Defining and Measuring Primary Medication Nonadherence: Development of a Quality Measure

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SUMMARY

Poor medication adherence has been increasingly recognized as a major public health issue and a priority for health care reform. Primary medication nonadherence (PMN) is a subset of this broader subject and occurs when a new medication is prescribed for a patient, but the patient does not obtain the medication, or an appropriate alternative, within an acceptable period of time after it was prescribed. It is increasingly evident that the public health problem of PMN is widespread. However, the lack of standardized definitions and measures inhibits the ability to establish the true incidence of this problem or to track changes in PMN rates over time.

Given the limitations of current measures, the Pharmacy Quality Alliance (PQA) convened an expert working group to set parameters for a new industry measure. That new measure, which links electronic prescribing and pharmacy dispensing databases and was developed and approved by the PQA, is described here. PMN literature from 1990 to June 2015 is also reviewed, and existing PMN measures are summarized.

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Poor medication adherence has been increasingly recognized as a major public health issue and a priority for health care reform.¹ Studies have estimated medication nonadherence rates as high as one third to one half of all patients, leading to an avoidable cost of \$290 billion annually in the United States.^{2,3} Poor medication adherence has been linked to worse health outcomes, increased hospitalizations, and increased health care costs.⁴⁻⁶

In its 2003 report on medication adherence, the World Health Organization (WHO) noted that “increasing the effectiveness of adherence interventions may have a far greater impact on the health of the population than any improvement in specific medical treatments.”⁷ This report defined adherence as the “extent to which a person’s behavior—taking medication, following a diet, and/or executing lifestyle changes—corresponds with agreed recommendations from a healthcare provider.”⁷ While this concept seems straightforward, defining and measuring medication nonadherence has proven challenging.⁶ Raebel et al. (2013) have proposed separate constructs of medication adherence and persistence.⁸ They defined adherence as the extent to which a patient takes a medication as prescribed, focusing on frequency, time ingested, and dose. Persistence, by contrast, relates to the time over which a patient continues treatment.

Primary and secondary nonadherence are distinct subsets of medication nonadherence.⁸ Primary medication nonadherence (PMN) occurs when a new medication is prescribed for a patient, but the patient does not obtain the medication or an appropriate alternative within an acceptable period of time after it was prescribed. This includes prescriptions that patients actually present (or are electronically prescribed), as well as those that never reach the pharmacy. Secondary nonadherence measures prescription refills among patients who previously filled their first prescriptions.

Secondary nonadherence has emerged as a major target of quality improvement initiatives. The Centers for Medicare & Medicaid Services, for example, has adopted secondary adherence-related measures as part of its star ratings program for Medicare Advantage plans and stand-alone prescription drug plans. Secondary adherence rates are publicly reported for these plans, and incentives, including quality bonus payments, are tied in part to performance on secondary nonadherence measures.⁷ These secondary nonadherence measures are likely to underestimate the true rate of nonadherence, however, since their method for calculation is to use prescription claims data to identify patients who filled a prescription at least 2 times in the measurement period but then did not refill the medication regularly. Because a patient needs to fill the prescription twice to be included in the adherence measure, this would mean that the method thus misses instances of PMN when the medication never reaches the patient in the first instance.

With most medication adherence research to date focused on secondary nonadherence, PMN has been identified as a major research gap.^{6,9,10} The few studies on PMN have differed in operational definition and methods of measurement. The lack of standardized measures for PMN has limited the understanding of its true extent and the ability to compare PMN rates across the health care system. One reason for the challenge in measuring PMN is the difficulty in linking prescriptions that are written with those that are dispensed. Many written prescriptions for new medications never make it to the pharmacy, so there are difficulties in calculating an accurate denominator. Growth in electronic prescribing has partially resolved this issue, and new measures have emerged linking electronic prescribing databases with pharmacy dispensing databases.⁸ This method for capturing PMN may lead to more standardized PMN measures, which may prove useful for benchmarking and quality improvement initiatives.

This commentary reviews the literature on PMN, summarizes existing PMN measures, and describes a new PMN quality measure, which was developed and approved by the Pharmacy Quality Alliance, a national measure development organization.

Methods

To assess the published data on PMN, a literature review was conducted using Google Scholar and PubMed databases, covering the time period from 1990 to June 2015. Search terms included “primary non-adherence,” “primary medication non-adherence,” “medication non-redemption,” “medication non-fulfillment,” “primary non-compliance,” “first-fill prescriptions,” and “newly initiated drug therapy.” The bibliographies of identified articles were examined to identify additional relevant literature. We excluded non-English articles, as well as letters, editorials, comments, and review articles. Selected articles were reviewed, and the key elements were extracted for comparison and synthesis.

Literature Review Findings

The literature review produced 35 articles that were included for further analyses. Table 1 provides an overview of key elements from these studies.¹¹⁻⁴⁵ The majority of the studies (77%) have been published since 2010, indicating recent momentum in research for this subset of medication adherence.

Terminology

While many terms have been used to describe PMN, “primary medication nonadherence,” or its reciprocal “primary adherence,” have been the most frequently used terms since 1990 and were used in 77% of all studies identified. Other terms used, in decreasing order of frequency, include “prescription abandonment” (3 studies), “first-fill adherence” (2 studies), “unfilled prescriptions” (2 studies), “initial noncompliance” (1 study), “nonfilling” (1 study), and “primary prescription noncompliance” (1 study).

It is important to distinguish PMN from prescription abandonment. “Prescription abandonment” is traditionally used in studies as a broader term than PMN and occurs whenever a prescription is filled by a pharmacy but not claimed by the patient. This umbrella term thus includes instances of first-fill abandonment, which is PMN, as well as the abandonment of refilled prescriptions, which is not PMN but, rather, secondary nonadherence. Further, abandonment rates are generally calculated based on prescriptions that reach the pharmacy and, thus, miss the significant portion of prescriptions written but never filled at a pharmacy. For these reasons, abandonment measures contain elements of PMN but are imperfect proxies for PMN. While abandonment rates may be useful for pharmacy self-assessment to track the impact of operation changes, they are separate and distinct from PMN.

PMN Operational Definition

While the extant literature on PMN generally defines PMN as an instance in which a patient does not fill a newly prescribed medication, variation exists with respect to (a) the definition of “new prescription”; (b) the number of days that elapse after a prescription is ordered before a medication is considered to be not filled; and (c) the types of medications included in the measure. To determine if a prescription is new, measures traditionally had a look-back period of 6-24 months to determine if the medication had been previously dispensed. The length of time that previous studies gave patients to fill a prescription before classifying it as PMN had the greatest variation, spanning from 48 hours to 12 months; some studies did not even offer a time limitation. Studies generally limited the measure to chronic medications, while some were specific to individual medication classes (e.g., statins or bisphosphonates). Acute medications, such as antibiotics or antivirals, were generally excluded, since these medications may sometimes be written by prescribers for patients to fill on an as needed basis.

Method of Measurement

The PMN studies we assessed varied widely in their methods of measurement. Early PMN studies generally employed labor-intensive methods such as random digit dialing, pharmacist-delivered questionnaires, or patient self-reports. These methods are unlikely to yield objective data or to be scalable for the purposes of benchmarking across the health care system.

Newer studies have used electronic prescribing records linked with pharmacy dispensing databases. For example, Fischer et al. (2011) linked e-prescribing transactions and pharmacy claims files.³³ New prescriptions were defined as those that had not been filled in the previous 12 months. PMN was defined as “the number of prescriptions filled divided by the total number of prescriptions written.” Patients were given up to 12 months to fill a prescription before it was classified as PMN.³³ Studies such as that from Fischer et al. have been enabled by working with integrated health systems and national pharmacy chains/pharmacy benefit managers, since these agencies capture robust information on prescriptions written and prescriptions dispensed. Similarly, international studies within single-payer health care systems have leveraged government databases that record all prescriptions ordered and link these with comparable government databases that contain complete prescription dispensing records.^{12,14} The broad reproducibility of such methods in multipayer health care systems such as those in the United States is difficult given the lack of comprehensive government prescription ordering and dispensing datasets.

Reported PMN Rates

Given the variation in PMN definition and methods of measurement across the 35 studies, it is of little surprise that

TABLE 1 Review of Primary Medication Nonadherence Studies

Author/Date	Term Used	Definition	Study Type	Adherence Measurement	Reported PMN Rates (%)
Fischer et al. (2015) ¹¹	Primary medication nonadherence	Patient pickup of prescription within 30 days of initial order.	Prospective randomized controlled trial	Prescription order data were provided from integrated health system electronic health records and linked to pharmacy fill data from national pharmacy chain/pharmacy benefit management company.	6.00
Thengilsdottir et al. (2015) ¹²	Primary nonadherence	Proportion of patients who did not get a prescription for a statin or antidepressant within a year of issue.	Retrospective study	Data on patients with new prescriptions were linked to databases with dispensing histories, both government databases.	6.30 for statins 8.00 for anti-depressants
Cizmic et al. (2015) ¹³	Primary adherence	Proportion of patients who purchased bisphosphonate prescription within 25 days.	Prospective randomized controlled trial	Data were obtained from Kaiser Permanente Colorado's pharmacy and membership databases.	69.50 ^a
Pottegard et al. (2014) ¹⁴	Primary nonadherence	Not redeeming prescription within 4 months from day prescription was issued.	Retrospective study	Primary nonadherence was calculated by linking data on prescriptions issued with data on prescriptions redeemed from government databases.	9.30
Jackson et al. (2014) ¹⁵	Primary medication nonadherence	New medication was e-prescribed for patient aged 18 years or older but was not obtained within 30 days.	Retrospective study	Using the PQA PMN measure, PMN rates were calculated using transactional data from a national pharmacy chain.	12.20
Richmond et al. (2014) ¹⁶	Primary nonadherence	Patient failed to obtain prescribed medication within 14 days.	Cross-sectional study of adult patients using self-reported and objective measures	New patients who were given prescriptions after visits were called 14 days later to confirm if they had filled prescriptions. Every other patient that said yes was selected for external validation of claims through pharmacy records.	6.20
Bauer et al. (2013) ¹⁷	Primary nonadherence	No dispensing of index prescription within 60 days of index prescription date.	Observational cohort, follow-up study	Self-reported and electronic records.	4.00
Bergeron et al. (2013) ¹⁸	Prescription abandonment/primary adherence	Unfilled prescriptions/more than 1-week delay in filling prescription.	Cross-sectional evaluation, follow-up study	Patient interviews and follow-up phone calls were done before e-prescribing, 1 to 6 months after e-prescribing, and 12 to 18 months after e-prescribing.	6.90 before e-prescribing 10.60 1-6 months after e-prescribing 2.50 12-18 months after e-prescribing
Cheetham et al. (2013) ¹⁹	Primary nonadherence	Patients did not pick up new prescriptions within 90-day window.	Retrospective cohort study	Electronic medical records and new e-prescriptions.	15.40
Deroose et al. (2013) ²⁰	Primary nonadherence	New prescriptions were not dispensed within 14 days.	Randomized control trial	Collected from electronic records.	65.90 total patient population 74.00 in control group 57.70 in intervention group
Ding et al. (2013) ²¹	Prescription nonfullfillment	Not filling the prescription issued by a health care provider.	Randomized control trial	Completed telephone interviews 1 week after index ED visit, then extracted all pharmacy and health care use claims information from the state Medicaid database for all subjects within 30 days of index ED visit.	26.00 ^a

TABLE 1 Review of Primary Medication Nonadherence Studies (continued)

Author/Date	Term Used	Definition	Study Type	Adherence Measurement	Reported PMN Rates (%)
Fallis et al. (2013) ²²	Primary nonadherence	Patient did not fill an initial prescription within 7 days.	Retrospective study	Patient discharge summaries were obtained from online medical discharge system. Medication dispensing data were obtained using web-accessible interface to view publically funded prescription drug claims.	28.00
Harrison et al. (2013) ²³	Primary nonadherence	Patients who never fill newly ordered medication (12 weeks post-index prescription date).	Cross-sectional telephone survey	Subjects were called 12 weeks post-index e-prescription date.	75.00
Hogan et al. (2013) ²⁴	Primary nonadherence	Never purchasing a newly prescribed medication.	Cross-sectional study	Electronic medical records and new e-prescriptions.	15.00
Liberman et al. (2013) ²⁵	Primary nonadherence	Failing to initiate prescribed therapy. No paid claims for varanciline in the 12-month period following the prescription order.	Retrospective study	E-prescriptions and adjudicated pharmacy claims.	55.70
Linnet et al. (2013) ²⁶	Primary nonadherence	Patient did not redeem prescribed medication at some point during drug therapy.	Population-based data linkage study	All prescriptions dispensed by Icelandic pharmacies were sent electronically to Icelandic Prescriptions Database of the Directorate of Health. Data were compared with a primary health care database of electronic medical records (including e-prescriptions).	6.20
Reynolds et al. (2013) ²⁷	Primary nonadherence	Failure to pick up a new prescription within 60 days of the order date.	Retrospective study	Electronic medical records and new e-prescriptions.	29.50
Fernando et al. (2012) ²⁸	Primary prescription noncompliance	Patients failed to get prescriptions filled.	Prospective randomized study	Study outcomes were collected by performing telephone interviews after ED discharge.	12.50 total patient population 13.70 in e-prescriptions 11.20% in standard script groups
Rosman et al. (2012) ²⁹	Unfilled prescriptions	New prescriptions not filled within 3 days of visit.	Prospective cohort study	Research assistants contacted parents or guardians by phone 7 to 10 days after initial visits to pediatrician to ask if prescriptions had been filled. If prescriptions had been filled, assistants called pharmacy directly to confirm prescription fill and pickup.	32.00
Saks et al. (2012) ³⁰	Primary nonadherence	Prescriptions not filled within 30 days of receipt.	Prospective cohort study	Data were collected by review of pharmacy records. Patients provided information for pharmacies where they normally filled prescriptions. Pharmacies were contacted after a 30-day interval.	27.00 ^a
Shin et al. (2012) ³¹	Primary nonadherence	Patients failed to pick up newly prescribed prescription from pharmacy within 14 days of index date.	Retrospective study	Electronic medical records and new e-prescriptions.	9.80
Zweigoron et al. (2012) ³²	Unfilled prescriptions/primary medication nonadherence	Prescriptions not filled within 60 days.	Retrospective observational study	Compared prescription data from an electronic medical record with insurance claims provided by Illinois Medicaid.	22.00
Fischer et al. (2011) ³³	Primary nonadherence	Not filling first prescription for medications prescribed (allowed up to 180 days).	Retrospective observational study	Analyzed e-prescriptions received through iScribe and compared them with claims data.	24.00
Fischer et al. (2010) ³⁴	Primary nonadherence	All new prescriptions filled within 180 days designated as adherence.	Retrospective study	E-prescriptions.	28.30

TABLE 1 Review of Primary Medication Nonadherence Studies (continued)

Author/Date	Term Used	Definition	Study Type	Adherence Measurement	Reported PMN Rates (%)
Fischer et al. (2010) ³⁵	Primary nonadherence	Prescriptions given to patients but never filled within 180 days.	Retrospective study	E-prescriptions through iScribe.	22.80
Groves et al. (2010) ³⁶	Primary nonadherence	Prescribed items that were never picked up (in the past 6 months).	Retrospective observational study	Community pharmacist issued questionnaires to customers, and those who finished first questionnaire received follow-up questionnaire in the mail.	9.60
Shrank et al. (2010) ³⁷	Prescription abandonment	Prescriptions not picked up within 14 days of delivering prescription.	Cross-sectional cohort study	Prescriptions returned to stock at pharmacy after ~14 days. Descriptive statistics used to summarize characteristics of patients.	3.27
Gleason et al. (2009) ³⁸	Prescription abandonment	Failure to retrieve a medication that had gone through an insurance claim (90 days).	Cross-sectional observational study	Paid claims and records of medications retrieved at pharmacy.	7.34
Karter et al. (2009) ³⁹	Primary nonadherence	Failing to initiate therapy within 60 days of index date.	Retrospective study	Electronic medical records and new e-prescriptions.	4.70
Shah et al. (2009) ⁴⁰	First-fill adherence	Prescription claimed within 30 days of electronic health record order date.	Retrospective cohort study	Linking electronic health records and pharmacy claims.	17.00 ^a
Shah et al. (2008) ⁴¹	First-fill adherence/nonfilling	Prescription was claimed within 30 days of electronic health record order date.	Retrospective cohort study	Linking electronic health records and pharmacy claims.	15.00 ^a
Wamala et al. (2007) ⁴²	Primary nonadherence	Patients reported that they refrained from purchasing prescribed medications at the pharmacy.	Cross-sectional population-based study	Based on data from Swedish national public health surveys.	7.60 ^a
Wroth et al. (2006) ⁴³	Primary medication nonadherence	Patients failed to fill prescription provided by practitioner (in the past 12 months).	Retrospective study	Random digit dialing telephone patient-reported survey.	21.60
McAaffrey et al. (1998) ⁴⁴	Initial noncompliance	Patients failed of their own accord to receive intended medications within 48 hours.	Prospective observational study	Audit of unclaimed prescription information and patient data from 3 pharmacies and tracking logged prescriptions for 4 weeks.	1.94
Beardon et al. (1993) ⁴⁵	Primary nonadherence	Patients failed to redeem prescription for duration of therapy.	Observational data comparing written prescriptions with those dispensed and subsequent case records	Data from prescription reports and primary care records.	14.50

^aPMN rate was calculated from data provided in the study.

ED= emergency department; PMN=primary medication nonadherence; PQA=Pharmacy Quality Alliance.

reported PMN rates have varied significantly, with a range of 1.94% to 75%. The nonweighted average PMN rate across all studies was 20.3%. Thus, it is not possible to make accurate comparisons of PMN rates given the wide variation in definition and measures.

New PMN Measure Development and Definition

To help advance a consensus definition and method of measurement of PMN, the Pharmacy Quality Alliance (PQA), a measure development organization, convened an expert panel on PMN in 2011. Panelists came from a variety of backgrounds and included experts in pharmacy, managed care, electronic

prescribing, medicine, and research. The expert panel met on several occasions in person and via teleconference to review the extant literature and reach a consensus on a definition and measure for PMN. Technical specifications were developed, and the developed measure was modified slightly based on feedback submitted in a public comment period. The measure was further tested in real-world community pharmacy settings by the University of Mississippi, as described below, to assess the practicality and utility of the PMN measure. PQA's Quality Measurement Expert Panel (QMEP) considered evidence from these studies, and the PMN measure was judged to have sufficient evidence of validity to warrant endorsement by the PQA

TABLE 2 Chronic Medication Classes Included in PMN Measure

Medication Classes
Angiotensin-converting enzyme (ACE) inhibitors, plus combination products
Angiotensin II receptor blockers (ARBs), plus combination products
Biguanides (plus combination products)
Chronic obstructive pulmonary disease (COPD) medications
Direct renin inhibitors, plus combination products
Dipeptidyl peptidase 4 (DPP-IV) inhibitors, plus combination products
Hydroxymethylglutaryl-CoA (HMG-CoA) reductase inhibitors, plus combination products
Incretin mimetic agents
Inhaled corticosteroids
Meglitinides, plus combination products
Sulfonylureas, plus combination products
Thiazolidinediones, plus combination products
Sodium-glucose co-transporter type 2 (SGLT2) inhibitors
PMN = primary medication nonadherence.

membership. Based on the recommendation from the QMEP, the measure was endorsed in November 2013 by a vote of the PQA membership.⁴⁶

According to the PQA quality measure, “PMN occurs when a new medication is prescribed for a patient, but the patient does not obtain the medication, or appropriate alternative, within an acceptable period of time after it was prescribed.”⁴⁶

Key Elements of the PMN Measure

Given the areas of variation identified in the literature review, the following elements were considered for the consensus PMN measure:

1. A new prescription is described as one where the same drug or its generic equivalent had not been filled during the prior 180 days.
2. The measurement period of time is 12 months. This is the time when the prescription medication fill pattern is assessed. Thus, the measurement period will require 19 months of pharmacy prescription dispensing data, including 6 months before the measurement period premeasurement period) and 1 month following the measurement period (postmeasurement period).
3. Focus is on chronic medications that fall within measurement priorities outlined in the National Quality Strategy, which sets standards and regulations to measure the quality of health care and its impact on public health. Priority is given for chronic obstructive pulmonary disease, diabetes, dyslipidemia, and hypertension.

A full listing of medication classes that count toward the PQA PMN measure is available in Table 2.⁴⁶

The expert panel also excluded instances where an “appropriate alternative medication” was dispensed. The panel noted that formularies may require a switch to a preferred medica-

tion and, thus, did not classify an instance as PMN if a drug product was dispensed that appears in the same medication class as the product that was e-prescribed. For example, if a statin was e-prescribed, and a separate statin was dispensed, it would not be classified as an instance of PMN. Without exempting appropriate alternative medications, measures are likely to overestimate the extent of PMN.

Consensus PMN Measurement

Denominator. The denominator consists of the number of e-prescriptions for newly initiated drug therapy for chronic medications listed in Table 2 during the measurement period and for patients aged 18 and older. Thus, when using e-prescribing data, all newly initiated prescriptions transmitted through an e-prescribing portal for any medication in Table 2 should be identified and counted.⁴⁶

Several instances are excluded from the denominator. To winnow out medications that are not new, prescriptions dispensed in the preceding 180 days for the same drug were excluded. Similarly, any over-the-counter medication that is e-prescribed was excluded, and duplicate medications, defined as any medication that has been e-prescribed twice in a 30-day period with no prescription fill in between the e-prescriptions, was also excluded. Lastly, pharmacies must have 30 or more e-prescriptions for newly initiated medications in the denominator in order to ensure an adequate sample size for appropriate comparison.⁴⁶

Numerator. The numerator consists of the number of e-prescribing transactions in the denominator where there is no pharmacy dispensing event that matches the patient and the prescribed drug or appropriate alternative drug within 30 days following the e-prescribing event. Thus, patients are given 30 days before being classified as primary nonadherent. If a prescription is reversed and not collected by the patient, it is not considered a dispensing event.

The measure level for the current PMN metric is a pharmacy or network of pharmacies. At this time, the PMN measure is not intended for use by pharmacy benefit managers or health plans, since the required e-prescribing data are not available in administrative prescription drug claims.⁴⁶

Testing Results

Based on the rates calculated in testing, PMN is a significant problem in the community pharmacy setting, with rates varying among pharmacies. In a study by the University of Mississippi, testing revealed that of the e-prescriptions received during the 1-year observation period, an average of 12.2% of new prescriptions (or drug alternatives) were not claimed within the 30-day period.¹⁵ There was significant variability among pharmacies (ranging from 4.9% to 78.6%), as well as among classes of drugs, suggesting that significant opportunities exist for quality improvement.¹⁵ Based on scientific

evidence and these testing results, PQA's QMEP considered the measure to be feasible, important, scientifically valid, and useful for quality improvement.

Notably, the average PMN rate calculated from the consensus measure (12.2%) was lower than many rates observed in the literature review.¹⁵ This lower rate is likely because of the measure's exclusion criteria, which do not count scenarios in which an appropriate alternative medication is dispensed, among other scenarios. In addition, previous studies have shown that e-prescriptions are more likely to be picked up than hard copy prescriptions. Given that the consensus measure is limited to e-prescriptions, this is likely another reason for lower rates than when including hard copy prescriptions.^{47,48}

Measure Limitations

There are several potential limitations to the PMN measure. PMN is only feasible with combined data from e-prescribing transactions and prescription dispensing data because of the need to link prescriptions written with those dispensed. Changes in pharmacy benefit coverage during the measurement period may confound the PMN rates. In addition, the measure is dependent on e-prescribing and does not account for hard copy prescriptions that do not make it to pharmacies. While growing, e-prescribing rates vary regionally, and areas with low current uptake may not prove as useful for measurement. Given the 30-day time frame in which a prescription needs to be filled, the measure assumes that the patient did not receive a medication sample from the physician that would prevent pickup during the measurement period. Lastly, because the unit of analysis is the pharmacy, the measure assumes that the patient did not receive the medication at another pharmacy than the pharmacy it was e-prescribed to.

Conclusions

It is increasingly evident that the public health problem of PMN is widespread. However, the lack of standardized definitions and measures inhibits the ability to establish the true incidence of this problem or to track changes in PMN rates over time. The effort to develop a consensus-based definition and quality measure of PMN is an important step towards consistent measurement of this phenomenon. Because e-prescribing is becoming the leading mode of prescription transmission, it is important to have standardized methods of tracking PMN in order to study the effectiveness of interventions to reduce PMN. Further research should evaluate clinical scenarios in which improvements of PMN is most linked to improved patient outcomes. One scenario in which the PMN measure may be specifically considered is that of hospital discharges, since adherence to discharge medications is an important consideration for hospital readmissions. The endorsed PQA measure outlined in this manuscript provides a consensus-based, tested, and validated method to calculate PMN using pharmacy dispensing data linked to an e-prescribing system.

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