



ICD-9-CM to ICD-10-CM/PCS Conversion of AHRQ Quality Indicators: Summary of Challenges with Recommendations for AHRQ

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Executive Summaryⁱ

In January 2009, the Department of Health and Human Services (HHS) published its final rule on the transition from ICD-9-CM to ICD-10-CM and ICD-10-PCS for Health Insurance Portability and Accountability Act (HIPAA) transactions. Under this rule, the standard medical data code sets for coding diagnoses and inpatient hospital procedures will change on October 1, 2013. HIPAA's "Administrative Simplification" standards apply only to electronic transactions involving covered entities (i.e., health plans, health care clearinghouses, and health care providers that transmit any health information in electronic form), but the hospital and health insurance industries are gearing up for complete conversion of all business activities that involve diagnosis or procedure coding on October 1, 2013.

This conversion will have profound effects on the flow of health information throughout the US health care industry. Diagnosis codes accompany virtually all claims for professional and hospital payment to commercial insurers as well as Medicare, Medicaid, and Children's Health Insurance Program agencies. All of the AHRQ Quality Indicators (QIs) will be affected, because diagnosis and procedure codes are used in the numerator specifications for the Prevention Quality Indicators (PQIs), most Patient Safety Indicators (PSIs), most Pediatric and Neonatal Quality Indicators (PDIs), and the subset of Inpatient Quality Indicators (IQIs) related to hospital utilization and volume. Medicare Severity Diagnosis Related Groups (MS-DRGs) and Major Diagnostic Categories (MDCs) derived from ICD-9-CM codes are also used in the denominator specifications of almost all QIs. The Center for Medicare & Medicaid Services' (CMS) classification of "major operating room procedures," based on ICD-9-CM procedure codes, is used in the specifications of "postoperative" PSIs and PDIs. Risk-stratification and risk-adjustment will also be affected, because a variety of ICD-9-CM tools are used for this purpose, such as 3M's All Patient Refined DRGs (APR-DRGs), AHRQ Comorbidity Software, AHRQ's Clinical Classification System, and Jenkins' Risk Adjustment for Congenital Heart Surgery (RACHS). Each of these systems will need to be translated to ICD-10-CM/PCS before a fully operational version of AHRQ QI software can be released.

This impending conversion of diagnosis coding to ICD-10-CM is not a one-time event, but the first in a series of future code set conversions. ICD-11 is currently under development by the World Health Organization (WHO), with endorsement by the World Health Assembly scheduled for 2014. In addition, the American Recovery and Reinvestment Act established the Systematized Nomenclature of Medicine Clinical Terms (SNOMED CT) as one of the standard code sets for use in the exchange of electronic health information. It is therefore anticipated that measures used by the Federal government and endorsed by the National Quality Forum (NQF) will eventually also need to be specified using SNOMED CT.

There are several important differences relevant to quality measurement between ICD-9-CM Volumes 1 and 2 and ICD-10-CM, and between ICD-9-CM Volume 3 and ICD-10-PCS:

- ICD-10-CM diagnosis codes have three to seven alphanumeric characters, versus a maximum of five numeric characters in ICD-9-CM. As a result, there are approximately 68,000 ICD-10-CM diagnosis codes versus only about 14,000 in ICD-9-CM.

- ICD-10-PCS procedure codes have up to seven alphanumeric characters, versus a maximum of four numeric characters in ICD-9-CM. As a result, there are approximately 87,000 ICD-10-PCS procedure codes versus only about 4,000 in ICD-9-CM.
- The substantial increase in the number of codes reflects new dimensions of code specificity that were unavailable in ICD-9-CM. For example, ICD-10-CM includes a modifier for the laterality of relevant conditions. The tabular list of diseases in ICD-10-CM has 22 chapters, compared to 19 chapters in ICD-9-CM.
- ICD-10-PCS has a completely new multiaxial structure that allows precise differentiation of body parts, procedure types, surgical approaches, and devices used.
- Both ICD-10-CM and ICD-10-PCS are designed for expandability to accommodate new codes. Given fewer constraints in coding architecture, the ICD-10-CM/PCS code sets may change more significantly each year than the ICD-9-CM code sets did. In addition, ICD-10-CM is subject to change not only by the Coordination and Maintenance (C&M) Committee, but also by the WHO's ICD-10 Update Reference Committee.

AHRQ will confront a variety of “technical” challenges related to translating QI specifications from ICD-9-CM to ICD-10-CM and ICD-10-PCS, as well as “implementation” challenges related to NQF maintenance and other ongoing initiatives.

The most important technical challenge is that some ICD-9-CM code translations to ICD-10-CM or ICD-10-PCS will be one-to-many. AHRQ will need to apply clinical logic to decide whether all of the “many” codes identified by mapping software should be retained in the definition of the measure. In many cases, this code expansion may enable more precise specification of the relevant clinical concept, at the price of less consistency between the ICD-9-CM and ICD-10-CM/PCS based indicators. Unfortunately, there is little guidance available on how to evaluate differences between the populations identified by different code sets. The ideal testing approach would be to run a measure on a single set of patients coded in both the target and source code sets and then to analyze the results for discrepancies. At present, due to lack of data, this method of validation is impossible.

With respect to implementation, the NQF has adopted the following timeline for code set conversion:

- “January 2010-September 2011: Measure developers/stewards who have begun the conversion process on endorsed or newly submitted measures and have both ICD-9-CM and ICD-10-CM/PCS codes to submit to NQF for review can do so anytime within this timeframe; submissions will be received via the annual update process or the appropriate endorsement-maintenance project.”
- “October 2011-December 2013: Measure developers/stewards will be required to submit both ICD-9-CM and ICD-10-CM/PCS codes for review for all endorsement and maintenance projects. (If a measure is not due for maintenance during this period, then the annual update process will be used instead.)”
- “January 2014: ICD-9-CM codes will no longer be accepted for measure specifications after December 31, 2013.”

Because measure rates and distributions may change in somewhat unpredictable ways after conversion to ICD-10-CM/PCS, AHRQ will also face implementation challenges related to

programs that use the QIs to track performance of the health care system over time, including the National Healthcare Quality Report (NHQR), the National Healthcare Disparities Report (NHDR), My Own Network by AHRQ (MONAHRQ), public report card sponsors including Chartered Value Exchanges and state/local health data agencies, and the Organization for Economic Cooperation and Development's (OECD) Health Care Quality Indicators Project.

Based on the background and conversion challenges described above, we offer the following recommendations for consideration by AHRQ:

- Because of the large number of indicator components that must be converted, and the interdependencies among these components, we recommend that AHRQ undertake a phased conversion process beginning in 2011. "Building blocks" that are incorporated into multiple QIs should be prioritized for early conversion, along with NQF-endorsed measures that are due for maintenance submission in the 4th quarter of 2011 or early 2012. For example, AHRQ should consider prioritizing conversion of exclusions that involve several hundred codes and that impact multiple indicators. Conversions that are likely to require clinical expertise, because of the number of codes involved or the complexity of the underlying clinical concepts should also be prioritized ahead of conversions that appear more straightforward.
- We recommend that AHRQ dialogue with CMS to learn from its three-year experience with MS-DRG conversion, and to employ similar conversion techniques if appropriate. Because MS-DRGs are used in the AHRQ QI logic, the availability of tested ICD-10 MS-DRGs will facilitate conversion of the AHRQ QIs to ICD-10-CM/PCS.
- The OECD's recent conversion of selected PQIs and PSIs to ICD-10 has provided several lessons relevant to the forthcoming conversion challenge. AHRQ should recognize that the complete QI conversion process is likely to lead to both re-examination of the clinical concepts underlying some QIs and proposals to the ICD-10-CM/PCS C&M Committee to ensure that those concepts can be accurately captured in ICD-10-CM/PCS.
- We recommend that AHRQ submit ICD-10-CM/PCS specifications of QIs as part of the triennial maintenance process, starting in October 1, 2011, as NQF will not have the infrastructure to review changes that affect the clinical concepts embedded in a measure through the annual update process. In personal communications, NQF staff leaders have stated that "any measures being reviewed in an endorsement-maintenance project, or otherwise, will be required to submit both ICD-9-CM and ICD-10 CM/PCS codes," starting October 1, 2011 through September 30, 2013. Any endorsed measures not up for maintenance review in a scheduled project prior to October 2013 will be asked to submit ICD-10-CM/PCS codes via the annual update process.
- We recommend that AHRQ establish a standard process for obtaining expert clinical and coding input during conversion, following "best practices" suggested by the NQF. Following these practices will provide structure for AHRQ's contracting process and maximize the likelihood of successful NQF review of re-specified measures. The specific practices include: (1) using a team approach to convene clinical and coding experts in the appropriate clinical domain(s); (2) defining the goal of the conversion process (i.e., to be fully consistent with the intent of the original measure, to take advantage of a more specific code set to form a new version of the measure fully consistent with the original intent, or to change the intent of the measure); (3) using appropriate conversion tools, such as CMS' General Equivalence Mappings (GEMs); (4)

assessing whether the measure has materially changed, based on the intent of the conversion, face validation of the new specification, and empirical testing with dual-coded or longitudinal data; (5) soliciting stakeholder comments; and (6) versioning the updated measure.

- We recommend that AHRQ collaborate with other Federal agencies, including CMS, to commission the creation of data sets independently coded in both ICD-9-CM and ICD-10-CM/PCS.
- For releases after October 1, 2013, AHRQ will need to decide whether to retain ICD-9-CM specifications within the same software modules with current ICD-10-CM/PCS specifications, or whether to refer users to earlier software versions if their data predate October 1, 2013. Clear, precise documentation and user education will need to accompany either choice.
- We recommend that AHRQ develop and promote user support tools that will enable users to understand how to track provider performance before and after October 1, 2013. Such tools could be embedded within the QI software; for example, ICD-9-CM based QI rates estimated using data before October 1, 2013 could be statistically adjusted to improve comparability with rates based on ICD-10-CM/PCS coded data after October 1, 2013. Similarly, AHRQ will need to provide information to users of the NHQR, NHDR, and MONAHRQ about how to interpret temporal trends in QI rates.

Landscape of code set conversion

The 9th revision of the International Classification of Diseases (ICD–9) was originally developed and maintained by the World Health Organization (WHO) to classify causes of death. However, its scope was expanded, through the development of the U.S. clinical modification, to include non-fatal diseases (morbidity). The Centers for Disease Control and Prevention (CDC) developed and maintains “ICD-9-CM Volumes 1 and 2” for diagnosis coding,ⁱⁱ and the Centers for Medicare & Medicaid Services (CMS) maintains “ICD-9-CM Volume 3” for inpatient procedure codes.ⁱⁱⁱ The Department of Health and Human Services (HHS) officially adopted ICD-9-CM in 1979 for morbidity applications, and the system has been used since 1983 to assign Diagnosis Related Groups (DRGs) for Medicare’s Inpatient Prospective Payment System. ICD-9-CM Volumes 1, 2, and 3 were also adopted as Health Insurance Portability and Accountability Act (HIPAA) code sets in 2000 for reporting diagnoses, injuries, impairments, and other health problems and their manifestations, and causes of injury, disease, impairment, or other health problems in standard transactions.^{iv} All of the AHRQ Quality Indicators,^v and many other quality indicators endorsed by the National Quality Forum (NQF), are specified using ICD-9-CM codes.

After the WHO released the 10th revision of the International Classification of Diseases (ICD–10) in 1990, it was adopted for cause-of-death reporting by member states starting in 1994,^{vi} and by the United States in 1999. The National Center for Health Statistics (NCHS) developed the Clinical Modification of ICD-10 (ICD-10-CM) for morbidity coding, following a thorough evaluation by a Technical Advisory Panel and extensive consultation with physician groups, clinical coders, and others to assure clinical accuracy and utility. A draft version of ICD-10-CM and a preliminary crosswalk from ICD-9-CM were published in 1997, revised in 2002 after a public comment period, and pilot tested in 2003.^{vii} The results of this pilot test and subsequent revisions to ICD-9-CM have been incorporated into annual updates of ICD-10-CM.

CMS, formerly the Health Care Financing Administration, began developing ICD-10-PCS in 1990 to address several limitations with ICD-9-CM, Volume 3.^{viii} ICD-9-CM procedure codes have four digits with only 10 fourth-digit codes available in each three-digit category, leading to codes that are insufficiently specific and scattered in unexpected locations across the code set. In addition, ICD-9-CM suffers from inconsistent identification of the procedure approach (i.e., open versus laparoscopic or endoscopic), as different approaches to performing the same procedure were not envisioned when ICD-9-CM Volume 3 was developed in the 1970s. ICD-10-PCS was developed through a contract to 3M Health Information Systems; a Technical Advisory Panel provided review and comments throughout development. After initial release in 1995, pilot testing was conducted in 1996-1997, and a final version with a crosswalk to ICD-9-CM, Volume 3 was released in 1998.^{viii} Since, then ICD-10-PCS has been updated each year to accommodate changes made to ICD-9-CM, Volume 3.

In January 2009, HHS published its final rule on the transition from ICD-9-CM to ICD-10-CM and ICD-10-PCS for HIPAA transactions.^{iv} Under this rule, the standard medical data code sets for coding diagnoses and inpatient hospital procedures will change on October 1, 2013 (instead of October 1, 2011, as originally proposed). HIPAA’s “Administrative Simplification” standards apply only to electronic transactions involving covered entities (i.e., health plans, health care

clearinghouses, and health care providers that transmit any health information in electronic form).^{viii} Although it is therefore possible that ICD-9-CM could continue to be used for other types of activities after October 1, 2013, the hospital and health insurance industries are gearing up for complete conversion of all business activities that involve diagnosis or procedure coding on that date.^{ix}

This conversion will have profound effects on the flow of health information throughout the US health care industry. Diagnosis codes accompany virtually all claims for professional payment to commercial insurers as well as Medicare, Medicaid, and Children's Health Insurance Program (CHIP) agencies. Procedure codes accompany virtually all claims for hospital services, and are used together with diagnosis codes in the construction of Medicare Severity Diagnosis Related Groups (MS-DRGs). The Medicare fee-for-service program, and many other public and private payers, use MS-DRGs to set prospective payments for acute care hospitals. Diagnosis and procedure codes are widely used in proprietary risk-adjustment software, such as 3M's All Patient Refined DRGs (APR-DRGs)^x and Thomson-Reuters' Risk Adjusted Mortality Index and Expected Complication Rate Index.^{xi}

All of the AHRQ Quality Indicators (QIs) will be affected by the conversion to ICD-10-CM and ICD-10-PCS. Diagnosis and procedure codes are used in the numerator specifications for the Prevention Quality Indicators (PQIs), most Patient Safety Indicators (PSIs), most Pediatric/Neonatal Quality Indicators (PDIs), and the subset of Inpatient Quality Indicators (IQIs) related to hospital utilization and volume. These codes, and MS-DRGs and Major Diagnostic Categories (MDCs) derived from them, are also used in the denominator specifications of almost all of the AHRQ QIs. The CMS classification of "major operating room procedures," based on ICD-9-CM procedure codes, is used in the specifications of several "postoperative" PSIs. Risk-stratification and risk-adjustment will also be affected, because a variety of ICD-9-CM tools are used for this purpose, such as APR-DRGs, AHRQ Comorbidity Software, AHRQ's Clinical Classification System, and Jenkins' Risk Adjustment for Congenital Heart Surgery (RACHS). Each of these systems will need to be translated to ICD-10-CM/PCS before a fully operational version of AHRQ QI software can be released.

Finally, this impending conversion of diagnosis coding to ICD-10-CM should not be regarded as a one-time event, but as the first in a series of future code set conversions. ICD-11 is currently under development by the WHO, with endorsement by the World Health Assembly and publication scheduled for 2014.^{xii} The US is involved in the development of ICD-11, as Donna Pickett from the NCHS is leading the Morbidity Reference Group and Harold Pincus from Columbia University is co-leading the Quality and Safety Topic Advisory Group. (Patrick Romano from the QI support team is also involved in the latter Group). The unusually lengthy period between ICD-9 and ICD-10 was a historical aberration; revisions to ICD are more typically released about every 10 years.^{xiii} In addition, regulations implementing the Health Information Technology for Economic and Clinical Health Act (HITECH) provisions of the American Recovery and Reinvestment Act (ARRA) established the Systematized Nomenclature of Medicine Clinical Terms (SNOMED CT) as one of the standard code sets for use in the exchange of electronic health information.^{xiv} SNOMED CT is a clinical vocabulary that covers a vast range of clinical activities and conditions with a high degree of specificity,^{xv} and is designed to facilitate interoperability of electronic health records.^{xvi} It is therefore anticipated that

measures used by the Federal government and endorsed by NQF will eventually also need to be specified using SNOMED CT.^{xvii}

Background on ICD-10-CM and ICD-10-PCS

There are several important differences relevant to quality measurement between ICD-9-CM Volumes 1 and 2 and ICD-10-CM, and between ICD-9-CM Volume 3 and ICD-10-PCS. These differences may be summarized as follows:

Number of codes

ICD-10-CM diagnosis codes have three to seven alphanumeric characters, versus a maximum of five numeric characters in ICD-9-CM. As a result, there are approximately 68,000 ICD-10-CM codes versus only about 14,000 ICD-9-CM diagnosis codes.^{iv} ICD-10-PCS procedure codes also have up to seven alphanumeric characters, versus a maximum of four numeric characters in ICD-9-CM, Volume 3. As a result, there are approximately 87,000 ICD-10-PCS codes versus only about 4,000 ICD-9-CM procedure codes.^{iv}

New dimensions of code specificity

The substantial increase in the number of codes reflects new dimensions of code specificity that were either unavailable or only partially available in ICD-9-CM. For example, ICD-10-CM includes a modifier for the laterality of relevant conditions. This change will make it possible to distinguish left sided events, such as hip fractures, from right sided or bilateral events. Bilateral conditions are often associated with worse outcomes, such as a higher risk of death, than unilateral conditions. The tabular list of diseases in ICD-10-CM has 22 chapters, compared to 19 chapters in ICD-9-CM. The chapter on diseases of the nervous system and sense organs in ICD-9-CM is expanded to three chapters in ICD-10-CM, including diseases of the nervous system, diseases of the eye and adnexa, and diseases of the ear and mastoid process. ICD-10-CM specifies certain conditions in more detail than ICD-9-CM by adding anatomical sites and types of injury (open or closed), health care behaviors, and screening abnormalities and other findings relevant to ambulatory care.^{xviii}

ICD-10-PCS is profoundly different from ICD-9-CM Volume 3, in that it has a multiaxial structure that allows precise differentiation of body parts, procedure types, surgical approaches, and devices used.^{xix} Specifically, the seven characters of an ICD-10-PCS code refer, in sequence, to the ICD chapter, the body system involved in the procedure, the underlying objective of the procedure, the body part(s) involved, the surgical approach, any devices used, and an anatomic qualifier. ICD-10-PCS is designed for completeness (i.e., each “substantially different” procedure has a unique code), expandability, specificity (e.g., Not Otherwise Specified codes have been eliminated), and standard terminology. One implication of this structure is that some ICD-9-CM procedure codes require multiple ICD-10-PCS codes to capture all components of what surgeons may regard as a single procedure.

New code structure allows more room for future updates

Both ICD-10-CM and ICD-10-PCS are designed for expandability to accommodate new codes, as new conditions are recognized and as new procedures are developed. By contrast, a serious limitation of ICD-9-CM, especially Volume 3, has been its lack of expandability. Given fewer constraints in coding architecture, the ICD-10-CM/PCS code sets may change more significantly each year than the ICD-9-CM code sets did.

Another relevant consideration is that the WHO created an ICD-10 Update and Revision Committee to consider and recommend periodic changes to the international version of ICD-10.^{xx} These changes in diagnosis coding will automatically affect ICD-10-CM as well, because country-specific versions of ICD-10 (such as ICD-10-CM) are required to maintain interoperability with the international version. By contrast, ICD-9-CM was entirely under the control of US agencies, so diagnosis coding in the US has not previously been affected by WHO actions.

Conversion challenges

AHRQ will confront a variety of “technical” challenges related to translating QI specifications from ICD-9-CM to ICD-10-CM and ICD-10-PCS, as well as “implementation” challenges related to NQF maintenance, reporting in the National Healthcare Quality Report (NHQR) and National Healthcare Disparities Report (NHDR), and other public reporting initiatives.

The “technical challenges” involved in code set conversion were well summarized in the recent NQF Expert Panel report:^{xvii}

“Mapping—linking concepts and terms from one terminology or classification to another—is the most common method for migrating between code sets. Maps provide an expression of the relationships among the terminologies or classification systems involved and guide the user in deciding how concepts in different terminologies are similar or different. However, mapping between code sets presents some specific challenges. For example, in the migration from ICD-9-CM to ICD-10-CM/PCS, one code can be represented by four or five codes, while some concepts/codes in ICD-9-CM may not exist in ICD-10-CM/PCS or vice versa.

“Furthermore, maps often do not provide a direct one-to-one map between codes, but only identify suggestions; the ultimate selection of similar codes is currently left to the user. This discrepancy makes replicating numerator or denominator populations for measures using different code sets difficult. Additionally, the same two code sets could be mapped differently if the purposes, or use cases, are different. Rule-based maps have an underlying use case and require knowledge of rules and definitions of the system being mapped to (target); the same applies for the rules and definitions of the system being mapped from (source). For instance, if the use case is reimbursement as opposed to quality measurement, there are particular rules that may affect the logic of code mapping...

“However, associating similar codes is not the only step in the migration process. Validation to determine whether the codes selected match the concepts within the measure is also important. Ideally, there should be equivalence of ICD-9-CM and ICD-10-CM/PCS code sets targeting the same patient population, and the code sets should ultimately measure the same thing. In most cases there should be sufficient overlap; however, there is little guidance available on how to evaluate the difference between the populations identified by different code sets. The ideal mechanism for testing for overlap of populations coded by different code sets would be to run the measure on a single population of patients coded in both the target and source code sets (i.e., dual-coded data set) and analyze the results for discrepancies. At present, due to lack of data, this method of validation is impossible. Furthermore, the appropriate tolerance level for population discrepancies is unknown...

“Face validity is addressed when the measure developer and clinical/coding experts reconsider the code list based on clinical concepts. Of the four NQF measure evaluation criteria (importance, scientific acceptability, usability, feasibility), code conversions could have the most significant impact on the scientific acceptability, including reliability and validity. Reliability and validity are generally demonstrated through measure testing data that show the measure is repeatable and accurate. Feasibility, the extent to which the required data are readily available—and retrievable without undue burden—will also be affected in the short term, at least until data coded in the code set become widely available.”

In practice, the most important challenge that AHRQ will face is that the majority of ICD-9-CM code translations to ICD-10-CM or ICD-10-PCS will be one-to-many translations. AHRQ will need to apply clinical logic to decide whether all of the “many” codes identified by mapping software should be retained in the definition of the measure. In many cases, this code expansion may enable more precise specification of the relevant clinical concept, at the price of less consistency between the ICD-9-CM and ICD-10-CM/PCS based indicators. In other words, code set conversion provides an opportunity for AHRQ to improve the positive predictive value (i.e., accuracy) of its QIs by ensuring better correspondence between the clinical concept of interest and the codes used to measure that concept. A research team from Alberta compared the accuracy of comorbidity measures after conversion from ICD-9-CM to ICD-10-CA (i.e., the Canadian version of ICD-10, which offers more specificity than ICD-10 but generally less specificity than ICD-10-CM), using a dual-coded data set with 4,008 randomly selected adult records from four teaching hospitals.^{xxi} Among 32 evaluated comorbidities, sensitivity comparisons generally favored ICD-9-CM (i.e., 7 of 8 conditions with significantly [$p<0.01$] different sensitivity between the two code sets) whereas specificity comparisons generally favored ICD-10-CA (i.e., 2 of 2 conditions with significantly different specificity between the two code sets).

With respect to implementation challenges, the NQF has implemented the following timeline for code set conversion, based on the report submitted by its Expert Panel:

- “January 2010-September 2011: Measure developers/stewards who have begun the conversion process on endorsed or newly submitted measures and have both ICD-9-CM and ICD-10-CM/PCS codes to submit to NQF for review can do so anytime within this timeframe; submissions will be received via the annual update process or the appropriate endorsement-maintenance project.”

- “October 2011-December 2013: Measure developers/stewards will be required to submit both ICD-9-CM and ICD-10-CM/PCS codes for review for all endorsement and maintenance projects. (If a measure is not due for maintenance during this period, then the annual update process will be used instead.)”
- “January 2014: ICD-9-CM codes will no longer be accepted for measure specifications after December 31, 2013.”^{xxvii}

The purpose of this timeline is to ensure that all NQF-endorsed measures are available in ICD-10-CM/PCS by the end of 2013 (i.e., within one quarter of the national implementation date) while distributing the burden on both measure stewards and NQF staff and panel members over a reasonably long period of two years. This timeline also allows measure stewards to prioritize their conversion efforts, focusing initially on measures that are due for maintenance submission in the 4th quarter of 2011 or early 2012. Another important goal of this timeline is to ensure that the greatest possible percentage of measure conversions is reviewed through the maintenance process, rather than through the annual update process. The NQF annual update process does not have the staff or expert panel support to consider proposed conversions that exploit the enhanced specificity of ICD-10-CM/PCS to refine the clinical concepts embedded within an endorsed measure. Accordingly, measure maintenance submissions after October 1, 2011 without ICD-10-CM specifications may not be reviewed until those specifications are provided.

Because measure rates and distributions may change in somewhat unpredictable ways after conversion to ICD-10-CM/PCS, AHRQ will also face implementation challenges related to programs that use the QIs to track performance of the health care system over time. These programs include:

- The NHQR and NHDR include tables and graphs that use selected AHRQ QIs to track health care system performance, nationally and within states, over time.^{xxii} These presentations may be misleading if they cross October 1, 2013.
- My Own Network by AHRQ (MONAHRQ) allows users to generate report cards from their own hospital administrative data to track health care system performance over time.^{xxiii} These presentations may also be misleading if the data cross October 1, 2013.
- Many other public report card sponsors, including Chartered Value Exchanges supported by AHRQ, state health data agencies and organizations, and state Medicaid and CHIP agencies, publish tables and graphs that use selected AHRQ QIs to track hospital or health care system performance over time. These presentations, which often trigger local media interest,^{xxiv} may also be misleading if the data cross October 1, 2013.
- As a supporter of the Organization for Economic Cooperation and Development’s (OECD) international Health Care Quality Indicators Project,^{xxv} AHRQ contributes HCUP data to enable international comparisons of hospital and health care system performance. Given that countries transitioned from ICD-9 or ICD-9-CM to ICD-10, or country-specific versions thereof, at different times, comparisons of national health care system performance in time periods prior to October 1, 2013 may be biased by code set differences.^{xxvi}

Recommendations to AHRQ

Based on the background and conversion challenges described above, we offer the following recommendations for consideration by AHRQ:

Start early with a subset of measures and “building blocks”

Because of the large number of indicator components that must be converted, and the interdependencies among these components, AHRQ should undertake a phased conversion process beginning in 2011. In particular, “building blocks” that are incorporated into multiple QIs should be prioritized for early conversion, along with NQF-endorsed measures that are due for maintenance submission in the 4th quarter of 2011 or early 2012 (see below). For example, AHRQ Comorbidity Software is used for risk-adjustment in the PSI module, and AHRQ Clinical Classification Software is used for risk-adjustment in the PDI module. Several PSIs have shared or overlapping exclusions for conditions such as trauma and infections (present on admission). *We recommend that AHRQ prioritize conversion of these exclusions that involve several hundred codes and that impact multiple indicators. Conversions that are likely to require clinical expertise, because of the number of codes involved or the complexity of the underlying clinical concept(s), should also be prioritized ahead of conversions that appear more straightforward.*

Build on work that has already been done by CMS and OECD

CMS began converting the ICD-9-CM based Medicare Severity Diagnosis Related Groups (MS-DRGs), version 26.0, to ICD-10-CM/PCS in 2008-09, as an exercise to evaluate the effectiveness of the General Equivalence Mappings (GEMs) for converting applications that use ICD-9-CM. Since then, CMS has updated the ICD-10 MS-DRGs to version 27.0 MS-DRGs, and the version 28.0 update is underway. CMS has described a four step process for this conversion: “(1) the 2011 version GEMs are used to translate the approximately 500 ICD-9-CM code lists comprising the MS-DRGs to comparable lists of ICD-10-CM/PCS codes; (2) initial tests ensure that all ICD-10-CM codes are assigned to an MDC and all ICD-10-PCS codes are represented in the logic; (3) the draft converted lists are analyzed for issues, (e.g., list assignment conflicts, necessary ICD-10-PCS clusters) and all issues are resolved; (4) the converted lists receive additional clinical review as needed.”^{xxvii} *We recommend that AHRQ dialogue with CMS to learn from its three-year experience with MS-DRG conversion, and to employ similar conversion techniques if appropriate. Because MS-DRGs are used in the AHRQ QI logic, the availability of tested ICD-10 MS-DRGs will also facilitate conversion of the AHRQ QIs to ICD-10-CM/PCS.*

Another process that AHRQ can learn from is the OECD’s conversion of most AHRQ PSIs and PQIs to the WHO version of ICD-10, in collaboration with the International Methodology Consortium for Coded Health Information (IMECCHI).^{xxviii} This conversion was accomplished through a four step process: (1) investigators in Germany and Australia independently translated the ICD-9-CM definition of each indicator to ICD-10, and tested the resulting translation in country-specific data; (2) these two translations were used to create a combined list of codes linked to the definition of an indicator by either team, along with a list of candidate codes that were considered but rejected by either team; (3) 21 physician health services researchers and coding professionals from seven countries independently reviewed and voted on whether each

code on this combined list matched the original clinical concept in ICD-9-CM; (4) at a face-to-face meeting, members of this Working Group discussed codes for which consensus was not reached in the previous step; six reviewers with the most relevant experience (including Patrick Romano from the QI Support Team) rated each code through a two-round modified Delphi process after consultation with an ICD-10 expert coder from the WHO Update and Revision Committee. Indicators that rely on procedure codes, such as PSI #04- Postoperative Wound Dehiscence and PSI #10- Postoperative Physiologic and Metabolic Derangement, were not included in this conversion effort because each country currently uses its own procedure classification system.^{xxix}

Several lessons were learned through this OECD process.^{xxviii} First, many ICD-9-CM codes could be mapped directly to a single ICD-10 code. However, in other cases, an ICD-9-CM code did not map exactly, requiring clinical judgment to evaluate the accuracy of the match. Some ICD-10 codes were identified that had no match in ICD-9-CM but met the clinical definition of a PSI (e.g., “anesthesiology devices associated with adverse incidents; surgical instruments, materials and devices, including sutures). In other cases, the clinical specificity achievable in ICD-9-CM could not be matched in ICD-10 (e.g., location and staging of pressure ulcers), suggesting the need for further modification of ICD-10-CM to capture PSI-relevant clinical concepts. In other words, *the complete QI conversion process is likely to lead to both re-examination of the clinical concepts underlying some QIs and proposals to the ICD-10-CM/PCS Coordination and Maintenance Committee to ensure that those concepts can be accurately captured in ICD-10-CM/PCS.*

Submit updates through NQF maintenance process

The NQF timeline for code set conversion mandates that all endorsed measures be available with ICD-10-CM/PCS specifications by December 31, 2013. The NQF timeline is presented in a figure at the end of this report,^{xvii} although this “Figure 2” incorrectly refers to the 2013 conversion as “to ICD-9-CM/PCS.” Any measures specified with ICD-9-CM that do not also have ICD-10-CM/PCS specifications by that date will lose NQF endorsement. However, AHRQ will need to start submitting ICD-10-CM/PCS specifications as early as October 1, 2011 (based on the established measure maintenance schedule), as NQF will not have the infrastructure to review changes that affect the clinical concepts embedded in a measure through the annual update process. In personal communications (February 2011), NQF staff leaders have stated:

- Beginning in October 2011, “any measures being reviewed in an endorsement-maintenance project, or otherwise, will be required to submit both ICD-9-CM and ICD-10 CM/PCS codes.”
- “Any endorsed measures not up for maintenance review in a scheduled project prior to October 2013 will be asked to submit ICD-10-CM/PCS codes via the annual update process.”
- “During the Oct 2011-Oct 2013 timeframe, ad hoc reviews of measures with significant coding changes (i.e. changing intent) that cannot be slotted in an upcoming project, will be considered.”

As described above, inexact mapping of some ICD-9-CM codes to ICD-10-CM/PCS will necessarily affect the clinical concepts embedded in some measures; these situations may not be apparent until AHRQ actually starts to convert each measure. For these reasons, *we recommend*

that AHRQ plan to start submitting updates as early as October 1, 2011, in accord with the measure maintenance cycle established by NQF. If certain “building blocks” of risk-adjustment, such as the AHRQ Comorbidity Software, are not available in ICD-10-CM by the time of maintenance submission, those conversion specifications can be submitted later (as they are not central to the definition of an endorsed measure).

Establish standard process for obtaining expert input

The NQF report describes a recommended process for measure stewards to use in converting their measure specifications from ICD-9-CM to ICD-10-CM/PCS. These “best practices” are based on the National Library of Medicine’s (NLM) Basic Mapping Project assumptions,^{xxx} which are intended to enhance reproducibility in mapping between code sets. The NLM assumptions that apply here include:

1. “Target users of the map must participate in its design and testing to ensure that it is fit for its intended purpose...”
2. “Production of mappings will be an iterative process, which must involve testing, validation, and use in real world settings...”
3. “The creation of mappings is likely to suggest ways to improve the vocabularies on both ends of the map.”

We recommend that AHRQ and its contractors adopt the “best practices” described below whenever possible, because following these practices faithfully will provide structure for the contracting process and maximize the likelihood of successful NQF review of re-specified measures.

- **“Convene Clinical and Coding Experts:** ...use a team approach that involves experts in the code sets and the appropriate clinical domain. The team should be used to identify specific areas where questions of clinical comparability exist, evaluate consistency of clinical concepts, and ensure appropriate conversion. Experts are needed in both the source and the target code set (e.g., ICD-9-CM and ICD-10-CM/PCS). Clinical expertise should be in the care setting represented by the clinical domain for the measure and may require specialized knowledge in some clinical areas. Multiple individuals or subteams are required to permit triangulation of code conversions, with adjudication of differences.”^{xvii}
- **“Determine Intent:** When converting a quality measure from ICD-9-CM to ICD-10-CM/PCS, rather than doing a code-to-code conversion, a measure developer may choose to take advantage of the added granularity and specificity [that] ICD-10-CM/PCS offers, potentially making the updated measure inherently different... [T]he most ideal way to convert code sets for quality measures would be to examine the original intent of the measure and select codes directly from the target code set to define the concepts rather than relying on mapping alone. The intent... also will need to be described during the NQF submission process...: (1) measure steward’s goal was to convert this measure to a new code set, fully consistent with the intent of the original measure; (2) The measure steward’s goal was to take advantage of the more specific code set to form a new version of the measure, but fully consistent with the original intent; (3) The measure steward has

changed the intent of the measure. This measure would be considered “new,” and the original measure should be considered for retirement.”^{xvii}

- **“Use Appropriate Conversion Tool:** When converting from ICD-9-CM to ICD-10-CM/PCS, for example, maps such as GEMs^{xxx} can be useful for narrowing the choice of target codes...”^{xvii}

- **“Assess for Material Change:** Measure developers should determine during the process whether the measure has materially changed based on the intent of the updated measure and any testing that has been performed. NQF has previously defined a material change as a change in relative ranking... This step is intended to address the comparability of the converted measure (using ICD-10-CM/PCS) to its predecessor (using ICD-9-CM). Measure information should indicate which specifications in the measure have changed (i.e., exclusions, code changes) and explain the expected impact of these changes on the previous trend line for the measure. For existing measures undergoing coding updates and maintenance, the extent to which the population identified with the new code set overlaps with that identified in the old code set should be assessed, if possible. Measure sponsors also should assess, if possible, whether the conversion results in rates that are similar within defined tolerances. The type of data available for testing will determine the specific validation approach to be used:
 - i. ...Ideally, the measure steward will have access to data that are coded in both the original (source) code set and the new (target) code set. If the measure results using both the source and target code sets are the same, then the measure would be considered to be unchanged. If the measure results are not the same, then an explanation should be provided as to why the measure is yielding different results (e.g., change in performance versus change in measure definition).
 - ii. Direct testing and validation... may not be possible if a test data set in both the source and target code sets is not available. In this situation, the developer/steward should rely principally on face validity, based on following the recommended code conversion process previously described, which includes the use of experts in the code sets and the appropriate clinical domain. In this case, testing may be deferred until the next endorsement maintenance cycle for the measure.
 - iii. Two additional recommended approaches to validation of code set conversions, when a dual-coded data set is not available, include: (1) validating the category of information used in the measure (e.g., diagnosis, procedure, medication) as it is coded with the new code set, using original data source review as a gold (criterion) standard... (the validity) of the conversion is established by showing that the post-conversion data are highly accurate, relative to a criterion standard; and (2) demonstrating consistency over time through longitudinal analysis of results based on old and new code sets, to identify expected or unexpected changes. This approach also can be used to demonstrate consistency across geographic areas or payers, where one data set is coded using the old code set and a

contemporaneous data set from a different area or payer is coded using the new code set.”^{xvii}

- **“Solicit Stakeholder Comments:** Conversion to new code sets requires involvement of many stakeholders; measure developers should solicit comments from a wide audience for additions and deletions, and with specific attention to new codes.”^{xvii}
- **“Version the Updated Measure:** Measures with coding updates should be identified by version. Different versions of measures may be used longitudinally for various purposes but may not be exactly comparable.”^{xvii}

Facilitate development of a dual coded data set for testing

The NQF Expert Panel on Coding Maintenance recommended that dual-coded data sets in ICD-9-CM and ICD-10-CM/PCS should be created and made available to measure developers for testing the validity of code conversions. CMS sponsored a similar effort for nursing homes during its transition from Minimum Data Set (MDS) 2.0 to 3.0.^{xxxii} According to the Expert Panel, the desirable attributes of such data sets include: “(1) matching of claims data encompassing both paper and electronic data with externally coded data in ICD-9-CM and ICD-10-CM/PCS; (2) data representing at least two years to permit longitudinal tracking of patients and application of criteria based on prior utilization; (3) representation of multiple settings of care, not just hospitals; (4) diverse data sets that would cover all payers and age groups (Medicare, Medicaid, and commercial populations); and (5) availability at no charge to all measure developers and implementers for testing purposes.”^{xvii} The Panel recognized that creating dual coded data would be a challenging undertaking for any one entity and recommended that it be accomplished through a collaboration of organizations with access to the necessary resources. Federal (e.g. AHRQ, CMS) and state agencies and payers should consider contributing to such an effort, as appropriate, to have data available related to children, obstetrics, Medicaid and CHIP enrollees, Veterans Health Administration facilities, and psychiatric/mental health facilities. *We recommend that AHRQ collaborate with CMS and other Federal agencies to commission the creation of such data sets, at least for Medicare fee-for-service beneficiaries (i.e. through the existing infrastructure of Clinical Data Abstraction Centers).*

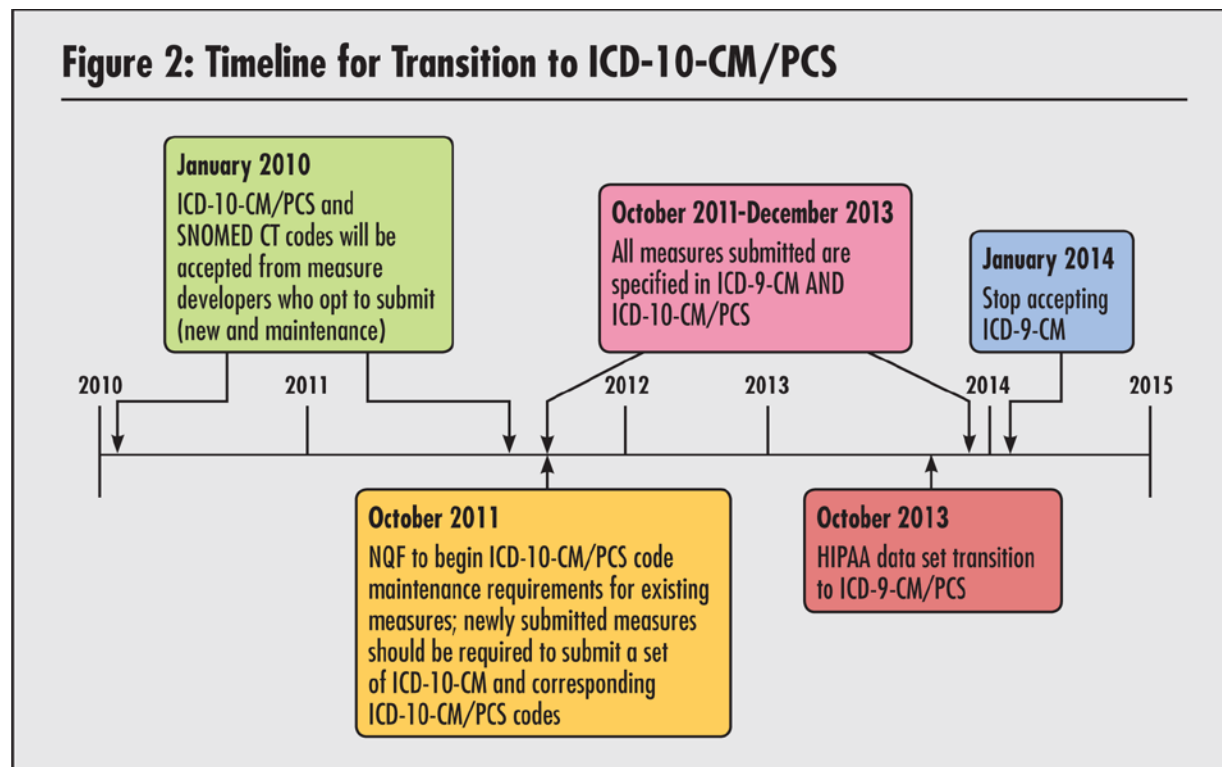
Develop methodologies for facilitating trend analyses

For all of the reasons described above, QI users may be surprised by sudden changes in QI rates associated with code set conversion in October 2013. In addition, QI users may be disappointed to lose the backward compatibility that has been an ongoing feature of QI software. In other words, each version of the QI software has been designed for applicability not only to current data, but also to previous ICD-9-CM coded data (for at least five years). *For releases after October 1, 2013, AHRQ will need to decide whether to retain ICD-9-CM specifications within the same software modules with current ICD-10-CM/PCS specifications (even though those ICD-9-CM specifications will no longer be NQF-endorsed), or whether to refer users to earlier*

software versions if their data predate October 1, 2013. Clear, precise documentation and user education will need to accompany either choice.

Related AHRQ programs that use the QIs to facilitate public reporting, such as MONAHRQ and support for Chartered Value Exchanges, will require some retooling to ensure that stakeholders understand the implications of code set conversion for public reporting. Simple pooling of data coded in different code sets before and after the transition date will be problematic, given that indicator specifications and risk-adjustment methods will change. Displaying trend lines for hospital performance before and after the transition date may also be problematic, especially because some hospitals may lag behind others in establishing proficiency in ICD-10-CM/PCS coding. For example, Australian researchers demonstrated a substantial increase in the reported rate of PSI 3 (Pressure Ulcer) after the switchover from ICD-9-CM to ICD-10-AM, the Australian clinical modification of ICD-10.^{xxxiii}

Accordingly, we recommend that AHRQ develop and promote user support tools that will enable users to understand how to track provider performance before and after October 1, 2013. Such tools could conceivably be embedded within the QI software; for example, ICD-9-CM based QI rates estimated using data before October 1, 2013 could be statistically adjusted to improve comparability with rates based on ICD-10-CM/PCS coded data after October 1, 2013. Similarly, AHRQ will need to provide information to users of the NHQR and NHDR about how to interpret temporal trends in QI rates before and after October 1, 2013. These efforts should be informed by AHRQ's previous efforts to address comparability between users with and without "present on admission" data,^{xxxiv} and by NCHS' efforts to estimate and disseminate cause-specific "comparability ratios" for cause of death coding across ICD versions.^{xxxv}



This “Figure 2” is adapted from National Quality Forum, *ICD-10-CM/PCS Coding Maintenance Operational Guidance: A Consensus Report*, Washington DC, 2010.^{xvii} Please note that the box marked “October 2013” should say “HIPAA data set transition to ICD-10-CM/PCS.”

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