Proportion of Days Covered (PDC) as a Preferred Method of Measuring Medication Adherence

By: David P. Nau, RPh, PhD, CPHQ
Senior Director, Research & Performance Measurement
Pharmacy Quality Alliance

Source: http://www.pqaalliance.org/files/PDCvsMPRfinal.pdf

Background

The Pharmacy Quality Alliance (PQA) has developed, tested and endorsed numerous measures of medication-use quality. PQA members identified medication adherence as an important component of medication-use quality, and therefore PQA sought to endorse a standard method for calculation of medication adherence using data that would be widely available across prescription drug plans and pharmacies. After reviewing the extant literature and conducting tests of draft measure specifications, PQA chose to endorse the method known as Proportion of Days Covered (PDC).

Review of Methods for Adherence Measurement

Numerous methods have been utilized to estimate patients' adherence to a medication regimen. Since PQA sought a method that could be derived from drug claims data, the review of methods focused on the two most common claims-based approaches to estimating adherence, namely the medication possession ratio (MPR) and the proportion of days covered (PDC). PQA first convened a workgroup of experts in 2006 to review the literature and to call upon their experience to select the preferred method of adherence measurement for PQA. This workgroup remains active today within the PQA infrastructure as new therapeutic categories are added to PQA's medication adherence set.

Medication Possession Ratio.

The most commonly used method for claims-based adherence measurement was the medication possession ratio (MPR). As noted by Peterson and colleagues (2007), the MPR has been operationally defined in many different ways. In general, it involves the summation of the "days' supply" of medication refills across an interval; however, researchers have defined the numerator and denominator of the ratio in differing ways, and also report the MPR in varying ways. In some cases, the researchers defined the time interval as the time between the first fill and last fill of a medication. This approach focuses only on the time period that the patient was persistent with the medication, and does not account for a patient's discontinuation of the medication. In other cases, the interval was defined as the time from the first fill until the end of a measurement period (typically, the end of a calendar year). This approach does account for a patient's discontinuation of medication. The numerator of the MPR has also been defined in varying ways. Although the basic calculation is to sum the days supply for the fills of medication, some researchers will exclude the days supply of the final fill while others will include the days for the final fill but cap the ratio at 1.0.

The MPR has sometimes been criticized by some researchers for its likelihood of overestimating the true rate of medication adherence. The overestimation is most likely to occur when the patient receives early refills of the target medications which may result in an "extra fill" during a defined measurement interval. If this situation is not addressed by capping the ratio at 1.0, then any resulting

reports on the average MPR will be skewed upwards. Additionally, since the MPR is often calculated for a class of medications (e.g., all statin drugs), a switch between medications in the same class during the interval, with an overlap of the new drug with the prior drug, will inflate the MPR. The MPR is similarly inflated if the patient takes concurrent medications from within the same class during the measurement period. This occurs frequently with antipsychotic drugs (Martin et al., 2009).

Proportion of Days Covered.

The proportion of days covered (PDC) is a newer method of calculating adherence than the MPR but it has been studied extensively in recent years. One of the first reports of PDC was by Benner and colleagues (2002). Although some variations in PDC calculations exist (Choudhry et al, 2009), the PDC tends to be operationally defined more consistently than is the MPR.

The PDC calculation is based on the fill dates and days supply for each fill of a prescription; however, it differs from the MPR in that the PDC is not a simple summation of the days supply. The denominator for the PDC (at the patient-level) is the number of days between the first fill of the medication during the measurement period and the end of the measurement period. For example, if the measurement period is a calendar year (365 days), and if the patient's first fill of the medication is on day 10 of the year, then the denominator period is 355 days (365 – 10 = 355). This means that a patient who discontinues the medication during the measurement period will still be tracked through the end of the year, and thus the non-persistence is accounted for in the PDC.

The patient-level numerator for the PDC is the number of days covered by the prescription fills during the denominator period. Rather than summing the days supply, the analyst should create time arrays (or vectors) to reflect the dates that were encompassed by each fill. So, a 30-day supply of medication obtained on March 1st would create an array that covers March 1-30. Once the arrays are created for each fill during the denominator period, the analyst can then determine how many of the days in the denominator period were covered by at least 1 array. This method is described in detail, along with SAS program codes, by Leslie (2007). PQA also recommends the method described by Leslie for adjusting the start date of each array when the patient has overlapping arrays for an identical (e.g., generically equivalent) medication. This adjustment is based on the premise that when a patient refills a prescription before the preceding medication supply was exhausted (i.e., early refill), that the patient finishes the supply for the preceding fill before starting the new supply. However, when patients are taking multiple concurrent medications within a broad class (e.g., a class defined as all oral diabetes drugs), then the arrays would not be adjusted since the patient was taking the medications concurrently. Therefore, the PDC would reflect whether the patient had at least one of those drugs available on a particular day (i.e., if they are taking metformin and glipizide on the same day, the day is only counted once as a covered day). This approach is similar to the "at least 1" method for PDC suggested by Choudhry and colleagues (2009).

Comparison of MPR and PDC.

A few studies have directly compared the adherence rates calculated by both MPR and PDC. Martin and colleagues (2009) showed that the PDC will provide a more conservative estimate of the adherence rate in situations when the patient has switches of medications within a class or concurrently uses more than one drug in a class. During 2010-11, FMQAI (a CMS-contracted quality improvement organization) worked with RAND and the University of Florida to compare the MPR and PDC measures across multiple classes of medications in a Medicare population from Florida and Rhode Island (Campbell et al, 2011). We believe the following inferences can be made from the FMQAI analyses: 1) the PDC and MPR will provide nearly identical results when examining adherence to a single drug (e.g., only levothyroxine); 2) the PDC will provide a more conservative estimate of adherence when examining adherence to a class of drugs that are prone to frequent switching and concomitant therapy with multiple drugs within the class (as with antipsychotic drugs);

and 3) adjustment for inpatient hospital stays does not significantly alter the population estimate for adherence, even within a population that is prone to frequent inpatient visits (e.g., schizophrenia patients using antipsychotics).

Using the PDC as a Performance Measure

Performance measures are typically expressed as a rate (numerator divided by denominator) wherein the denominator includes all eligible patients and the numerator is the subset of denominator patients who met a specified parameter. When using PDC as a performance measure for a health plan or pharmacy benefit manager, PQA recommends that the denominator include the patients who were continuously-enrolled in the plan and who used at least one drug from the target class (e.g., statins). The numerator would include the subset of the denominator patients who achieved a high-level of adherence. Based on numerous studies of the relationship of medication adherence and healthcare outcomes, PQA selected 0.8 (or 80%) as the threshold above which the patient can be considered to be highly-adherent for most classes of chronic medications (antiretrovirals for HIV/AIDS being a noted exception to this general rule wherein a 90% threshold was chosen). Consequently, when the PDC is used within a performance reporting program, the "adherence rate" that is reported reflects the percent of patients who achieved a high level of adherence to the target class of drugs.

PDC Calculations as Specified by PQA

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 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, 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 this number by 100 to obtain the PDC (as a percentage) for each patient.
4. Count the number of patients who had a PDC greater than 80% and then divide by the total number of eligible patients.
5. An example of SAS code for steps 1-3 is available at the URL: http://www2.sas.com/proceedings/forum2007/043-2007.pdf

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