clinic who were diagnosed with hypertension in the measurement year and had at least one prescription filled for an AHM. This is the numerator for the PMN measure.
- Step 17. Calculate the PMN rate for each FQHC. The PMN rate is one minus (the numerator from step 16 divided by the denominator provided by HCNNY) for each FQHC.
- Step 18. Create a table with those recipients from the step2 table who have two or more fill dates for AHMs in the same class during the measurement year along with the FQHC to which they were attributed, if any. The output is stored in a table

called pdc_denom. This table identifies the recipients that are included in the denominator for the PDC measure calculation.

Run this Data Step in SQL Developer to Pull Data from the Medicaid Data Mart

Step 19. Create a table with Medicaid enrollment information for each recipient in the pdc_denom table. The output table is called eligpop1_pdc and contains the recipient id, the insurance plan id, the age, the zip code, each month the recipient was enrolled in Medicaid, and the Medicaid and Medicare coverage codes.

These Data Steps are Run in SAS

Step 20. Create a table identifying each month the recipients in the eligpop1_pdc table were enrolled in Medicaid for the measurement year. The output is stored in a table called eligpop_pdc

Step 21. Create a table identifying the last month each recipient in the eligpop_pdc table was enrolled in Medicaid for the measurement year. This allows an adjustment to be made for those individuals who were not continuously enrolled in Medicaid, i.e. who were enrolled for less than 11 months, in the measurement year. The output is stored in a table called end_date.

Step 22. Create a table identifying the first date an AHM was filled in the measurement year for each recipient in the eligpop_pdc table. A separate start date is identified for each AHM class for which the recipient has a pharmacy claim in the measurement year. The output is stored in a table called start_date.

Step 23. Create a table with repeating rows for each recipient in the eligpop_pdc table showing the recipient id, each month the recipient was enrolled in Medicaid, the last month of enrollment in Medicaid, the first date the AHM class was prescribed, each fill date for the AHM class in the measurement year, and the days supplied for each fill date. For those AHM classes that have a days supplied that goes past the last day of enrollment, the days supplied is adjusted to match the end of the enrollment period. The output is stored in a table called members.

Step 24. Transpose the members table to create a single row per recipient with multiple columns for each fill date and number of days supplied for each AHM class.

24a. Create a table that transposes the members table by fill date. This table contains a single row for each AHM class and eligible month for each recipient. It also includes the last month the individual was enrolled in Medicaid. A column is added for each fill date for a given class. The output is stored in a table called fill_dates.

24b. Create a table that transposes the members table by days supplied. This table contains a single row for each AHM class and month of enrollment for each recipient. It also includes the last month the individual was enrolled. A column is added for each day supplied for a given class. The output is stored in a table called days_supply.

24c. Create a table that combines the fill_dates and days_supply tables. This table contains one row for each eligible month and each AHM class for each

recipient. It contains columns for each fill date for an AHM class along with the days supplied each time a medication in the AHM class was dispensed. The output is stored in a table called both.

Step 25. Determine the number of days covered and the number of eligible days. Calculate the Proportion of Days Covered.

25a. To calculate the number of days covered for a given class, create an array with 365 days. Start with the number of days supplied at the first fill date and put a 1 in the array for each day supplied. Proceed to the second fill date and put a 1 in the array for each day supplied. Continue until you have covered all days supplied for a given class. Sum the data in the array, i.e. count the number of 1s, to calculate the number of days covered.

25b. To calculate the number of eligible days for a given class, subtract the first day the recipient was dispensed medication in the class from the last day of Medicaid enrollment in the measurement year.

25c. To calculate the Proportion of Days Covered, divide the number of days covered by the number of eligible days. The output is stored in a table called pdc. This table also contains a numerator indicator (1=yes and 0=no) to identify if the person has a $PDC \geq 80\%$.

Step 26. Find the maximum numerator indicator for each recipient included in the calculation, i.e. those individuals without ESRD or pregnancy indicators. The output is a table called pdc_final. The table includes recipient id, a numerator indicator, a denominator indicator, the FQHC (when doing FQHC level calculations), and the class (when doing AHM class level calculations).

Step 27. Create summary tables...

27a. Statewide PDC rates are created by summing the numerator and denominator indicators and then dividing the numerator sum by the denominator sum. Neither the FQHC nor the class variable should be in the pdc_final table to do this calculation. This calculates the percentage of people who have a $PDC \geq 80\%$ for at least one AHM class.

27b. FQHC level PDC rates are created by summing the numerator and denominator indicators associated with those individuals attributed to each FQHC and then dividing the numerator sum by the denominator sum. The class variable should not be in the pdc_final table to do this calculation. This calculates the percentage of people attributed to an individual FQHC who have a $PDC \geq 80\%$ for at least one AHM class.

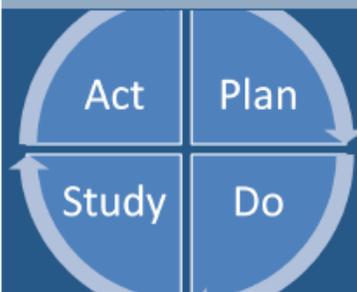
27c. AHM class level PDC rates are created by summing the numerator and denominator indicators associated with those individuals taking medications in each class and then dividing the numerator sum by the denominator sum. This can be done for either the statewide class PDC rates or the FQHC level PDC rates. This calculates the percentage of people who have a $PDC \geq 80\%$ for each AHM class

Using Medicaid Data to Assess Medication Adherence: ASTHO Project Summary



New York State Department of Health
Division of Chronic Disease Prevention
ASTHO Million Hearts Learning Collaborative Meeting
December 10-11, 2014: Washington, D.C.





Outline

- Background
- Medication Adherence
- Project Overview
- Data Sources
- Metrics and Measurement
- Results
- Lessons Learned and Next Steps

PROJECT SUMMARY

BACKGROUND

As part of the Million Hearts State Learning Collaborative, three Federally Qualified Health Centers (FQHCs) in New York State (NYS) were engaged to improve the detection and control of hypertension. The Learning Collaborative, funded by the Association of State and Territorial Health Officials (ASTHO), identified the need for actionable data. To address this need, the project entitled “Using Medicaid Data to Assess Medication Adherence” was undertaken by the NYS Department of Health (DOH) and supported by an ASTHO Expansion Grant.

MEDICATION ADHERENCE

Medication adherence is “the extent to which patients take medications as prescribed by their health care providers.”¹ More specifically, it refers to whether or not the patient follows the provider’s recommendation with respect to the timing, dosage, and frequency with which the medication is taken.² Non-adherence is associated with higher costs of care and adverse outcomes such as increased risk of morbidity and mortality.³

PROJECT OVERVIEW

The medication adherence project examined adherence to anti-hypertensive medications (AHMs) for those individuals with hypertension (HTN) who were enrolled in Medicaid in 2012. The goal was to integrate information on medication adherence from Medicaid claims and encounters into quality improvement initiatives to improve blood pressure control among New Yorkers. The Model for Improvement was used as the project model.⁴ The key project activities are outlined below.

Identify Project Partners – The project team consisted of members from the Health Center Network of New York (HCNYY) and three of their member Federally Qualified Health Centers (FQHCs); IPRO; and the NYSDOH’s Office of Quality and Patient Safety (OQPS) and Division of Chronic Disease Prevention (DCDP).

Measurement Development – Measure definitions and technical specifications were developed for two measures of HTN medication adherence – a non-adherence measure and a proportion of days covered (PDC) measure. Both measures are described in detail in the Metrics and Measurement section.

Programming – This activity included the development of a comprehensive AHM drug list and the development of SAS code to calculate the two AHM measures using Medicaid data.

Development of Practice Level Rates – A list of the clinic National Provider Identifiers (NPIs) for each of the three FQHCs was used to attribute Medicaid recipients to the clinic where they were diagnosed with HTN. The AHM adherence rates were calculated for each FQHC by summing Medicaid recipients attributed to the clinic who were numerator and denominator compliant for each measure.

DATA SOURCES

Two data sources were used for this project – eClinicalWorks electronic health records (EHRs) and the NYS Office of Health Insurance Programs' Medicaid Data Mart. The EHR data was pulled by HCNNY using a data extraction tool developed by the EHR vendor (BridgeIT). The extracted EHR data was used to calculate the denominator for the non-adherence measure. The remainder of the project data came from the Data Mart, an electronic administrative data source that contains information on eligibility; claims, encounter, and pharmacy records; provider characteristics; site of care; and member-specific demographic information for each Medicaid enrollee. The data used in this project included records from January 1, 2012 to December 31, 2012.

METRICS AND MEASUREMENT

The expected outcome for this project included the calculation of a measure of primary non-adherence (a no fill rate) and a measure of secondary adherence (the PDC rate). These measures are described in detail below. Both measures excluded patients diagnosed with end-stage renal disease or pregnancy during 2012.

Non-Adherence - The percentage of adult patients with HTN who were prescribed an AHM in 2012 and did not have a Medicaid pharmacy claim for that drug during the measurement period. The denominator was the number of patients diagnosed with HTN at each FQHC in 2012 who were subsequently given a prescription for an AHM based on the EHRs. The numerator was the number of patients who were diagnosed with HTN at each FQHC in 2012 and had a pharmacy claim for an AHM in the same year based on Data Mart records. The non-adherence rate was calculated as one minus the fill rate, i.e. one minus the numerator divided by the denominator.

PDC Rate – The percentage of adult patients with HTN with two or more Medicaid pharmacy claims for an AHM in 2012 who had $\geq 80\%$ of the days covered from the initial fill date to the end of the covered period. The denominator was the total number of patients aged 18 to 85 diagnosed with HTN and dispensed AHMs on two unique dates of service during 2012. The numerator was the number of patients who had $\geq 80\%$ of the days covered from the initial fill date until the end of the coverage period. The PDC rate was calculated by dividing the numerator by the denominator. Both FQHC and statewide rates were calculated for this measure.

RESULTS

The results for the non-adherence measure are shown in Table 1. The overall non-adherence rate was 20% with non-adherence rates at the individual FQHCs of 18% and 39%. Data for the third health center was not available at the time this report was produced.

Health Center	Number of Patients With a Claim for at least 1 AHM (filled)	Number of Patients Diagnosed with HTN Prescribed At Least 1 AHM (prescribed)	Non-Adherence Rate 1-(filled/prescribed)
Health Center 1	198	327	39%
Health Center 2	2,694	3,276	18%
Health Center 3	582	Not Available	—
Overall Rate (HC1 and HC2)	2,892	3,603	20%

The results for the PDC rate are shown in Table 2. The overall PDC rate (aggregating across all three health centers) is 58% compared to 62% for the statewide rate. The individual FQHC's PDC rates ranged from 55% to 59%.

Health Center	Number of Patients with 80% or more days covered for at least one AHM (num)	Number of Patients With a Claim for AHM on at least 2 different service dates(denom)	PDC Rate (num/denom)
Health Center 1	110	187	58.8%
Health Center 2	1,437	2,475	58.1%
Health Center 3	286	521	54.9%
Statewide Rate	217,523	350,259	62.1%

The two classes of AHM drugs prescribed most often at these three health centers in 2012 were angiotensin-converting enzyme (ACE) inhibitors / angiotensin receptor blockers (ARBs) and Thiazides. The overall PDC rate (aggregating across all three health centers) for these two AHM classes was 50% and 42%, respectively. Statewide, these two classes were also the most prescribed and the PDC rate was 55% for ACE/ARBs and 48% for Thiazides.

LESSONS LEARNED AND NEXT

This project examined two measures for medication adherence: the PDC rate and the non-adherence rate. The PDC rate is a feasible adherence measure; however, a determination of the cost-benefit must be made by weighing the resources (staff time, funding) against the benefits (quality of the estimates, perceived utility by the FQHCs). One barrier to adopting this measure is the amount of staff time it takes to generate a comprehensive list of AHM medications for a given measurement period.

The primary lesson learned from the non-adherence measure is that it cannot be reliably calculated on a statewide level due to the lack of a single system that captures both prescribing and dispensing prescription information. This project tested whether it was plausible to estimate the number of HTN patients at each FQHC from the Medicaid data. The number of HTN patients attributed to the FQHCs using Medicaid data was 12% lower than the number of HTN patients identified using the EHRs. Since the calculation includes a mix of Medicaid and EHR data, the actual non-adherence rate may vary considerably from the rate calculated in this project. The non-adherence measure is not a feasible measure to use in future studies due to this limitation.

Future work includes continued testing of the PDC measure and the exploration of additional measures to determine if there are other adherence measures that the providers find to be more actionable for quality improvement purposes. Two of the new measures examined in the next round of testing include tracking AHM adherence self-management goals and a self-reported measure, i.e. using AHM adherence scales at provider visits.



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