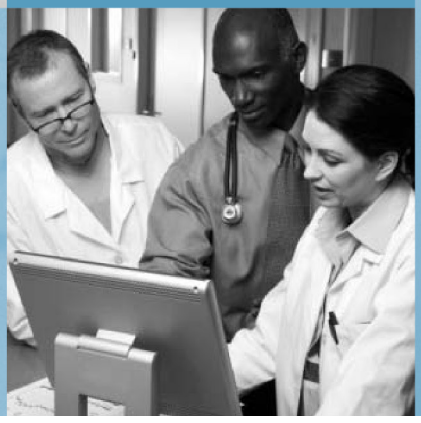
Health IT Utilization



Driving Quality—A Health IT Assessment Framework for Measurement

A CONSENSUS REPORT

National Quality Forum

The National Quality Forum (NQF) operates under a three-part mission to improve the quality of American healthcare by:

- building consensus on national priorities and goals for performance improvement and working in partnership to achieve them;
- endorsing national consensus standards for measuring and publicly reporting on performance; and
- promoting the attainment of national goals through education and outreach programs.

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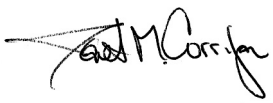
Foreword

THE U.S. HEALTHCARE SYSTEM is burdened by high costs and inefficient delivery models. Shortcomings in quality information available to providers and consumers contribute to these challenges. Health IT is considered a promising tool that can provide information to healthcare stakeholders, allowing them to make care decisions based on individual preferences and evidence-based practices, and in doing so, improve quality, safety, and efficiency of the health system. As policy makers, providers, and payers increasingly look to health IT to provide actionable information, it is critical to develop an infrastructure that also enables the collection of comparable information on how and when health IT systems are used.

In 2008, the National Quality Forum (NQF) endorsed nine structural voluntary consensus standards, developed by the Health IT Structural Measures Panel, to assess and encourage clinician adoption of health IT. NQF's endorsement of these standards was an initial start for health IT adoption to help improve quality of care. Next, NQF recognized the need to advance understanding of the specific features and functions of health IT that improve quality.

In January 2010, NQF convened the Health IT Utilization Expert Panel, which included broad representation from the healthcare community, to develop the Health IT Utilization Assessment Framework. The framework, described in detail in this report, is designed to help define, understand, and measure how providers use health IT systems. It also identifies important and common approaches for how we should build health IT systems to capture information about their meaningful use and lays a foundation for the development of health IT usage measures.

NQF thanks the Health IT Utilization Expert Panel members, the Expert Panel's Chair, Blackford Middleton, Vice Chair Eric Schneider, and NQF members for their contributions to developing an infrastructure that, in the future, will make information widely available and significantly improve the quality of care delivered in this country.



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Executive Summary

HEALTH INFORMATION TECHNOLOGY (HEALTH IT) offers great promise to improve healthcare quality, safety, and affordability, and the health of the population. Passage of the recent Health Information Technology for Economic and Clinical Health Act (HITECH) in the American Recovery and Reinvestment Act (ARRA) is expected to significantly drive increased adoption of health IT systems. As health IT system use becomes more widespread, it will be necessary to assess whether the tools are effectively and "meaningfully" used. Although some evidence shows use of health IT systems can decrease errors of omission and commission and reduce unnecessary, ineffective, and harmful care, other evidence is less convincing. Assessing and tracking the performance of health IT systems requires measures of health IT systems, including measures of functions and capabilities, as well as *when* and *how* health IT systems are used.

This report is based on the work of the National Quality Forum's (NQF's) Health Information Technology Utilization Expert Panel (Expert Panel). Specifically, the report examines, defines, and organizes the data needed to measure effective health IT use to better understand how health IT tools can improve the efficiency, quality, and safety of healthcare delivery. The report builds on the work of NQF's Health Information Technology Expert Panel (HITEP), which was established to accelerate efforts to ensure health IT will effectively support quality measurement. The Health IT Utilization Expert Panel expands on HITEP's Quality Data Set (QDS), a framework developed to clearly define concepts used in quality measures and clinical care to drive the use of quality measurement based on information available from an electronic health record (EHR).

The Expert Panel developed the *Health IT Utilization Assessment Framework* (framework). The framework is designed to define a method for expressing data that can be captured by health IT systems to understand and measure their effectiveness. Health IT use assessment can provide valuable information for most healthcare stakeholders, including the quality improvement community, the health IT vendor community, providers, payers, purchasers, and policymakers. The framework is expected to support effective and meaningful EHR use assessment by:

- enabling development of measures of effective health IT use;
- understanding capabilities of the EHR and other health IT tools to meet meaningful use requirements;
- assessing unintended consequences of health IT usage;
- enabling information capture as a byproduct of clinical workflows;

- enhancing collaboration between health IT vendors, purchasers, implementers, and certifying bodies by encouraging the use of common health IT assessment strategies;
- enabling determination of high-priority health IT usage that supports certification of real-world implementations; and
- encouraging clinical effectiveness research regarding unintended consequences of health IT usage as well as research to determine effective health IT utilization.

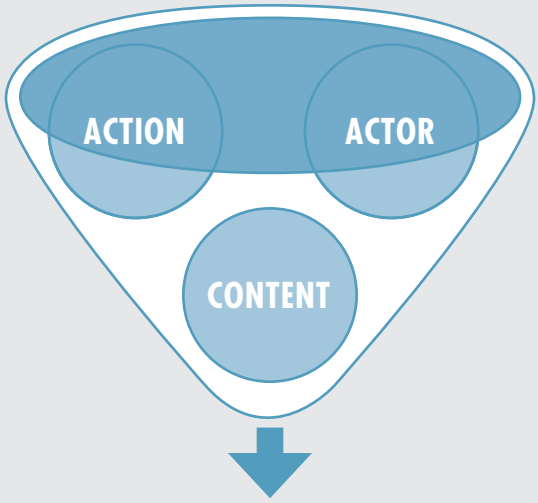
This framework provides a unique approach to identifying and measuring: 1) the use of health IT applications; 2) whether the workflow (driven by the system's user interface) occurs as designed; and 3) that such use improves care processes, quality, and safety. The report provides four examples: 1) measurement of clinical decision support (building on the work of the NQF Clinical Decision Support Expert Panel), 2) e-prescribing, 3) order sets, and 4) clinical summaries. Each of the examples is modeled based on metrics in the 2010 Final Rule for the EHR incentive program.

This report is only a first step in establishing a standard methodology to measure the use of health IT systems to identify their effective use. Currently, standards exist only for EHR certification, not for assessing effective health IT use. The meaningful use EHR incentive program and certification requirements for interoperability (sending information from one system to another) provide the incentive, but a standard mechanism to determine appropriate utilization of EHRs does not yet exist. Standards are needed to assess EHR use; without them consistency and comparability are not guaranteed. The framework described in this report will significantly inform standardization efforts with respect to structural components of EHRs and other clinical information systems. Such standardization will allow for clearly defined measures with reliable, consistent, and achievable results while reducing the effort required to assess clinical system effectiveness by system vendors, implementers, or users of such systems. Performance measures of health IT systems using these standard user interactions and transactions will enable clinical effectiveness research, help determine unintended consequences of health IT, and evaluate the real-world usability of products and applications.

Health IT Utilization Assessment Framework Refinement and Evolution Recommendations

1. NQF should incorporate the *Health IT Utilization Assessment Framework* into the QDS Model and continue to manage its evolution with public consensus as existing standards and quality measures evolve. Specifically, the framework should be incorporated as a new QDS category, listing each of the actions identified in this report in the *action-actor-content* triplet (Figure 1).
2. The Department of Health and Human Services should consider the adoption of health IT utilization metrics as an EHR certification requirement; specifically, adopt the capture, logging, and evaluation by EHRs of each of the 20 triplets identified in this report as EHR certification requirements.
3. The health IT use data requirements should be incorporated into standard frameworks such as the HL7 EHR Functional Model to encourage further evaluation and efforts by the appropriate standard development organizations (SDOs).

Figure 1: The Health IT Utilization Assessment Framework



Determining usage of health IT requires identifying the *action* expected, the *actor* performing the *action*, and the *content* on which the action is taken. All three components are required to more accurately and precisely understand the use of health IT applications.

4. Standards development organizations, professional societies, workflow planners, and other key stakeholders and entities should collaborate to standardize, harmonize, and identify definitions of and gaps in roles for all users of clinical applications and health IT systems.
5. NQF should pursue a call for measures of health IT utilization.

As health IT use quality measures are conceptualized and developed, the *Health IT Utilization Assessment Framework's* data requirements provide clear guidelines for the information necessary and potentially available. The work of the Health IT Utilization Expert Panel advances the focus from adopting health IT to appropriately and effectively using health IT. This work signals to the healthcare community that adoption of a health IT system alone is not sufficient to promote greater efficiencies in care and improve health outcomes; rather, a commitment to effective health IT use and to monitoring, measuring, and reporting this use is necessary to achieve these goals.

Background and Introduction

Background

HEALTH INFORMATION TECHNOLOGY (HEALTH IT) offers great promise to improve the quality, safety, and affordability of healthcare, and the health of the population. The Office of the National Coordinator for Health Information Technology (ONC) projected that electronic health record (EHR) adoption can reduce healthcare costs by 20 percent per year.[1] Although some have questioned that goal, providers over the past several years have increasingly implemented health IT systems (e.g., EHRs, electronic prescribing) in inpatient and ambulatory settings. Passage of the recent Health Information Technology for Economic and Clinical Health Act (HITECH) in the American Recovery and Reinvestment Act (ARRA) is expected to significantly drive adoption of health IT systems.[2] HITECH will provide more than $20 billion over the next five years to help providers become "meaningful" users of health IT. For health IT systems to fulfill their promise, however, they *must* support patient care directly—through clinical decision support and quality improvement—and support multiple uses of health information—through public reporting, public health surveillance, and clinical effectiveness research.

As health IT system use becomes more widespread, it will be necessary, through the development and use of metrics, to assess whether the tools are being effectively and "meaningfully" used. Although some evidence shows the use of health IT systems can decrease errors of omission and commission and reduce unnecessary, ineffective, and harmful care, other evidence is less convincing.[3-9] Identifying and developing measures of health IT activities and tracking performance on these metrics will be critical to assessing effective health IT use and driving more appropriate use where necessary. Measuring the quality of health IT use also requires an understanding of the system's functions and the capabilities that track and monitor *when* and *how* it is used.

In January 2010, the National Quality Forum (NQF) convened the Health Information Technology Utilization Expert Panel (Expert Panel; see Appendix A for list of members). The goal of the Expert Panel was to examine, define, and organize the information needed to measure effective health IT use to better understand how health IT tools are used and ultimately to improve the efficiency, quality, and safety of healthcare delivery.

This Expert Panel builds on the work of NQF's Health Information Technology Expert Panel (HITEP). NQF convened HITEP, with support from the Agency for Healthcare Research and Quality (AHRQ), to accelerate ongoing efforts defining how health IT can evolve to effectively support quality measurement. HITEP's output, the Quality Data Set (QDS), is a framework that clearly defines concepts used in quality measures and clinical care and is intended to enable quality measurement based on the information available from an EHR.

In 2007, the first HITEP (HITEP I) developed and released a framework to facilitate the development, use, and reporting of quality measures from EHR systems. The report that followed, *Recommended Common Data Types and Prioritized Performance Measures for Electronic Healthcare Information Systems,* proposed 11 data categories and 39 data types for a set of 84 high-priority quality measures to enhance capabilities for the electronic capture of data for quality measurement. In its second report, *Health Information Technology Automation of Quality Measurement: Quality Data Set and Data Flow,* the second HITEP (HITEP II) developed the QDS to enable automated, patient-centric, longitudinal quality measurement. The QDS is intended to serve as a centralized, maintained repository of data requirements (concepts, data types, data elements, and code lists) associated with quality measures and data definitions that provide unambiguous meaning for each data element in a quality measure.

HITEP I and II developed a structure for quality measure data types and data flow (i.e., the QDS). HITEP used *data type* to define a concept (e.g., medication) and how it was expected to be used (e.g., administered, ordered, etc.). HITEP further defined how that information is captured within a clinical workflow with *data flow* attributes:

- *source* (e.g., the originator of the information, e.g., a clinician, patient, or device);
- *recorder* (e.g., a clinician, patient, or device and possibly different from the source);
- *setting* (e.g., hospital, home, ambulatory setting); and
- *health record field* (e.g., location in the EHR where the information should reside).

These data flow attributes define information about the data captured to enable a more specific understanding of the clinical care process. They also enable clinical decision support (CDS) workflows to more clearly specify expected data sources, recorders, and settings. The QDS Model exists as a dynamic model that will expand and undergo versioning to support future needs for measurement, CDS, and care delivery.

The QDS has been incorporated into the Healthcare Information Technology Standards Panel (HITSP) updates to the Quality Interoperability Specification, a standard that encodes electronic quality measure data, and the HITSP components to which it refers.[10] The ONC created HITSP in 2005 to promote interoperability and the exchange of information between electronic health systems. HITSP specifically identified an electronic source and a standard code set for each data category and data type in the HITEP report. Leveraging the Quality Interoperability Specification will allow the QDS to become part of health information exchange standards used by the health IT community.

Additional information about user interactions with the EHR is necessary to determine the meaningful use of functionalities, such as electronic prescribing (e-prescribing) and CDS. Specifically, this will allow heath IT system users to use the tools in a manner that facilitates adherence to evidence-based care, directly supports better patient care, and improves outcomes.[11] The QDS supports detailed quality measure specification for use in EHRs, but currently there is no standard approach to evaluating whether and how EHR functions are used. The approach to monitoring EHR activities has been primarily focused on transactions that can produce claims for payment, or those needed to track the use of consumable (e.g., medications) and durable use (e.g., IV pumps, ventilators). The Health Insurance Portability and Accountability Act (HIPAA) has encouraged auditing of activities within the EHR, although such functions are mostly used to determine access and management of personal health information (PHI).[12] Auditing is essential to managing privacy and security, but it is not sufficient to determine the utilization of EHR functions within the usual process of care.

Introduction

This report describes the Health IT Utilization Expert Panel's approach to developing a framework to describe the information required to measure effective health IT utilization and presents the Expert Panel's final output, the *Health IT Utilization Assessment Framework* (framework) itself. The framework is designed to help define a method for expressing data that can be captured by health IT systems to understand and measure their usage.

Better understanding of how and what health IT features and functions providers actually use is valuable information for most healthcare stakeholders, including the quality improvement community, the health IT vendor community, payers, purchasers, providers, and policymakers alike.

For the quality improvement community, the framework can provide specific data elements to inform future performance measures and practices, including those to identify unintended consequences of health IT usage. For the health IT vendor community, the framework encourages information capture about the use of health IT as a byproduct of clinical workflows. By defining and identifying such information, the framework will also provide qualitative and quantitative information to support more effective implementation and analysis of usage by vendors, certifying bodies, implementers, purchasers, and providers. The framework could assist providers in better understanding how effectively they use an EHR's features and functions. In addition, it could offer proof and documentation for participation in incentive programs and other relevant initiatives. An increase in data logged in clinical systems will also provide information to drive research and study of health IT systems. For the policy community, the framework can inform the understanding of what health IT capabilities and high-priority functionalities are necessary to support meaningful use requirements and certification of EHRs.

The work of the Expert Panel advances[13] the focus from adopting health IT to appropriately and effectively using health IT. This work signals to the healthcare community that adoption of a health IT system alone is not sufficient

to promote greater efficiencies in care and to improve health outcomes; rather, a commitment to effective health IT use and to monitoring, measuring, and reporting this use is necessary to achieve these goals.

Expert Panel Analysis

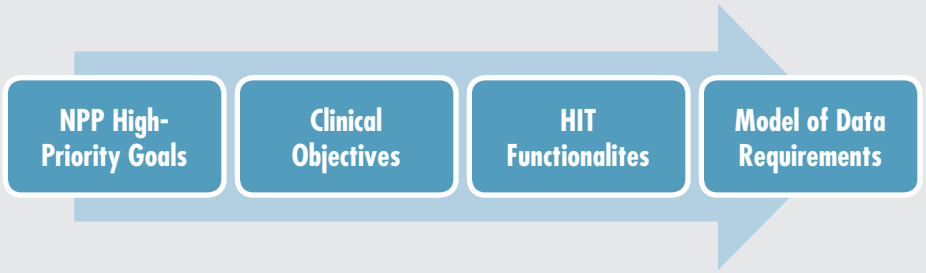
Methodology and Project Approach

The Health IT Utilization Expert Panel conducted seven virtual meetings between January and July 2010, and it implemented the following project approach (Figure 2) to identify the data elements necessary to measure health IT usage. The Expert Panel developed the *Health IT Utilization Assessment Framework* with full consideration of ongoing national efforts and activities to increase health IT use and improve overall healthcare quality.

The Expert Panel selected the National Priorities Partnership (NPP) Goals—patient engagement, care coordination, end-of-life care, safety, population health, and overuse—to inform development of the framework and ensure its relevance to direct patient care.[14] Using NPP Goals to guide the framework's development was intended to make certain that the data requirements identified support measurement and reporting of key health IT functions for existing and future measurement directions.

Additionally, the Expert Panel reviewed the Department of Health and Human Services' (HHS's) Health IT Policy Committee's Meaningful Use Matrix's Stage 1 Policy Objectives[15] (which were driven by the NPP Goals) to ensure the framework supported national efforts around meaningful use and health IT adoption. Collectively, the emphasis on the NPP Goals and meaningful use objectives ensured the framework would facilitate national efforts that incentivize clinician health IT use by identifying the data required to measure the use of those functions.

Figure 2: Health IT Utilization Expert Panel project approach



The Expert Panel identified the data elements necessary to measure health IT usage in support of national clinical objectives and goals.

Health IT Utilization Assessment Framework Development

In developing the framework, the Expert Panel first conducted an analysis of the major health IT functions described in: 1) the Centers for Medicare & Medicaid Services' (CMS's) Notice of Proposed Rule Making (NPRM) on meaningful use of EHRs and 2) the Certification Commission for Health Information Technology (CCHIT) specified health IT functions necessary to support meaningful use requirements and certification.[16] The Expert Panel then identified the data categories necessary to measure those functions in a health IT system (see the next section, "Framework Components").

The Expert Panel defined and agreed upon the following principles to steer development of the *Health IT Utilization Assessment Framework*:

- The first version of the framework will focus on data requirements to support process measures (methods by which healthcare is delivered) and structural measures (characteristics of the environment in which healthcare is delivered).[17] The Expert Panel expects that the framework will also enable improved health outcomes, given that adherence to evidence-based practices can drive better health outcomes.
- The framework's data elements should allow for and enable the differentiation of various levels of utilization. For example, to determine health IT effectiveness in different levels of health IT usage, data are required to capture multiple levels of utilization.
- The framework should be implementable and extensible (i.e., able to be modified) within health IT systems. Certification criteria that meet meaningful use requirements informed data element selection (see the next section, "Framework Components").
- The current framework is not intended to be an exhaustive list of data requirements for measurement of health IT use. The data requirements in the current framework are based on components of the January 2010 CMS NPRM.

The relevant certification criteria and meaningful use requirements informed the framework's development; however, the framework does not define specific data sources or requirements, which are defined at local implementation sites. With the framework as a foundation for potential information requirements, future health IT systems could be designed and implemented in local settings according to local practices to feed that information into specific workflow.

EHR certification standards currently exist, although a standard mechanism to determine appropriate use of EHRs is not yet in place. Future work to develop a standard on effective health IT use and certification requirements may build on the framework, but standards development, implementation, and regulation are outside the scope of work for the Health IT Utilization Expert Panel.

The Expert Panel specifically identified and developed several supporting examples to demonstrate how the framework can enable health IT systems to measure effective use and support the meaningful use objectives: CDS, e-prescribing, order sets, and clinical summaries (see the section "Examples of Measuring Health IT Use," below). The examples are not NQF-endorsed® measures, nor do they reflect the existence of health IT utilization measures. Measure development was not in the scope of the Expert Panel's activities or in NQF's domain; however, the Expert Panel recommends

a call for health IT usage measures to improve quality and safety of care.

Health IT Utilization Assessment Framework Components

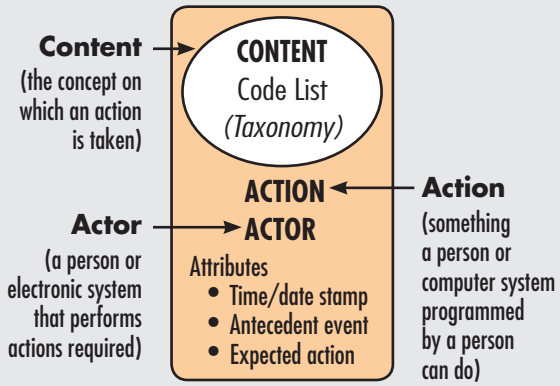
Measures of health IT use must capture data about how health IT usage impacts healthcare delivery across several dimensions, including cost and quality. Specifically, a health IT use measure must be able to identify:

- *Actor:* a person or electronic system that performs actions required in a measure of health IT utilization,
- *Content:* the concept on which an action is taken, and
- *Action:* something a measure recommends to a person or a computer programmed by a person.

The actor, content, and action are the essential components of a utilization data element, represented in Figure 3. A utilization data element requires logging of actions taken by whom (actor) and about what (content). The data element is not directly visible to a clinical application or health IT system user; rather, a measure of health IT use would utilize these components to capture the necessary information as the user interacts with the system's functions.

The Expert Panel determined that actors, content, and actions should be mapped to existing health IT terminology standards that allow information to be shared across healthcare settings unambiguously. Aligning the *Health IT Utilization Assessment Framework* with existing health IT standards can encourage interoperability and integration across health IT systems at a national level. The framework is purposefully agnostic regarding standards and their incorporation into certification criteria, and the Expert Panel recommends that the appropriate standards harmonization body should identify and define standard terminologies (see "Recommendations and Future Work," below).

Figure 3: Components of a utilization data element



The following proposed attributes were identified as common to all framework elements:

- Source: the originator of a data element, which may be an individual or a device
- Recorder: the individual or device that enters the data element in a health record field (may also be the source of the data)
- Setting: the physical location where a data element is captured, defining the encounter location where the data are expected to originate
- Date/time: the precise time and date recorded in an electronic health system
- Method: The manner in which the data element is captured (e.g., data entry by a user, a system query from one application to another, etc.)

- Justification (for action or lack of action): information about why an action is taken or not taken, potentially taken from a pick list or a free-text entry
- Content specific attributes: information (or metadata) that provides additional detail about an individual element (e.g., for medications, the content-specific attributes are, for example, frequency, duration, dose, and route).

The framework does not define specific actors for association with actions and content. The Expert Panel developed the framework with the understanding that variation in local practice, scope of practice laws, and available resources will influence implementation of health IT systems. Next, actors, content, and actions are described in more detail.

Actor

An actor can be a member of the healthcare delivery team, a patient, a caregiver, or an electronic system. This component of a utilization data element captures who performs the specific health IT action being measured. In this version of the framework, actors are defined by roles (human or health IT system). To evaluate existing standards' suitability to represent roles in the framework, the Expert Panel conducted a preliminary mapping of actors to three health IT standards: the HITEP II "Recorder" attributes (actors), HL7 actor roles, and LOINC Document Ontology Axis Values (roles).[18] This exercise identified some inconsistencies among standards for defining actor roles that should be considered for future work (see "Recommendations and Future Work," below). As described previously, the framework is purposefully agnostic of standard terminologies. The evaluation of vocabularies for content and their incorporation into certification criteria should be addressed by the appropriate standards development and harmonization entities.

Refer to Appendix C for the actors and roles that represent actions in the framework, as well as other taxonomies that the Expert Panel considered.

Content

Content is the substance or subject matter on which actions are taken. This component of a utilization data element captures the information about which a health IT action is expected. In this version of the framework, content elements (Box 1) were derived from CCHIT requirements and the CMS NPRM. Duplicate content items from the two lists were removed. The NQF QDS Model Version 2.1 informed the framework content. Aligning the *Health IT Utilization Assessment Framework* with the QDS provides a solid foundation for both health IT usage and quality measurement. The list of content elements is not intended to be exhaustive; content is expected to be managed using the QDS Model as it evolves over time. Many of these elements are managed in the QDS using the category "system characteristics." The most current version of the QDS Model is maintained on the NQF website.[19]

Action

An action is an interaction with the health IT system that can be the product of human action or a programmed activity of the health IT system itself. The action is the health IT functionality that is measured or the health IT intervention that is called for in a quality measure. The

Box 1: Health IT Utilization Assessment Framework Content Elements

1. alerts responded to by a user
2. allergy list
3. care modifications based on clinical decision support rules
4. claims submitted electronically to all payers
5. clinical summaries were provided
6. clinical summary
7. condition
8. demographic information
9. diagnostic test results
10. diastolic blood pressure changes
11. education provided
12. encounters where medication reconciliation is performed
13. formulary or preferred drug list
14. health maintenance items performed
15. height
16. high-profile order in order set
17. immunization allergy to immunization registry
18. immunizations
19. insurance eligibility
20. laboratory test result
21. medication allergy list
22. medication list
23. medication order (prescription)
24. medications (Beers Criteria)
25. non-medication allergy on allergy list
26. notifications by patient preference
27. patient preference for follow-up care
28. patient preference for preventive care
29. patient summary record from other providers
30. patients at high risk for cardiac events on aspirin prophylaxis
31. patients with access to personal health information electronically
32. prescriptions (permissible) electronically
33. problem list
34. procedures performed
35. quality measure results
36. reportable laboratory results to public health
37. smoking status
38. syndrome-based public health information
39. systolic blood pressure changes
40. transitions in care for which summary care record is shared
41. vital signs
42. weight changes

action concept allows for Application Service Management, a method of managing performance and quality of service.[20] A common classification system was used to describe all actions based on functions described in the Meaningful Use Proposed and Final Rules. Similar actions were classified into common themes. The Expert Panel updated the actions with services that are required to support greater attention to future measurement, including patient engagement in care and shared decisionmaking. The Expert Panel's analysis confirmed that the categories were sufficient to meet utilization measurement needs. Appendix D presents the list of actions that were identified by the Expert Panel. This list is not intended to be exhaustive.

The framework includes 20 categories of interactions with the health IT system, each of which can be performed by a human operator or the system itself. The framework action categories are listed below (see Appendix D

for a listing of the individual elements reviewed by the Expert Panel in developing the framework):

1. Access: The act of retrieving data or a computer file.
2. Acknowledge: To officially recognize, admit, or accept receipt of an object or information.
3. Alert: To make someone aware of a possible danger or difficulty.
4. Calculate: To compute mathematically.
5. Create: To produce something, as in a printed report or electronic copy.
6. Discontinue: To stop or end an activity that is planned or is happening regularly; also to remove an element from existing patient information, such as an allergy from an allergy list.
7. Document: To create a record of facts, events, symptoms, or findings.
8. Implement: To put into effect or action.
9. Notify: To inform or warn officially to make something known.
10. Order: An instruction or request to bring, supply, perform, or activate something.
11. Perform: To carry out an action or accomplish a task, especially one requiring care or skill.
12. Receive: To receive or take something provided.
13. Recommend: To suggest something as worthy of being accepted use or done.
14. Reconcile: To make two or more potentially conflicting things consistent or compatible such that inconsistencies are resolved or explained. Reconciliation can be performed with a wide range of content elements; some examples include medication lists, problem lists, allergy lists, patient demographics, and social history. Specifically, medication reconciliation is identified as a meaningful use criterion: "medication reconciliation is the process of comparing a patient's medication orders to all of the medications that the patient has been taking. This reconciliation is done to avoid medication errors such as omissions, duplications, dosing errors, or drug interactions. It should be done at every transition of care in which new medications are ordered or existing orders are rewritten. Transitions in care include changes in setting, service, practitioner, or level of care."[21]
15. Remind: To cause someone to remember or think of something, such as to take a specific action to maintain or improve health.
16. Report: To give detailed information about results of aggregate research, analysis, or investigations.
17. Review: To examine something critically to make sure it is adequate, accurate, and correct and to determine if new actions should be undertaken.
18. Stratify: To divide or arrange into classes, castes, or social strata into a series of graded statuses.
19. Transmit: To communicate a message, information, or news.
20. Update: To provide someone or something with the most recent information or with more recent information than was previously available.

Examples of Measuring Health IT Use

Examples of clinical decision support (CDS), e-prescribing, order sets, and clinical summaries are provided below to demonstrate how the *Health IT Utilization Assessment Framework* can enable measurement of effective use in EHRs and support the meaningful use objectives. Each example depicts a sample of utilization data elements but does not represent all information required for the example. The examples are not NQF-endorsed measures, nor do they reflect current measures of health IT utilization in development. Measure development was outside the scope of the Expert Panel's activities and NQF's domain; however, the Expert Panel recommends the development of effective health IT use measures to improve quality and safety of care (see "Recommendations and Future Work," below).

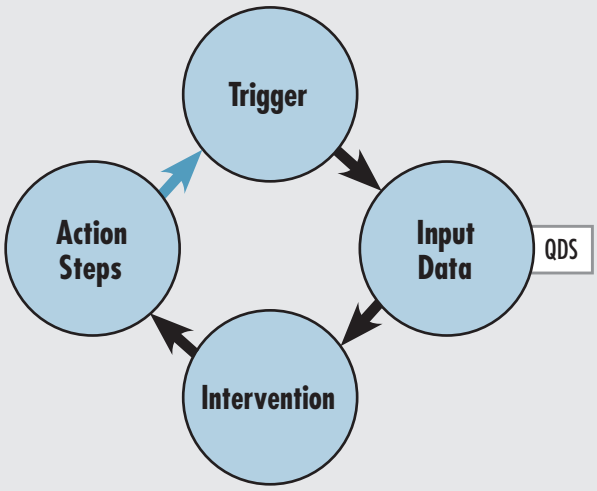
Example #1: Clinical Decision Support

Alert overrides are evidence that, for some clinicians, CDS rules can be ineffective and potentially viewed as a nuisance rather than as an enabler of improved care delivery. Overrides alone, however, do not tell the entire story because providers may comply with CDS guidelines after "a latent period."[22] Therefore, the steps for measuring CDS usage and effectiveness must account for the fact that action resulting from a clinical alert (e.g., a new medication order) may not occur until sometime after the alert is presented to the user (potential latency). Unless the alert is about an issue immediately life threatening to a patient, clinicians may respond at the most appropriate time in their own workflow, rather than at the time the alert fires.

In 2009 NQF's Clinical Decision Support Expert Panel developed a classification or "taxonomy" for CDS workflow, which was published in December 2010.[23] Figure 4 displays the taxonomy's four components, each of which is a basic step that must be programmed into an EHR to initiate and follow through with a CDS rule: triggers, input data, interventions, and action steps. This figure shows initiation of a rule based on a trigger, access of input data, provision of an intervention, and recommendation of an action step. In many cases the completion of one CDS rule can provide the trigger for the next rule in a chain of events to complete a complex process, as shown in the figure.

Triggers (solicit, update, act, and time) are those actions that initiate a CDS rule and can include any of the actions in the *Health IT Utilization Assessment Framework*. The input data are elements required by the rule to determine what action to take; most can be described with the existing QDS Model for existing data. Interventions (log, display, and notify) are also actions in the framework. Interventions are those things that the information system can accomplish. The action steps (collect information, request, acknowledge, communicate, and document) are actions that are expected of the receiver of the information provided by the rule. Any element of the CDS taxonomy can potentially be identified using the framework.

Figure 4: NQF CDS Taxonomy



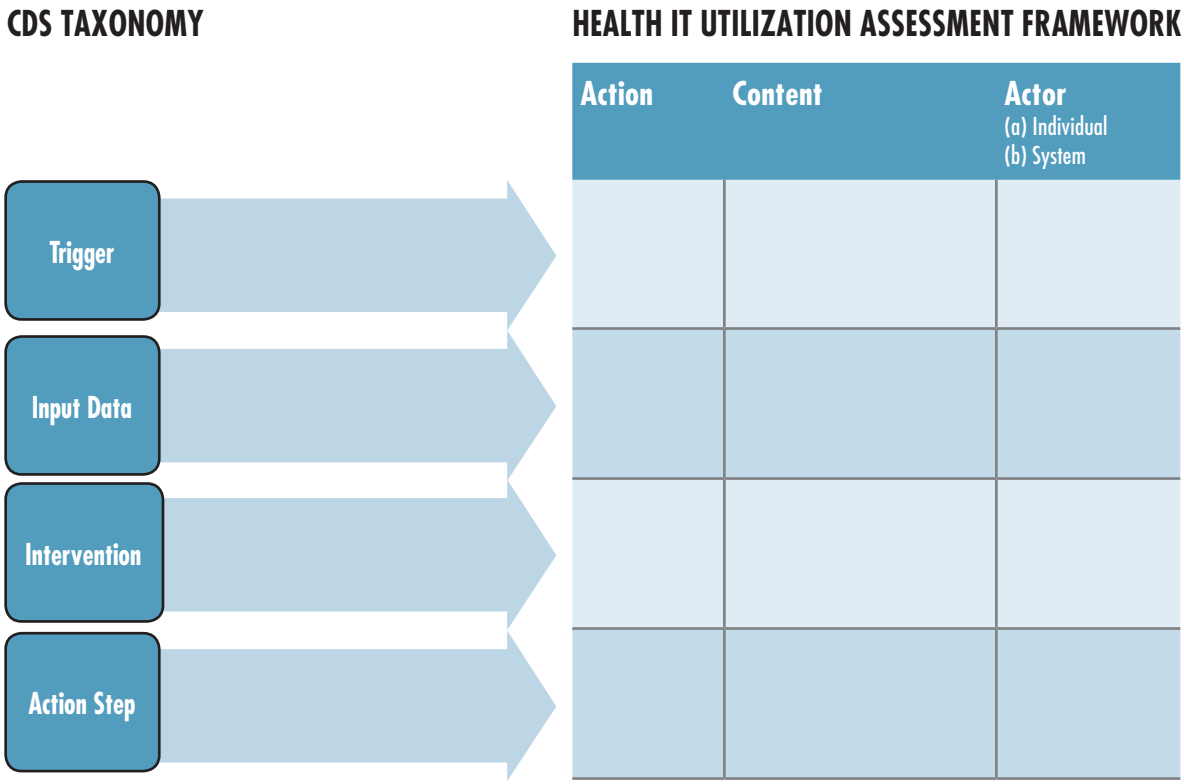
The CDS Taxonomy's four functional categories:

1. The *trigger* initiates a CDS rule.
2. The *input data* are represented by the components of the QDS data types.
3. *Interventions* include the possible actions the information system can take to deliver information.
4. The *action steps* are actions a receiver of the information can perform.

In a given cycle of a CDS rule, any input data, intervention, or action step may initiate a new trigger and launch a new CDS rule.

Figure 5 displays a template that will demonstrate for two CDS rules, or instances of CDS opportunities in a clinical workflow, how the CDS taxonomy components include actors, action, and content.

Figure 5: Relationship between the NQF CDS Taxonomy and the NQF Health IT Utilization Assessment Framework (template)

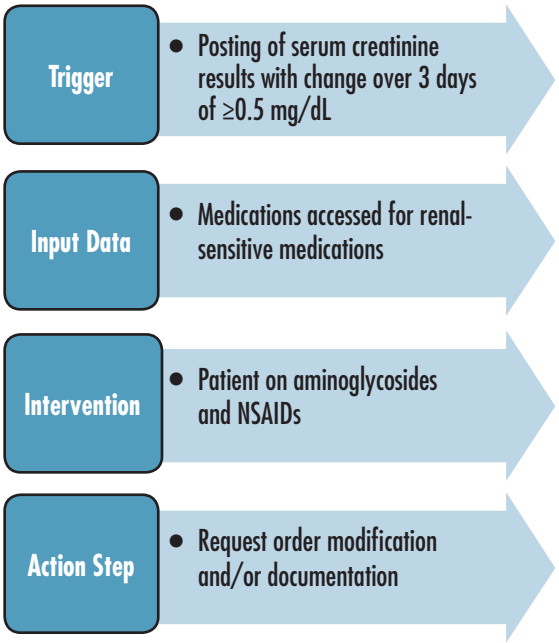


The four components of the CDS taxonomy are triggers, input data, interventions, and action steps. The identification of any CDS element requires an action, content, and actor, as described in the *Health IT Utilization Assessment Framework*. In the following figures, the CDS taxonomy components and potential associated actions, content, and actors are displayed for two rules or opportunities for CDS in a clinical workflow: Rule A and Rule B.

Figures 6 and 7 represent the two CDS scenarios for the CDS example: Rules A and B. Rule A provides guidance for modifying or discontinuing medication if a patient's serum creatinine rises above 0.5 mg/dL over a specified time period, which suggests a change in renal function (Figure 7). Rule B and its taxonomy are depicted in Figure 7.

Figure 6: CDS Example Rule A

CDS TAXONOMY



HEALTH IT UTILIZATION ASSESSMENT FRAMEWORK

Action	Content	Actor (a) Individual (b) System
Document	• Serum creatinine	b) System–(EHR) source is clinical laboratory
Access	• Active medication list • Check for value set of renal sensitive medications	b) System–(EHR) source is active medication list
Notify	• Notify – Alert user to altered patient state	b) System–(EHR)
Case 1: – Request – Communicate	• Suggest – Order modification – Document – Follow-up renal status assessment	a) Provider

Alert the responsible provider if the serum creatinine rises above 0.5 mg/dL over 3 days when the patient is taking aminoglycosides and/or nonsteroidal anti-inflammatory drugs (NSAIDS), and suggest an order to modify renal toxic medications and provide documentation.

Rule A Trigger Data
Action: Document (Post)
Actor: EHR
Content: Laboratory result

Rule Trigger: Rule A initiates with a trigger of creatinine elevation of ≥0.5 mg/dL occurring over 3 days. As shown in the figure, the trigger is storage of a new laboratory result and its comparison to prior results. In this case, the *action* is paired with the *actor* EHR as the clinical laboratory (the source of the data) posts, or *documents* a creatinine to the laboratory results section of the EHR. The *content* required is the serum creatinine delta (change in value of ≥0.5 mg/dL). The framework triplet is: *document, actor* (EHR), and *content* (serum creatinine delta).

Rule A Input Data
Action: Access
Actor: EHR
Content: Active medication

Rule Input Data: Rule A next searches for input data to determine if the patient is on active renal-sensitive medications. The utilization element *action* is access, the *actor* is the EHR, and the *content* is a set of medications.

Rule A Intervention Data
Action: Notify
Actor: EHR
Content: Order, documentation template

Rule Intervention: Rule A intervention is the utilization *action* notify, the *actor* is the EHR, and the *content* is a documentation template to identify a need for NSAIDs or an order to lower aminoglycoside dosage and order to discontinue NSAIDs.

Rule A Action Step Data
Action: Order, document
Actor: Provider
Content: Medication order, Justification documentation

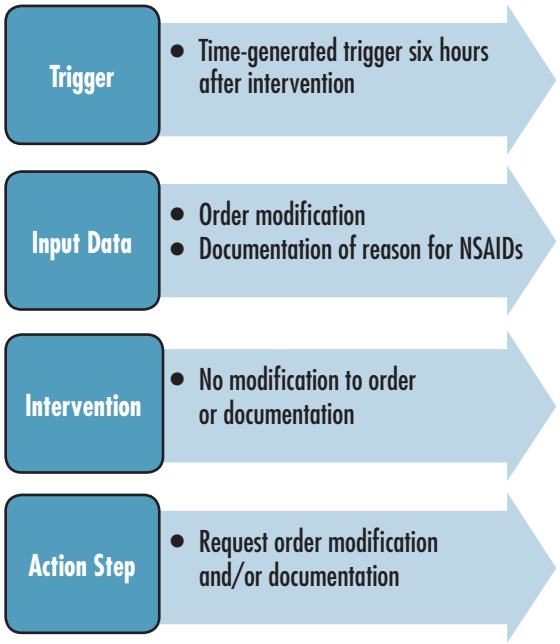
Rule Action Step: Rule A action steps are the items noted above as part of the intervention. At this point in the process, the utilization *actions* are either order or document, the *actors* are the treating providers, and the *content* is the specific documentation or the specific order.

Each of the action steps may be completed as provided, modified, or ignored. Because the actions may occur at uncertain latency after they are offered to the provider, a follow-up rule exemplar is presented using a latent period as the trigger.

The CDS example progresses to Rule B, displayed in Figure 8, which is set to trigger based on timing (elapsed time).

Figure 7: CDS Example Rule B

CDS TAXONOMY



HEALTH IT UTILIZATION ASSESSMENT FRAMEWORK

Action	Content	Actor (a) Individual (b) System
Time	• Intervention occurrence	b) System (EHR)
Access	• Order modification • Documentation	b) System (EHR) Source: medication orders, updates to active medication list, documentation
Notify	• Notify–Provider, Content=Reminders	b) System (EHR)
Request, Communicate	• Suggest – Order modify – Documentation – Follow-up renal status assessment	a) Provider

The CDS example, with Rule B, presumes that the action steps in Rule A have not occurred; the rule uses elapsed time as a trigger.

Rule B Trigger Data
Action: Elapsed time
Actor: EHR
Content: Order modification, documentation, follow-up renal status assessment

Rule Trigger: Rule B initiates the trigger generated by the intervention produced by Rule A, *notify*. The latency period for this example is six hours, but it could be set to any latency window. As shown in the figure, the trigger is an action that is identified based on elapsed time. In this example, the *action* is paired with the *actor* (EHR) as the intervention occurs, implying that the intervention action must be logged in such a way to provide data. The *content* required are the items identified in the action steps of Rule A (order modification, documentation, follow-up renal status assessment), along with associated information, metadata, indicating the individuals to whom the notification was sent, the time, and the action steps provided in the notification. The framework triplet is: *action* (elapsed time), *actor* (EHR), and *content* (presence of action step from Rule A–order modification, documentation, follow-up renal status assessment).

Rule B Input Data
Action: Access
Actor: EHR
Content: Order, Document

Rule Input Data: Rule B next searches for input data to determine if the expected documentation, new order, or order modification has occurred. The *action* is access, the *actor* is the EHR, and the *content* is one of a set of options (order, documentation).

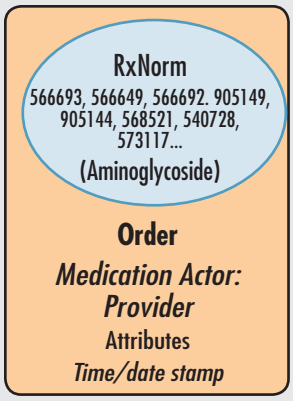
Rule B Intervention Data
Action: Access
Actor: EHR
Content: Order, Document

Rule Intervention: Rule B intervention is the utilization *action* notify, the *actor* is the EHR, and the *content* is the same options provided in Rule A (i.e., a documentation template to identify a need for NSAIDs or an order to lower aminoglycoside dosage and order to discontinue NSAIDs).

Rule B Action Step Data
Action: Order, Document
Actor: Provider
Content: Medication order, Justification documentation

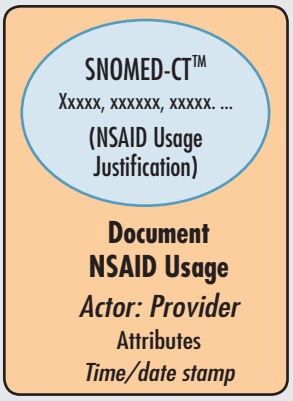
Rule Action Step: Rule B action steps are the same items noted in Rule A, that is, those action steps provided as part of the intervention. At this point in the process, the utilization *actions* are either order or document, the *actors* are treating providers, and the *content* is the specific documentation or the specific medication order. As with Rule A, each of the action steps may be completed as provided, modified, or ignored.

Figure 8a and 8b: Utilization data elements for determining effective CDS



(Figure 8a)

The rule output is an order for aminoglycosides with a lower dosage, increased frequency, or discontinuation. The *action* is the order, the *actor* is the provider, and the *content* is an aminoglycoside medication provided in the taxonomy RxNorm. Specific attributes of the medication for this example will also include dose and frequency. A time/date stamp is required.



(Figure 8b)

The rule output is justification of continuation of medication (NSAID). The *action* is the documentation, the *actor* is the provider, and the *content* is justification context provided in the taxonomy SNOMED-CT. A time/date stamp is required.

Measuring CDS Effectiveness

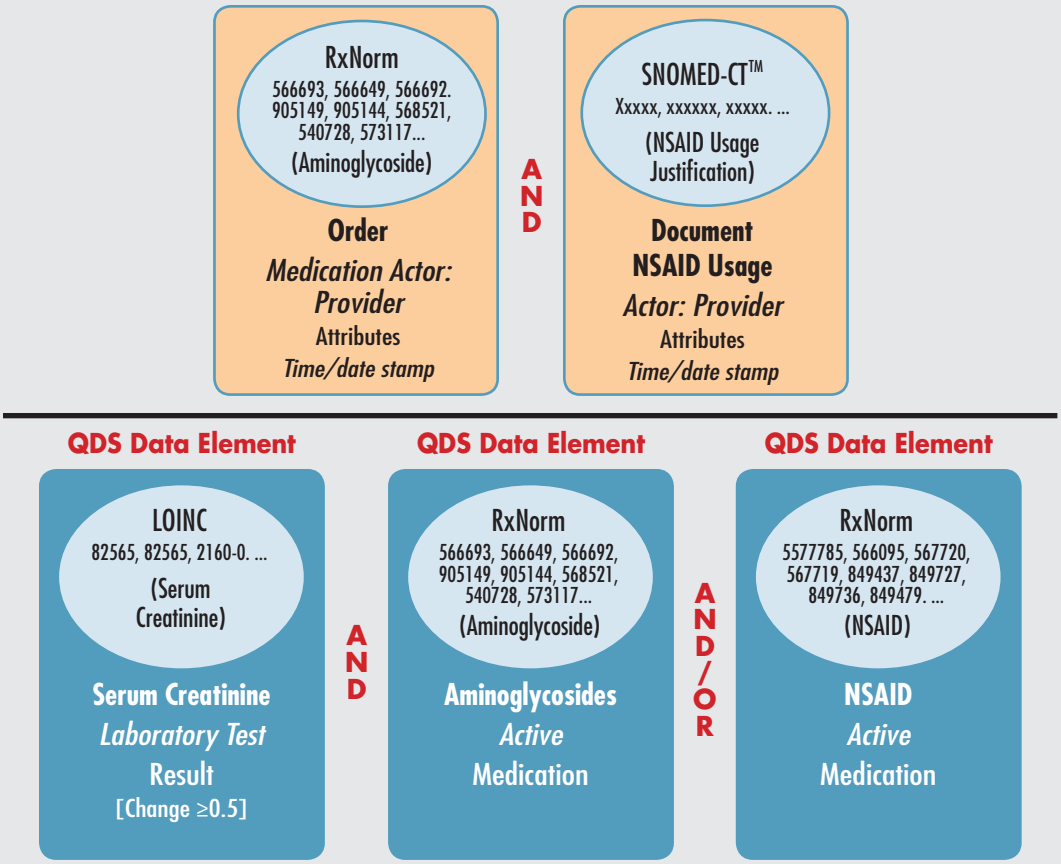
Determining that CDS rules are effective requires careful analysis. Measurement of adherence to a rule often requires creation of carefully constructed queries based on how each clinical data repository is constructed. The framework provides direction to standardize this process by defining data context for action, actor, and content. In the examples above, the expected output is an entered order or documentation. Figures 8a and 8b indentify sample utilization data elements for determining effective CDS.

Using these two new utilization data elements (depicted in Figures 8a and 8b) in a measure can result in the incorporation of existing QDS data elements into the measure's denominator to define the population and the incorporation of the utilization elements to determine the numerator.

We can depict the relevant measure of health IT use of CDS as follows.

As shown in Figure 9, a measure of CDS effectiveness can identify the population of patients in the denominator using existing QDS concepts: 1) the "Laboratory test result: serum creatinine" identified by a code list of LOINC codes, with a result indicating a change ≥0.5 mg/dL, and either or both of 2) "Medication active: aminoglycosides" identified by a code list of RxNorm codes, or 3) "Medication active: NSAID medications" identified by a code list of RxNorm codes. Each of these denominator elements uses the QDS Model as previously described. The numerator contains new data elements to indicate that either of the following has occurred: 1) an order *action* by a provider *actor* for aminoglycoside (using RxNorm) *content* or 2) a documentation *action* by a provider *actor* for reason and justification *content*.

Figure 9: An example measure of CDS effectiveness, with utilization data elements



The figure represents a sample of numerator and denominator elements present in the example measure of responsiveness (order and/or documentation) to an alert about elevated serum creatinine in the setting of renally toxic medications (aminoglycosides or NSAIDS) = (count of aminoglycoside and/or NSAID orders) and/or (documentation)/patients with serum creatinine rising above 0.5 mg/dL over 3 days and taking either aminoglycoside or NSAIDs.

Example #2: e-Prescribing

This example of measuring health IT use examines generating and transmitting permissible prescriptions electronically (e-prescribing). To measure that prescriptions are generated and transmitted electronically requires a number of data elements, for example, the prescription is generated, completed, and sent, and receipt is acknowledged. There are also contributing factors that can limit the scope of prescriptions that are available for electronic prescription. Such limiting factors include patient preference for a specific pharmacy, policies or rules regarding e-prescribing for controlled medications, and availability of receiving systems for the prescription. Some of the detailed data elements and limiting factors are presented in Box 2.

This example is designed to highlight the data elements that might be required for performance reporting. Figure 10 identifies the denominator as all patients who have had encounters with the clinician to determine the appropriate clinician to whom to attribute the clinical care. "Encounter: ambulatory" is an existing QDS data type, and the accompanying code list (value set) can constrain the encounters to those appropriate to the measure. In this example, the encounter concepts are codified using SNOMED-CT.

Box 2: e-Prescribing

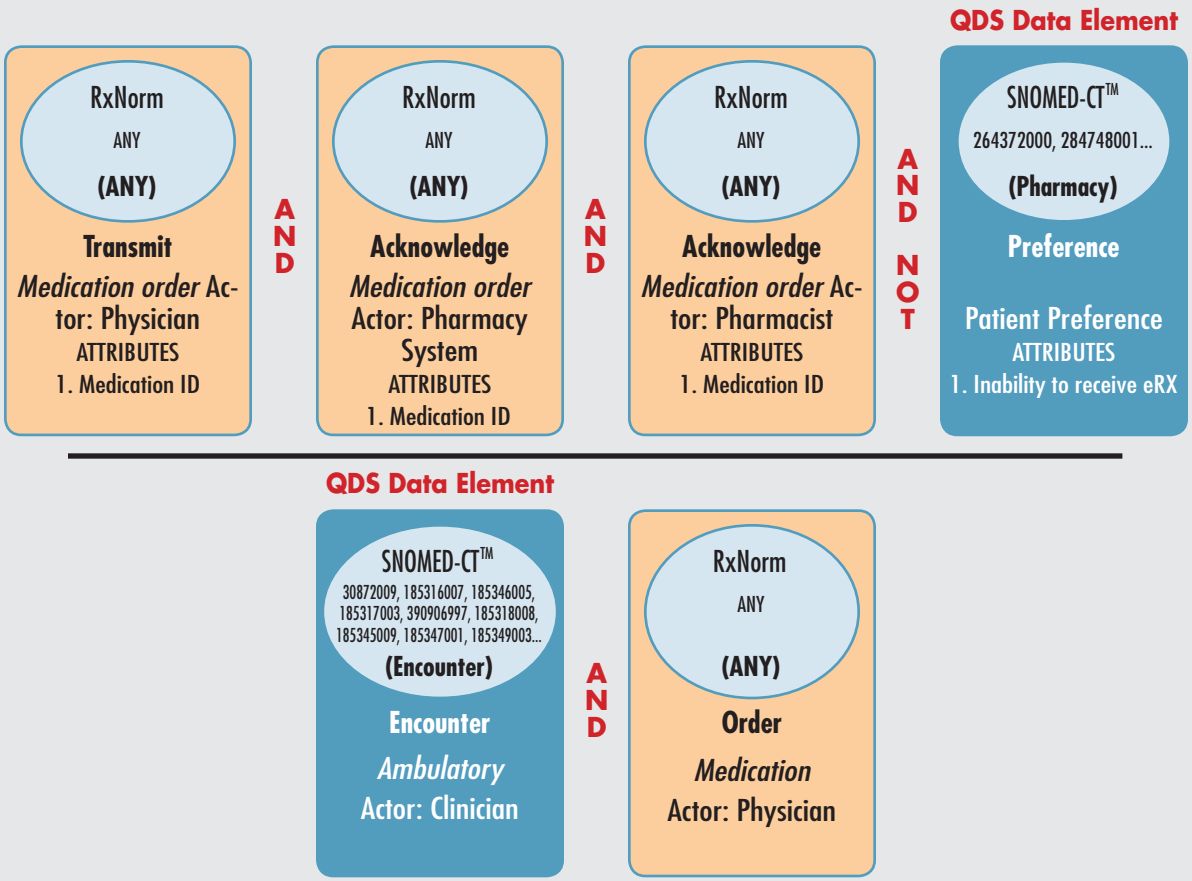
Data elements for e-Prescribing:

- The prescription was generated
- The prescription was transmitted/sent
- The prescription was received (capability at the receiving end to handle the transmittal, e.g., a log showing the order was actually received)
- Transmittal was acknowledged
- System characteristics regarding policy
  - Rules regarding controlled substances
  - Availability of e-prescribing (due to state law, local statute, etc.)

Attributes of e-Prescribing required for data analysis:

1. All prescriptions written by the ambulatory practice (medication orders)
2. Method of prescribing (e.g., e-prescription, fax, written)
3. Type of prescription (e.g., drug class—controlled substance)
4. Patient preference for e-Prescription vs. other workflow

Figure 10: An example measure of e-prescribing, with utilization data elements



The figure represents a sample of numerator and denominator elements present in the example measure of generating and transmitting permissible prescriptions electronically.

Also required in the denominator is any order (the *action*) by a clinician (the *actor*) for a medication (the *content*). Thus the new utilization data element in the denominator is the medication order *action-actor-content* triplet. The numerator is composed of expected elements, that is, the prescription was transmitted, acknowledged by the pharmacy system, and acknowledged by the pharmacist. The exclusion is shown using the existing QDS data type of patient preference. Table 1 lists the utilization data types in this example and their associated actions, actors, and content.

Additional exclusions will likely be necessary to handle system characteristics such as local policy regarding e-prescription for controlled medications (exclusion = all controlled medications) and other factors.

Table 1: Utilization data concepts and their associated actions, actors, and content for Example 2

Health IT Utilization Data Concepts	Action	Actor	Content
Medication order	Order	Clinician	Medication
Transmit medication order	Transmit	Clinician	Medication order
Acknowledge medication order	Acknowledge	Pharmacy information system	Medication order
Acknowledge medication order	Acknowledge	Pharmacist	

Example #3: Order Set

This example of measuring health IT use examines using evidence-based order sets and computerized provider order entry (CPOE). To measure that an evidence-based order set is used within CPOE requires a more complex set of data elements than described in Example 2. Order sets may be standardized within organizations. Even if they are derived from best-practice order sets published by knowledge vendors or premier academic institutions, the order sets are frequently modified locally and updated. Therefore, a clear definition of an order set is required. This example will not address specific order set content. Rather, it will focus on the information required about an order set (the metadata) that would assist with developing a measure of utilization.

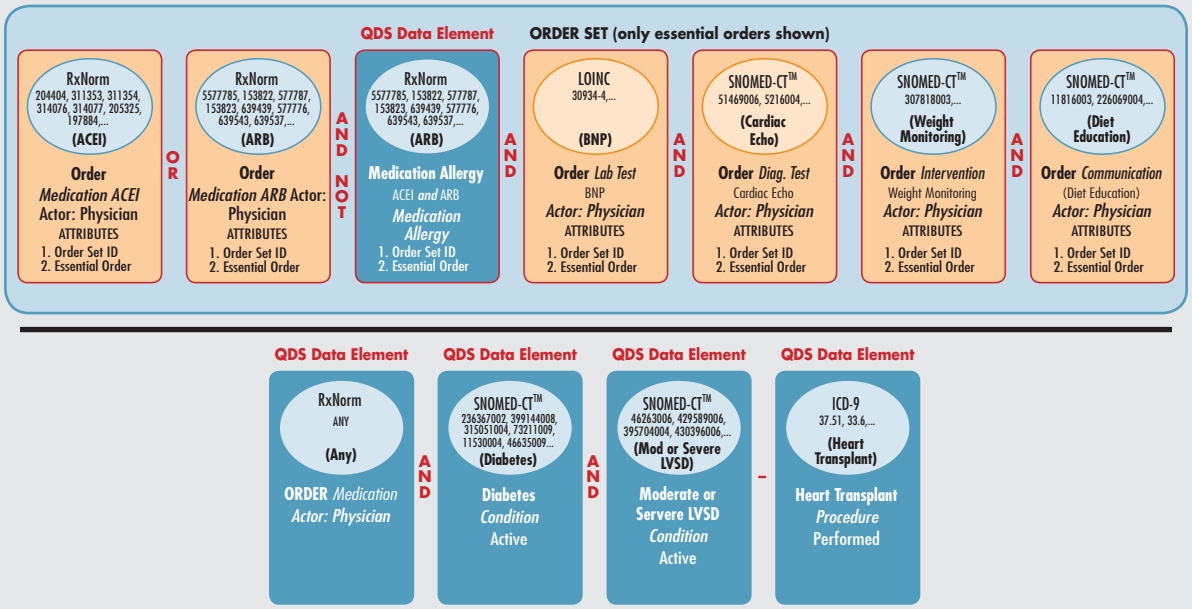
Order sets are often composed of multiple orders, some of which are essential to managing the condition or process at hand. Other orders within the set are based on convenience, for example, an inpatient order that includes, in addition to medications, tests, and treatments for a specific condition, as needed orders for medication to assist with sleep, toileting functions, and minor pain control. Use of an order set implies that the set is accessed and entered into the EHR for processing for any given patient. Any one or many of the orders within a set can be de-selected, and only one or a few can be selected for processing. Therefore, use of an order set requires definition to enable measurement. Here, it is assumed that each essential order (evidenced-based orders that pertain to the condition evaluated) is entered "as is," modified, or removed from the set with documented justification. Some of the detailed data elements and limiting factors are presented in Box 3.

Box 3: Order Sets

Data elements for order sets:

1. Essential orders in the order set can be specifically identified
2. Acceptable reasons for avoidance of specific essential orders are provided
3. Alternatives to essential orders can be identified
4. Patient characteristics requiring order set are clearly identified
5. System characteristics
6. Availability of order sets—acceptable sources

Figure 11: An example measure of an order set for patients with CAD, diabetes, and moderate or severe LVSD, with utilization data elements



The figure represents a sample of numerator and denominator elements present in the example measure of evidence-based order sets (medication, laboratory test, diagnostic test, intervention, and communication).

This example is designed to delineate the data elements that might be required for performance reporting. Figure 11 identifies an order set for patients with coronary artery disease (CAD), diabetes, and moderate or severe left ventricular systolic dysfunction (LVSD), or heart failure.

The denominator specifies each of the conditions that must be present in the same patient to include him or her. It also excludes all patients who have had heart transplants. Each of these data elements can be identified using the QDS data types with existing information in the EHR. The numerator elements, however, require data indicating that each element has been processed and is tagged as an essential order within the set. In this example, all essential orders or acceptable exclusions are required to meet the numerator requirements. Elements include an order for angiotensin converting enzyme inhibitor (ACEI) or angiotensin receptor blocker (ARB) medication, or allergy to both, an order for a laboratory test (BNP), and an order for diet education.

This example also highlights a need for new information about the data (metadata), specifically an indication that each order is a part of the order set and that each element is an essential order within that set. The example is presented to review the use of the framework as a tool to construct measures.

Table 2: Utilization data concepts and their associated actions, actors, and content for Example 3

Health IT Utilization Data Concepts	Action	Actor	Content
Order	Order	Clinician	Medication—angiotensin converting enzyme inhibitor (ACEI)
Order	Order	Clinician	Medication—angiotensin receptor blocker (ARB)
Document	Document	Clinician	Medication allergy—ACEI and ARB
Order	Order	Clinician	Laboratory test (BNP)
Order	Order	Clinician	Intervention—weight monitoring
Order	Order	Clinician	Intervention—diet education

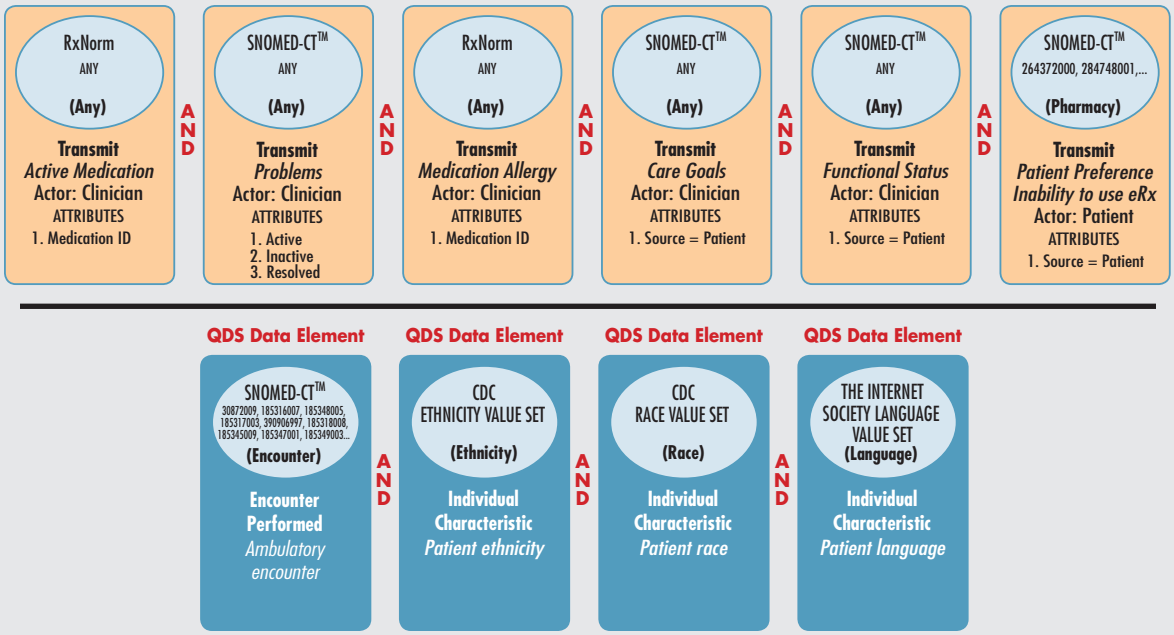
Example #4: Clinical Summary

There are different ways to consider measurement of sharing summary records with patients and incorporating patient preferences in care decisions. For this example a set of options for measurement of processes within the clinician-patient workflow is included. These options include: 1) transmission of clinical data, 2) receipt of clinical data, 3) system acknowledgment of receipt of clinical data, 4) patient acknowledgment of receipt of clinical data, and 5) update of clinical data with patient preferences. Therefore, this example includes separate metrics to manage each of these five concepts.

Transmit Clinical Data

This metric is intended to identify that a set of data is transmitted from a clinical site (sender) to a patient (receiver). Some of the detailed data elements are presented in Figure 12. Table 3 lists the utilization data concepts and their associated actions, actors, and content to measure transmitting clinical data.

Figure 12: An example measure of transmitting clinical data, with utilization data elements



The figure represents a sample of numerator and denominator elements present in the example measure. This example examines transmission of clinical data (medications, problems, medication allergies, care goals, functional status) based on patient preference; the example is stratified by ethnicity, race, and language preference.

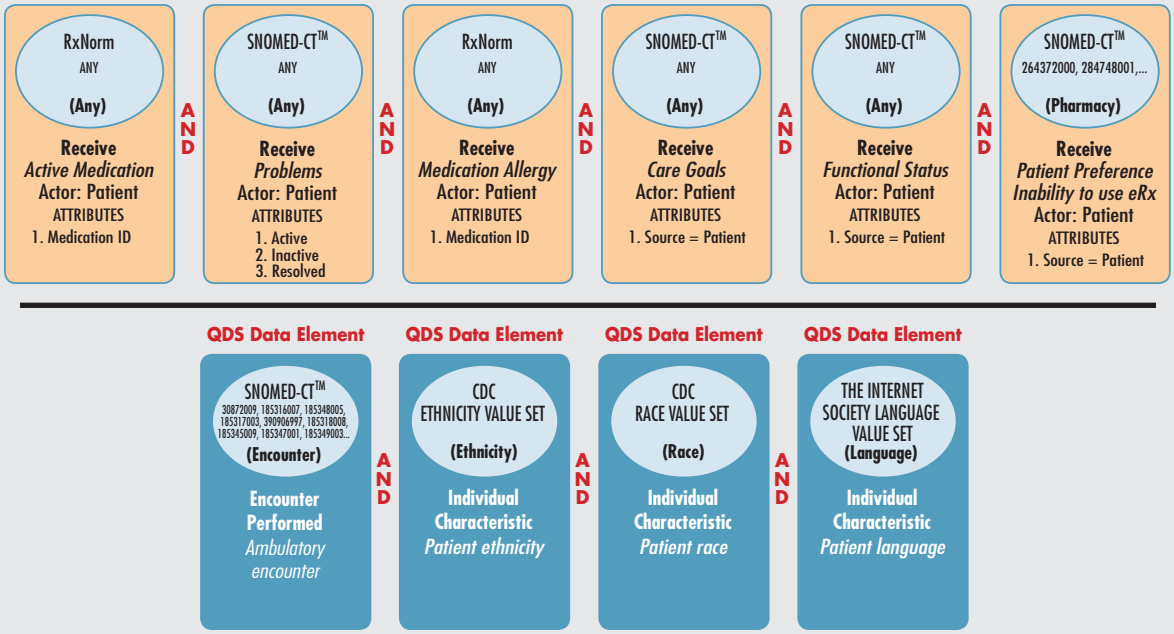
Table 3: Utilization data concepts and their associated actions, actors, and content for transmitting clinical data

Health IT Utilization Data Concepts	Action	Actor	Content
Transmit	Transmit	Clinician	Active medication list
Transmit	Transmit	Clinician	Active problem list
Transmit	Transmit	Clinician	Active allergy list
Transmit	Transmit	Clinician	Care goals (source of data = patient)
Transmit	Transmit	Clinician	Functional status (source of data = patient)
Transmit	Transmit	Clinician	Patient preferences (source of data = patient)

Receive Clinical Data

This metric is intended to identify that the set of data from a clinical site (sender) is received by a patient (receiver). Some of the detailed data elements are presented in Figure 13. The data elements for this example are: 1) clinical report received and 2) acknowledgement of receipt of clinical data transmitted. Table 4 lists the utilization data concepts and their associated actions, actors, and content to measure receiving clinical data.

Figure 13: An example measure of receiving clinical data, with utilization data elements



The figure represents a sample of numerator and denominator elements present in the example measure. This example examines receipt of clinical data (medications, problems, medication allergies, care goals, functional status) based on patient preference. The example is stratified by ethnicity, race, and language preference.

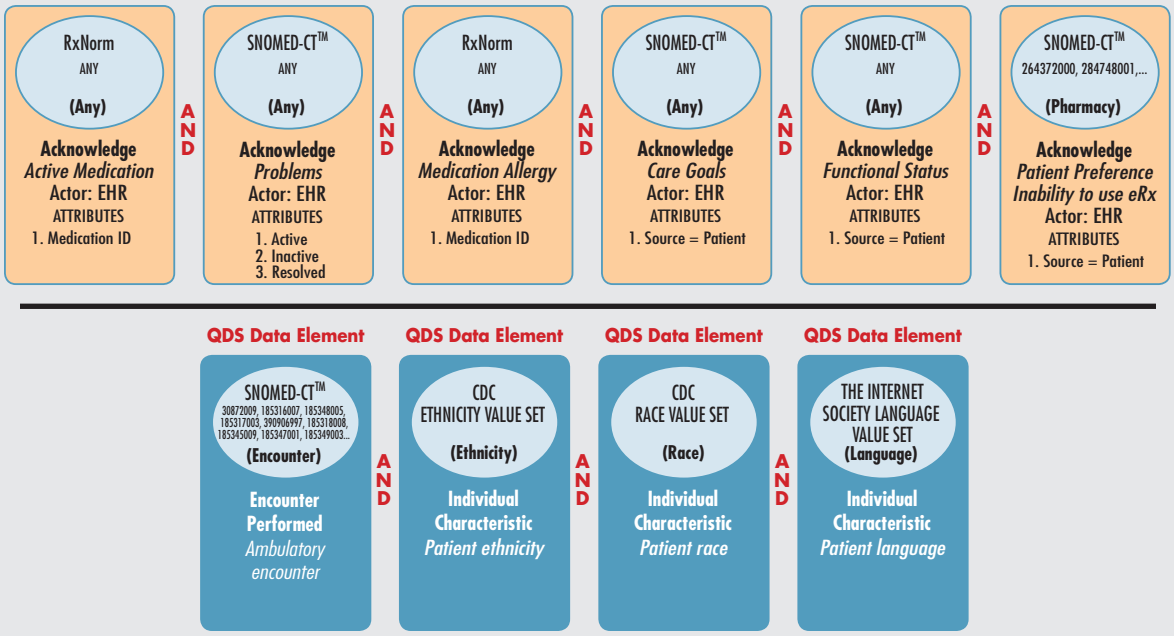
Table 4: Utilization data concepts and their associated actions, actors, and content for receiving clinical data

Health IT Utilization Data Concepts	Action	Actor	Content
Receive	Receive	Clinician	Active medication list
Receive	Receive	Clinician	Active problem list
Receive	Receive	Clinician	Active allergy list
Receive	Receive	Clinician	Care goals (source of data = patient)
Receive	Receive	Clinician	Functional status (source of data = patient)
Receive	Receive	Clinician	Patient preferences (source of data = patient)

Acknowledge Receipt of Clinical Data (System)

This metric is intended to identify that the system receiving the clinical set of data has acknowledged receipt. This type of acknowledgement is similar to a fax report of successful transmission. It does not indicate the patient has seen or reviewed the summary. Some of the detailed data elements are presented in Figure 14. The data elements for acknowledging receipt of clinical data (by the system) are: 1) clinical report received and 2) acknowledgement of receipt of clinical data transmitted (by the system). Table 5 lists the utilization data concepts and their associated actions, actors, and content to measure acknowledgement of receipt of clinical data (by the system).

Figure 14: An example measure of acknowledging receipt of clinical data (by the system), with utilization data elements



The figure represents a sample of numerator and denominator elements present in the example measure. This example examines acknowledging receipt (system) of clinical data (medications, problems, medication allergies, care goals, functional status) based on patient preference. The example is stratified by ethnicity, race, and language preference.

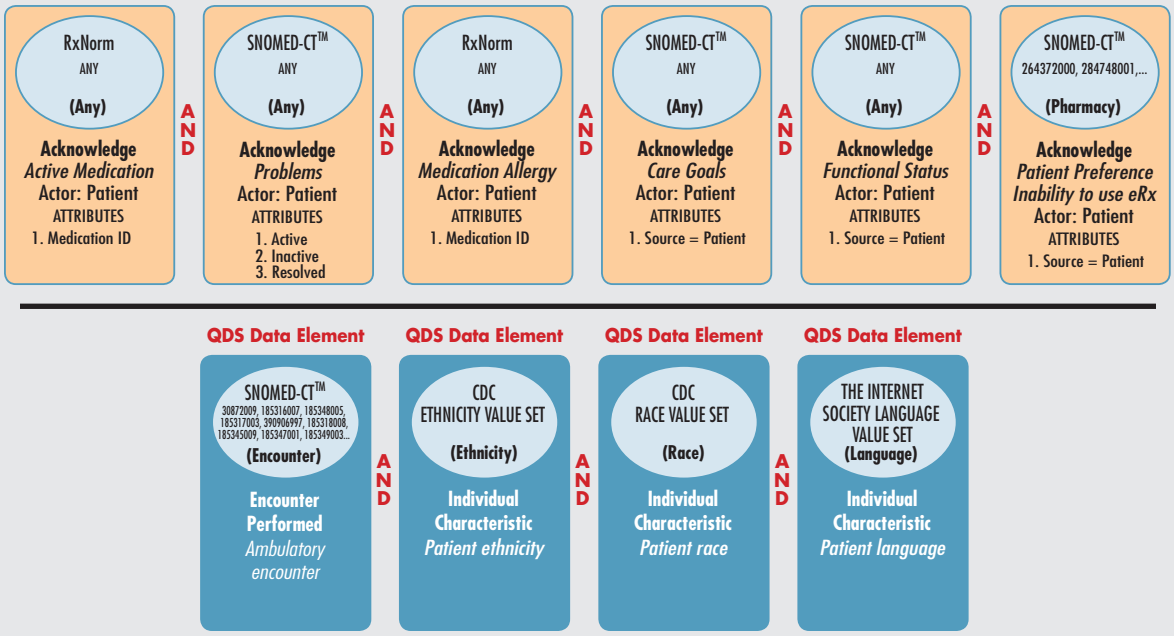
Table 5: Utilization data concepts and their associated actions, actors, and content for the example measure of acknowledging receipt of clinical data (by the system)

Health IT Utilization Data Concepts	Action	Actor	Content
Acknowledge	Acknowledge	EHR System	Active medication list
Acknowledge	Acknowledge	EHR System	Active problem list
Acknowledge	Acknowledge	Clinician	Active allergy list
Acknowledge	Acknowledge	EHR System	Care goals (source of data = patient)
Acknowledge	Acknowledge	EHR System	Functional status (source of data = patient)
Acknowledge	Acknowledge	EHR System	Patient preferences (source of data = patient)

Acknowledge Receipt of Clinical Data (Patient)

This metric is intended to identify that the patient receiving the clinical set of data has seen and acknowledged receipt. This type of acknowledgement requires human intervention—opening and agreeing that the summary has been received. Some of the detailed data elements are presented in Figure 15. The data elements for the example measure of acknowledging receipt of clinical data (by the patient) are: 1) clinical report reviewed and 2) acknowledgement of receipt of clinical data transmitted (by the patient). Table 6 lists the utilization data concepts and their associated actions, actors, and content for measuring acknowledgement of receipt of clinical data (by the patient).

Figure 15: An example measure of acknowledging receipt of clinical data (by the patient), with utilization data elements



The figure represents a sample of numerator and denominator elements present in the example measure. This example examines acknowledging receipt (patient) of clinical data (medications, problems, medication allergies, care goals, functional status) based on patient preference. It is stratified by ethnicity, race, and language preference.

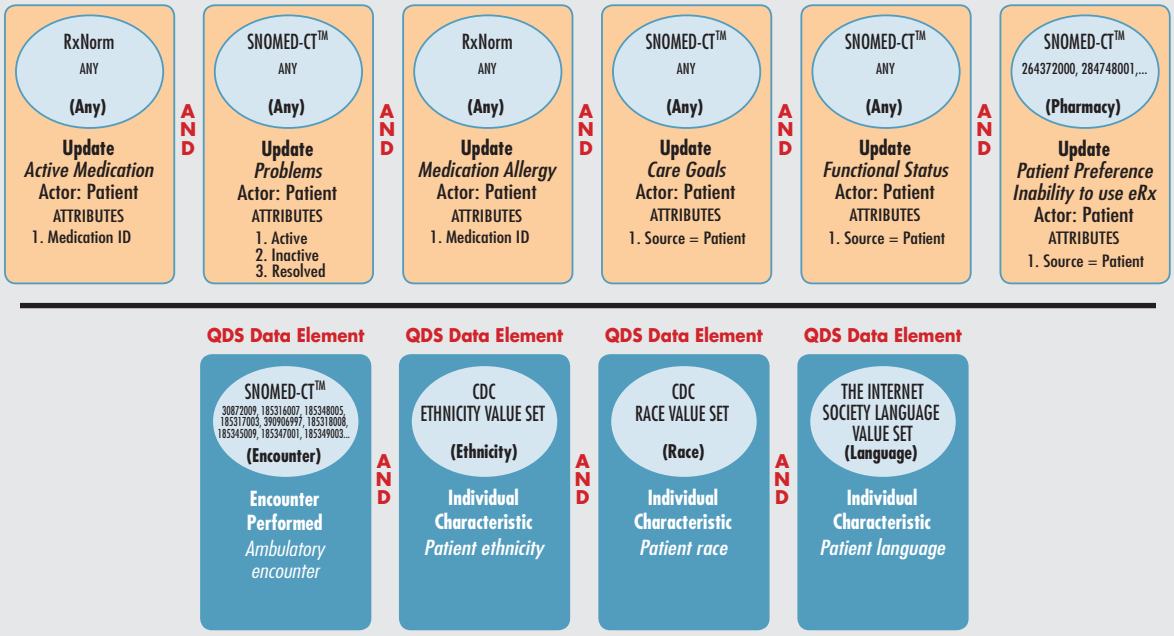
Table 6: Utilization data concepts and their associated actions, actors, and content for the example measure of acknowledging receipt of clinical data (by the patient)

Health IT Utilization Data Concepts	Action	Actor	Content
Acknowledge	Acknowledge	Patient	Active medication list
Acknowledge	Acknowledge	Patient	Active problem list
Acknowledge	Acknowledge	Patient	Active allergy list
Acknowledge	Acknowledge	Patient	Care goals (source of data = patient)
Acknowledge	Acknowledge	Patient	Functional status (source of data = patient)
Acknowledge	Acknowledge	Patient	Patient preferences (source of data = patient)

Update Clinical Data

This metric is intended to identify that the patient receiving the clinical set of data has submitted updates. Some of the detailed data elements are presented in Figure 16. The data elements for the example measure of updating clinical data are: 1) clinical report reviewed and 2) update of clinical data transmitted (patient). Table 7 lists the utilization data concepts and their associated actions, actors, and content to measure the update of clinical data.

Figure 16: An example measure of updating clinical data, with utilization data elements



The figure represents a sample of numerator and denominator elements present in the example measure. This example examines updating clinical data (medications, problems, medication allergies, care goals, functional status) based on patient preference. It is stratified by ethnicity, race, and language preference.

Table 7: Utilization data concepts and their associated actions, actors, and content for the example measure of update clinical data

Health IT Utilization Data Concepts	Action	Actor	Content
Update	Update	Patient	• Active medication list • Active problem list • Active allergy list • Care goals (source of data = patient) • Functional status (source of data = patient) • Patient preferences (source of data = patient)

Similar to the previous examples, new information about the data (metadata) is required, specifically the source (originator) of each data element, to impart more meaning to the information. This example is presented to review the use of the framework as a tool to construct measures.

Recommendations and Future Work

The *Health IT Utilization Assessment Framework* is expected to evaluate effective and meaningful EHR use and help avoid unintended consequences by:

- enabling development of measures of effective health IT use;
- understanding capabilities of the EHR and other health IT tools to meet meaningful use requirements;
- assessing unintended consequences of health IT use;
- enabling information capture as a byproduct of clinical workflows;
- enhancing collaboration among health IT vendors, purchasers, implementers, and certifying bodies by encouraging the use of common health IT assessment strategies;
- enabling determination of high-priority health IT use that supports certification of real-world implementations; and
- encouraging clinical effectiveness research regarding unintended consequences of health IT use as well as research to determine effective health IT utilization.

The framework put forth in this report provides a unique approach to identifying and measuring: 1) the use of health IT applications, 2) whether the workflow (driven by the system's user interface) occurs as designed, and 3) that such use improves care processes, quality, and safety. This report, however, presents only a first step in establishing a standard methodology for identifying and measuring the effective use of health IT.

Currently, standards exist only for EHR certification—not for effective health IT use. Certification requirements specify the activities that each EHR must accomplish and the terminology and categorization that should be used for interoperability (sending information from one system to another).[24] In the Final Rule for the EHR incentive program, CMS has defined specific numerators, denominators, and thresholds for activities in each EHR that eligible providers and hospitals must report to indicate that they are using their systems meaningfully.[25] However, there is currently no standard mechanism to determine the appropriate utilization of EHRs. To accomplish such measurement requires incorporating metrics of usage directly within the EHR infrastructure. Without standards, reported results may be inconsistent, and comparability is not guaranteed.

A standard framework of user interactions with EHRs and transactions among them is required to generate measures of use, enable clinical effectiveness research, determine unintended consequences of EHR use, and evaluate the real-world usability of EHR vendor products. The framework described in this report will enable significant movement toward standardizing the structural components of EHRs and other clinical information systems. Such standardization will also allow measurement to be clearly defined and make results reliable, consistent, and achievable with minimal additional effort on the part of system vendors, implementers, or users of such systems. This report should also provide a foundation for the field of Application Service Management (ASM) to health IT to provide more comprehensive visibility of an application's transactions, whether human or machine generated. Existing standards that are applicable to logging, auditing, and using logged information, such as ASTM International Standard E2147 should be explored.[26]

NQF, working with stakeholders in the health IT, quality, and policy communities, should pursue multiple applications for the framework through the following activities and areas of focus:

Framework Refinement and Evolution Recommendations

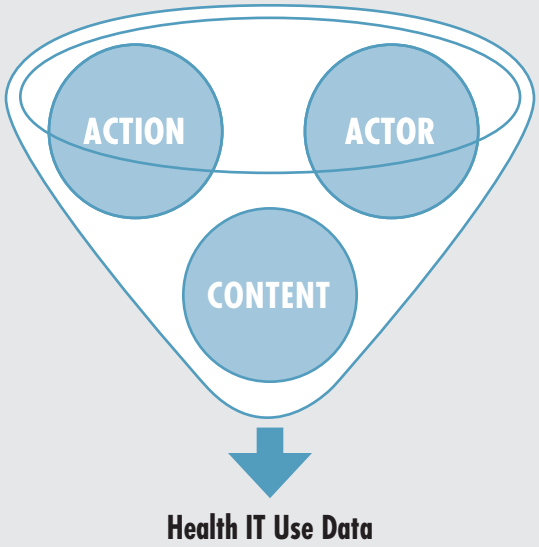
1. **NQF should incorporate the *Health IT Utilization Assessment Framework* into the QDS Model and continue to manage its evolution with public consensus as existing standards and quality measures evolve.**

   The QDS currently includes the category "system characteristics,"[27] identified to allow measure stratification according to staffing ratios and the infrastructure available locally (e.g., number of beds, number of ventilators, etc.). To date, listing of requirements to measure health IT use has not been included. The framework should be incorporated as a new category, listing each of the actions identified in this report (shown in Box 4) in the action-actor-content triplet in Figure 17 (replicated from Figure 1 in the "Executive Summary").

2. **The Department of Health and Human Services' Federal Advisory Committees should consider the adoption of health IT utilization metrics as an EHR certification requirement; specifically, adopt the capture, logging, and evaluation by EHRs of each of the 20 action triplets identified in this report as EHR certification requirements.**

   User-centered design is a common approach to developing software products. The International Standards Organization (ISO) 13407 human-centered design process lists

Figure 17: The Health IT Utilization Assessment Framework*



*Replicated from Figure 1

four components of user-centered design: 1) specify the context of use, 2) specify requirements, 3) create design solutions, and 4) evaluate designs.[28] Although carefully developed software applications may evaluate design during the development and update process, most health IT software applications do not provide ongoing evaluation of the design as part of the application workflow once the product is sold and delivered to a customer. Moreover, the customer has very limited data to understand successful or more challenging aspects of implementing these applications. Healthcare is a complex adaptive system that requires ongoing process and structure analysis to achieve expected outcomes. Rather than merely being a means to providing services and capturing revenue, EHR applications should also be capturing data about their effectiveness in managing the complexity of healthcare.

The *Health IT Utilization Assessment Framework* is a first step in defining the data elements and their interactions to enable clinical effectiveness research and subsequent measurement of effective and efficient use of health IT. Adoption of this framework as part of certification requirements for EHRs can lead to more precise and accurate measures of health IT usage, effectiveness, and unintended consequences.

NQF and standards development organizations should evaluate the framework with respect to its potential to enable coordination of care across settings. Care coordination requires four components: 1) transfer of responsibility of care, 2) management of activities within a specific setting, 3) ensuring the right level of care, and 4) monitoring outcomes of care. Most activity for managing care within and across settings of care has been derived from the nursing model of care plans. The ability to manage a process from one setting to another requires knowledge of the previous (antecedent) event and the expected outcome (or event) that should occur next. In addition to its benefits for measuring use of a clinical system, the *Health IT Utilization Assessment Framework* may also provide a mechanism to more clearly define the actions that have occurred and that are expected, which role and provider performs each action, and the specific content that is required. The framework should be carefully evaluated for care coordination requirements.

3. **The health IT use data requirements should be incorporated into standard frameworks such as the HL7 EHR Functional Model to encourage further evaluation and efforts by the appropriate Standard Development Organizations (SDOs).**

   The Expert Panel identified some inconsistencies among standards for defining actor roles to manage a very important component of the framework triplet. Actors are defined differently in SNOMED-CT, HL7, and other models. The framework needs a more granular concept–the role that can perform a specific function is required, with accompanying information (i.e., metadata) about the individual and his or her credentials. Some functions can be performed successfully and effectively by different individuals including a patient, a surrogate caregiver, a nurse, a physician, etc. The ability of each to perform a function is defined by local practice and custom, and may also be defined by policy and regulation. The ability of any individual to perform such a function successfully is often managed by experience and can be incorporated into privileging practices within organizations. The framework cannot presume to identify local practice and policy. Therefore, specification of actors by traditional roles (i.e., nurse, physician, patient, etc.) may not be ideal. A more functional role standard is needed, and harmonization of the various models described in this report is strongly recommended to meet these measurement and research needs.

4. **Standards development organizations, professional societies, workflow planners, and other key stakeholders and entities should collaborate to standardize, harmonize, and identify definitions of and gaps in roles for all users of clinical applications and health IT systems.**

   A clear delineation and definition of roles is important to enable clinical decision support so that the individual with appropriate credentials and privileges is provided with CDS action steps. The effort should reference and build on work by the ISO on functional and structural roles. A standard definition of roles is also important to evaluate effective utilization of the health IT system itself. Clinical effectiveness research of health IT use will need a method to evaluate which role might generate the greatest success, and standardization of available actions (the 20 categories identified in this report) is needed. Such standard "terminologies" for roles and actions will clarify and make more efficient the evaluation of health IT system use. Standardization should be managed in

Box 4: Health IT Utilization Assessment Framework Actions

1. Access
2. Acknowledge
3. Alert
4. Calculate
5. Create
6. Discontinue
7. Document
8. Implement
9. Notify
10. Order
11. Perform
12. Receive
13. Recommend
14. Reconcile
15. Remind
16. Report
17. Review
18. Stratify
19. Transmit
20. Update

concert by professional societies, measure and guideline developers, and organizations external to the usual health domain that manage business process management standards such as Object Management Group (OMG), the Workflow Management Coalition (WfMC), and others. The content components of this framework are managed using the QDS, which is coordinated with existing standards.

Specifically, the actor and action components should be analyzed further and grouped into cardinal classes of data that map to current, existing standards that allow for the unambiguous exchange of information across settings. In addition to its benefits for measuring use of a clinical system, the framework may also provide a mechanism to more clearly define actions that have occurred and that are expected, which role and provider performs each action, and the specific content required.

Measure Development and Endorsement Recommendation

5. **NQF should pursue a call for measures of health IT utilization.**

   As health IT use quality measures are conceptualized and developed, they should be described in terms of the *Health IT Utilization Assessment Framework's* data requirements. The framework supports measurement of health IT utilization across providers and settings by providing a foundational model for sharing through clinical applications, such as a computer, a monitoring device, or an application on a smart phone. Current measures reflect the siloed nature healthcare delivery; however, measures of health IT use should be capable of providing accountable care organizations with metrics for care coordination. Future measures should also be capable of business process management to align measurement with the needs of the "client," or patients, their caregivers, and payers.

Notes

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10. HITSP Component, "Data Dictionary," HITSP/C154. Review Copy 20100131 V1.0.1. 2009.
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12. Nunn, Sandra, Managing audit trails, *J AHIMA,* 2009;80(9): 44-45.
13. In 2008, NQF endorsed nine structural voluntary consensus standards, developed by the Health IT Structural Measures Panel, for the purpose of assessing and encouraging clinician adoption of health IT. Through this process, healthcare stakeholders became more aware of the evidence and the impact of health IT adoption on improving quality. See Appendix E for the National Voluntary Consensus Standards for HIT: Structural Measures 2008.
14. National Priorities Partnership. National Priorities and Goals. Available at: **http://www.nationalprioritiespartnership.org**. Last accessed October 2010.
15. Office of the National Coordinator for Health Information Technology, Health IT Policy Council Recommendations to the National Coordinator for Defining Meaningful Use. Available at **http://healthit.hhs.gov/portal/server.pt/community/healthit_hhs_gov__policy_recommendations/1815**. Last accessed October 2010.
16. In its analysis, the Expert Panel noted that CCHIT efforts listed a number of certification criteria for each of the major health IT functions, each mapped to meaningful use requirements provided in the NPRM. By identifying the data necessary to measure use of the major health IT functions, the *Health IT Utilization Assessment Framework* ties together the health IT functions and related them to both meaningful use and the NPP Goals.
17. Donabedian A, The role of outcomes in quality assessment and assurance, *Quality Review Bulletin,* 1992;18(11): 356-360.
18. LOINC, LOINC Document Ontology Axis Values: Role. Available at **https://loinc.org/discussion-documents/document-ontology/loinc-document-ontology-axis-values/role**. Last accessed September 2010.
19. National Quality Forum (NQF), Quality Data Set Model. Available at **www.qualityforum.org/Projects/h/QDS_Model/Quality_Data_Set_Model.aspx**. Last accessed September 2010.

20. Application Service Management (ASM) focuses on delivery of business services and requires that each transaction is discretely measurable. ASM allows for isolation of the source of conditions that impact IT services through back-end analysis of actions that have occurred.

21. Joint Commission Resources, Medication Reconciliation: The Foundation for Safe Medication Use. Available at **www.jcrinc.com/DVDs/Medication-Reconciliation-The-Foundation-For-Safe-Medication-Use/1404/**. Last accessed April 2010.

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26. ASTM E2147 describes the security requirements for the development and implementation of audit and disclosure logs used in health information systems. It is used to log and report data about access to clinical records. A detailed analysis is needed to determine the standard's applicability and extensibility for logging and reporting information in the framework.

27. System characteristic is defined in the Quality Data Set (QDS) model as: The structural configuration of an organization, e.g., nursing staff ratios, availability of durable medical equipment, health information technology structures (e.g., e-prescribing), and invasive procedure capabilities. QDS version 2.1 is available at: **http://www.qualityforum.org/Projects/h/QDS_Model/Quality_Data_Set_Model.aspx**.

28. International Standards Organization, Ergonomics of human-system interaction—Part 210: Human-centred design for interactive systems, ISO 9241-210:2010. Available at **www.iso.org/iso/iso_catalogue/catalogue_ics/catalogue_detail_ics.htm?csnumber=52075**. Last accessed September 2010.

Appendix A
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Appendix B
Potential Data Requirements for Future Framework Iterations

THE FOLLOWING UTILIZATION DATA ELEMENTS were identified by the Health IT Utilization Expert Panel as having value for measuring health IT utilization. The current Health IT framework was developed based on analysis of the Centers for Medicare & Medicaid Services' (CMS's) December 2009 Notice for Proposed Rule Making (NPRM) on meaningful use, as well as on Certification Commission for Health Information Technology (CCHIT) requirements. Suggested data elements outside the scope of these sources have been logged below and will be considered as the framework evolves over time.

Since the time the Expert Panel conducted its analysis based on the NPRM, a Final Rule defining meaningful use regulations was released. The Final Rule represents a more constrained set of meaningful use expectations. Therefore, the framework proposed in this report (based on the NPRM) will provide direction to enable measurement that is currently not supported by standardized system components. The framework, when incorporated into the Quality Data Set (QDS), is expected to evolve as national priorities and requirements are determined.

1. Access clinical decision support tools or access knowledge base
2. Create electronic copy of discharge instructions
3. Create electronic copy of patient education materials
4. Add discontinue transition of care order
5. Document accurate patient identification
6. Document religion
7. Document social/home status, impairments (visual, auditory, movement)
8. Implement patient-centered coordination plan
9. Notify accountable entity of transition of care

10. Notify pharmacy of allergic reaction
11. Notify orderer of alarming lab result
12. Notify orderer of non-adherence after defined interval
13. Notify patient of clinical condition
14. Order disease management protocol
15. Order nutrition
16. Order activity level
17. Recommend wellness or prevention program
18. Recommend educational content
19. Recommend family involvement
20. Recommend care modifications based on advice from consultation(s).
21. Access clinical decision support tools or access knowledge base
22. Remind clinician when a prescription refill is due
23. Remind clinician when an order is not completed
24. Report infection to public health department
25. Report alerts suppressed by provider preference
26. Report percentage of patients provided a summary plan of care
27. Transmit patient summary to other providers
28. Transmit data to health information exchange
29. Update patient preferences
30. Patient preferences to procedures performed and quality measure results

Appendix C
Health IT Utilization Assessment Framework Actor Elements

TABLE C-1 ENUMERATES both "(human) roles" and "system actors." These are based on existing published sources: 1) HITEP II "Recorder" attributes (Actors)[1] and 2) LOINC Document Ontology Axis Values (Roles).[2]

The HL7 taxonomy was considered as an appropriate classification for actors in the Health IT Utilization Assessment Framework; however, on further review of the available HL7 concepts, including "RoleClass" and "RoleCodes," the Expert Panel determined that because each of these concepts contains multiple layers of subconcepts, additional work is required to map these codes to the framework. For this reason, the Expert Panel recommended HL7 and Reference Information Model (RIM) mapping efforts for a future harmonization effort.

The NUCC Healthcare Provider Taxonomy was also considered because: 1) it is present in claims and tells what role the actor provides in that specific claim, and 2) it is the taxonomy used in the National Plan and Provider Enumeration System's (NPPES) National Provider Index (NPI) registry. It is a self-identified taxonomy and is therefore non-refutable by the provider. However, due to the all-inclusive nature of the NUCC taxonomy, it is too large to be enumerated in the current classification recommended for actors in the framework.

The work by HITSP was also considered, namely, two value sets from the C80 Clinical Document and Message Terminology Component document—Provider Role Value Set (Table 2-125) and Provider Type Value Set (Table 2-127). For the Provider Role Value Set, HITSP narrowed down the HL7 Version 2 Provider Role Vocabulary to just four concepts: "consulting provider," "primary care provider," "referring provider," and "medical home provider." These are captured in the table below under "provider." For the Provider Type Value Set, HITSP derived a short list of 24 provider types from the NUCC Health Care Provider Taxonomy.

[1] NQF Health Information Technology Expert Panel II (HITEP II), Health IT Enablement of Quality Measurement Final Report, Washington, DC: NQF; 2009. Available at **www.qualityforum.org/projects/hitep2.aspx**. Last accessed September 2010.

[2] LOINC, Document Ontology Axis Values: "Role". Available at **http://loinc.org/discussion-documents/document-ontology/loinc-document-ontology-axis-values/role**. Last accessed September 2010.

Table C-1: Roles and Actors

Actors (Parent concept)	**Subconcepts*** **Note: concepts in the color BLUE are copied from the parent concept in the left column*	**Source 1: LOINC Document Ontology Axis Values** (Roles)	**Source 2: HITEP II Recorder atrributes** (Actors)
Assistant	Assistant	X	
Caregiver	Caregiver		
Care Manager	Care Manager		X
Case Manager	Case Manager	X	
Clerical	Clerical	X	
	Operating Room Clerk		X
	Registration Clerk		X
Clinical Trial Coordinator	Clinical Trial Coordinator		X
Counselor	Counselor	X	
Dentist	Dentist		X
Dietitian	Dietitian		X
Electronic Monitoring Device	Electronic Monitoring Device		X
EMS Staff	EMS Staff		X
Fiduciary	Fiduciary	X	
Family Member	Family Member		X
Laboratory/Lab Tech	Laboratory/Lab Tech		X
Interdisciplinary	Interdisciplinary	X	
	Team	X	

more

Table C-1: Roles and Actors *(continued)*

Actors (Parent concept)	Subconcepts* *Note: concepts in the color BLUE are copied from the parent concept in the left column	Source 1: LOINC Document Ontology Axis Values (Roles)	Source 2: HITEP II Recorder atrributes (Actors)
Medical Assistant/ Clinical Medical Assistant (CMA)	Medical Assistant/Clinical Medical Assistant (CMA)	X	X
Modality Device (Digital x-ray, U/S)	Modality Device (Digital x-ray, U/S)		X
Monitoring Device	Monitoring Device		X
Nursing	Nursing	X	X
	CRNA	X	
	Certified Nursing Assistant (CNA)	X	X
	Certified Nurse Midwife (CNMW)		X
	Certified Registered Nurse Anesthetist (CRNA)		X
	Clinical Nurse Specialist (CNS)	X	X
	Nurse		X
	Nurse Midwife	X	
	Nurse Practitioner	X	X
	Licensed Practical Nurse; Licensed Practice/Vocational Nurse (LP/VN)	X	X
	Registered Nurse (RN)	X	X
Other Clinician			X
Other Healthcare Team Member			X
Parent	Parent		
	Child		

more

Table C-1: Roles and Actors *(continued)*

Actors (Parent concept)	Subconcepts* *Note: concepts in the color BLUE are copied from the parent concept in the left column	Source 1: LOINC Document Ontology Axis Values (Roles)	Source 2: HITEP II Recorder atrributes (Actors)
Patient	Patient	X	X
	Patient Proxy		X
Payer	Payer		X
	Invoice payer		
Payee	Payee		
Pharmacist	Pharmacist		X
	Pharmacy Benefit Manager		x
	Pharmacy Management System (PhMS)		X
Physician	Physician	X	X
	Attending	X	
	Fellow	X	
	Resident	X	
	Intern	X	
Physician Assistant	Physician Assistant	X	X
Protocol	Protocol		X
Provider	Provider/Healthcare provider		X
	Consulting Provider		
	Medical Home Provider		
	Primary Care Provider		
	Referring Provider		
Radiologist	Radiologist		X

more

Table C-1: Roles and Actors *(continued)*

Actors (Parent concept)	**Subconcepts*** **Note: concepts in the color BLUE are copied from the parent concept in the left column*	**Source 1: LOINC Document Ontology Axis Values** (Roles)	**Source 2: HITEP II Recorder atrributes** (Actors)
Researcher	Researcher		**X**
	Clinical Research Investigator		
	Clinical Research Sponsor		
	Agent		
	Assigned Entity		
	Child		
	Citizen		
	Commissioning Party		
	Contact		
	Coverage Sponsor		
	Covered Party		
	Claimant		
	Dependent		
	Emergency Contact		
	Employee		
	Financial Guarantor		
	Guardian		
	Licensed Entity		
	Member		
	Military Person		
	Named Insured		

more

Table C-1: Roles and Actors *(continued)*

Actors (Parent concept)	**Subconcepts*** **Note: concepts in the color BLUE are copied from the parent concept in the left column*	**Source 1: LOINC Document Ontology Axis Values** (Roles)	**Source 2: HITEP II Recorder atrributes** (Actors)
Researcher *(contined)*	Next of Kin		
	Notary Public		
	Personal Relationship		
	Policy Holder		
	Program Eligible		
	Qualified Entity		
	Signing Authority or Officer		
	Subscriber		
	Underwriter		
Student	Sub-Intern	**X**	
Subject	Subject		
	Case Subject		
	Investigator Subject		
	Research Subject		
Technician	Technician	**X**	
	Radiology Technician		**X**
Therapist	Therapist	**X**	**X**
	Occupational Therapist		**X**
	Physical Therapist		**X**
	Respiratory Therapist		**X**

Appendix D
Health IT Utilization Assessment Framework Action Elements and Subelements

Action #1. Access—Definition: The act of retrieving data or a computer file.

1. Access active medication allergy list
2. Access active non-medication allergy list
3. Access diagnostic imaging order
4. Access patient-specific resources
5. Access immunization allergy from immunization registry
6. Access immunization history
7. Access immunization orders
8. Access immunization provided from immunization registry
9. Access laboratory order
10. Access medication allergy history over multiple visits (longitudinal care)
11. Access medication history over multiple visits (longitudinal care)
12. Access active medication list and supplements
13. Access medication order
14. Access non-medication allergy history over multiple visits
15. Access order set
16. Access patient demographic data
17. Access problem list
18. Access procedure orders
19. Access procedures performed
20. Access provider referral orders (incoming and outgoing)
21. Access securely diagnostic test results (patients)
22. Access securely medication allergy list (patients)
23. Access securely problem list (patients)
24. Access smoking status
25. Access syndrome-based information from public health
26. Access trends of body mass index (BMI) based on height and weight
27. Access vital signs
28. Access clinical summary for each office visit/encounter

Action #2. Acknowledge—Definition: To officially recognize, admit, or accept receipt of an object or information.

1. Acknowledge education receipt
2. Acknowledge receipt of clinical summary
3. Acknowledge receipt of diagnostic test results from other providers
4. Acknowledge receipt of generic medication order
5. Acknowledge receipt of imaging procedure order
6. Acknowledge receipt of immunization history from other providers
7. Acknowledge receipt of immunization order
8. Acknowledge receipt of laboratory study order
9. Acknowledge receipt of medication allergy lists from other providers
10. Acknowledge receipt of medication lists from other providers
11. Acknowledge receipt of medication order
12. Acknowledge receipt of medication order (prescription)
13. Acknowledge receipt of non-medication allergy list from other provider
14. Acknowledge receipt of patient preference documentation
15. Acknowledge receipt of patient preferences
16. Acknowledge receipt of patient summary from other providers
17. Acknowledge receipt of problem lists from other providers
18. Acknowledge receipt of procedure order
19. Acknowledge receipt of procedures performed from other providers
20. Acknowledge receipt of provider referral order

Action #3. Alert—Definition: To make someone aware of a possible danger or difficulty.

1. Alert for drug-allergy contraindications (real time)
2. Alert for drug-drug contraindications (real time)
3. Alert non-drug priority based on demographic data
4. Alert non-drug priority based on diagnostic test results
5. Alert non-drug priority based on patient medication list
6. Alert non-drug priority based on specific patient diagnoses/conditions

Action #4. Calculate—Definition: To compute mathematically.

1. Calculate body mass index (BMI)
2. Calculate quality measure results

Action #5 Create—Definition: To produce something as in a printed report or electronic copy.

1. Create electronic copy of diagnostic test results
2. Create electronic copy of immunization history
3. Create electronic copy of medication allergy list
4. Create electronic copy of medication list
5. Create electronic copy of patients clinical information
6. Create electronic copy of problem list
7. Create electronic copy of procedures performed

Action #6. Discontinue—Definition: To stop or end an activity that is planned or is happening regularly; also to remove an element from existing patient information such as an allergy from an allergy list.

1. Discontinue (make inactive or erroneous) medication allergy on allergy list
2. Discontinue imaging procedure order
3. Discontinue immunization series order
4. Discontinue individual order from order set
5. Discontinue laboratory study order
6. Discontinue medication order
7. Discontinue order for medication on medication list
8. Discontinue procedure order
9. Discontinue provider referral order

Action #7. Document—Definition: To create a record of facts, events, symptoms, or findings.

1. Document a progress note for each encounter
2. Document advance directive
3. Document alerts provided to user
4. Document alerts to which a user responds
5. Document attempts at smoking cessation
6. Document date of birth
7. Document diastolic blood pressure
8. Document encounter
9. Document ethnicity
10. Document gender
11. Document growth charts (height, weight, BMI) for patients 2-20 years old
12. Document height
13. Document immunization administration
14. Document insurance type
15. Document medication allergy on medication allergy list
16. Document medications on active medication list
17. Document new allergy
18. Document new medication on medication list
19. Document new problem (condition) on problem list
20. Document non-medication allergy on allergy list
21. Document patient demographic data
22. Document patient preference
23. Document patients' insurance eligibility
24. Document performance results
25. Document preferred language
26. Document problem on problem list
27. Document progress note
28. Document race
29. Document reason for non-compliance with drug-allergy check
30. Document reason for non-compliance with drug-condition check
31. Document reason for non-compliance with drug-drug interaction check
32. Document reason for removal of medication allergy from allergy list

33. Document reason for use of non-generic medication
34. Document smoking status
35. Document smoking status
36. Document syndrome-based public health information
37. Document systolic blood pressure
38. Document transactions to output clinical summaries
39. Document user access by user role
40. Document vital signs
41. Document weight

Action #8. Implement—Definition: To put into effect or action.

1. Implement clinical decision support rule

Action #9. Notify—Definition: To inform or warn officially to make something known.

1. Notify patients for follow-up care
2. Notify patients for preventive care

Action #10. Order—Define: An instruction or request to bring, supply, perform, or activate something.

1. Order (prescribe) medication
2. Order diagnostic imaging procedure
3. Order immunization
4. Order laboratory study
5. Order medication
6. Order medication as generic
7. Order new medication
8. Order order set
9. Order procedure
10. Order provider referral

Action #11. Perform—Definition: To carry out an action or accomplish a task, especially one requiring care or skill.

1. Perform drug-allergy interaction checking during ordering with active allergy list
2. Perform drug-drug interaction checking during ordering with active medication list
3. Perform drug-formulary adherence checking during ordering with active drug formulary

Action #12. Receive—Definition: To receive or take something provided.

1. Receive medication list from other provider
2. Receive clinical lab test result
3. Receive diagnostic test results from other provider
4. Receive documentation of patient preference
5. Receive eligibility response from private payers
6. Receive eligibility response from public payers
7. Receive immunizations from other provider
8. Receive insurance eligibility check electronically from private payers
9. Receive insurance eligibility check electronically from public payers
10. Receive laboratory results electronically in structured format

11. Receive medication allergy list from other provider
12. Receive non-medication allergy list from other provider
13. Receive patient summary record from other providers
14. Receive problem list from other provider
15. Receive procedures performed from other provider
16. Receive updates to immunization status

Action #13. Recommend—Definition: To suggest something as worthy of being accepted use or done.

1. Recommend care modifications based on clinical decision support rules

Action #14 Reconcile—Definition: To make two or more potentially conflicting things consistent or compatible such that inconsistencies are resolved or explained. Reconciliation can be performed with a wide range of content elements; some examples include medication lists, problem lists, allergy lists, patient demographics, and social history. Specifically, medication reconciliation is identified as a meaningful use criterion: "Medication reconciliation is the process of comparing a patient's medication orders to all of the medications that the patient has been taking. This reconciliation is done to avoid medication errors such as omissions, duplications, dosing errors, or drug interactions. It should be done at every transition of care in which new medications are ordered or existing orders are rewritten. Transitions in care include changes in setting, service, practitioner, or level of care." [1]

1. Reconcile medication allergy list at transitions of care
2. Reconcile medications
3. Reconcile problem list at transition of care
4. Reconcile two or more medication lists at encounter
5. Reconcile two or more medication lists at transitions of care

Action #15. Remind—Definition: To cause someone to remember or think of something, such as to take a specific action to maintain or improve health.

1. Remind patients per patient preference for follow-up care
2. Remind patients per patient preference for preventive care

Action #16. Report—Definition: To give detailed information about results of aggregate research, analysis, or investigations.

1. Report percentage claims submitted electronically to all payers
2. Report percentage lab results incorporated into EHR in coded format
3. Report percentage of all medications entered into EHR as generic where generic options exist in the relevant drug class
4. Report percentage of all patients with access to personal health information electronically
5. Report percentage of encounters for which clinical summaries were provided
6. Report percentage of encounters where medication reconciliation is performed
7. Report percentage of transitions in care for which summary care record is shared
8. Report percentage of patients at high risk for cardiac events on aspirin prophylaxis
9. Report on use of high-risk medications (Beers Criteria)
10. Report status for childhood immunizations
11. Reports generated based on health maintenance items performed

[1] Joint Commission Resources, *Medication Reconciliation: The Foundation for Safe Medication Use.* Available at **www.jcrinc.com/DVDs/Medication-Reconciliation-The-Foundation-For-Safe-Medication-Use/1404/**. Last accessed April 2010.

Action #17. Review—Definition: To examine something critically to make sure it is adequate, accurate, and correct and to determine if new actions should be undertaken.

1. Review all information for a lab test report specified at 42 CFR 493.1291(c)1 through (7).6
2. Review clinical laboratory tests received with LOINC codes
3. Review display of patients' insurance eligibility
4. Review display of received clinical lab test results for user interface
5. Review displayed changes in diastolic blood pressure
6. Review displayed changes in height
7. Review displayed changes in systolic blood pressure
8. Review displayed changes in weight
9. Review education provided
10. Review electronically formulary or preferred drug list
11. Review laboratory results electronically in human readable format
12. Review laboratory results incorporated as codified data
13. Review quality measure results

Action #18. Stratify—Definition: To divide or arrange classes, castes, or social strata into a series of graded statuses.

1. Stratify notifications by patient preference
2. Stratify patients by condition
3. Stratify reports by demographic information
4. Stratify by provider type
5. Stratify by provider role

Action #19. Transmit—Definition: To communicate a message, information, or news.

1. Transmit claim electronically to private payers
2. Transmit claim electronically to public payers
3. Transmit claims electronically to private payers
4. Transmit claims electronically to public payers
5. Transmit clinical summary
6. Transmit electronic permissible medication order (prescription)
7. Transmit electronically calculated quality measure results
8. Transmit immunization administered to immunization registry
9. Transmit immunization allergy to immunization registry
10. Transmit insurance eligibility check electronically to private payers
11. Transmit insurance eligibility check electronically to public payers
12. Transmit insurance eligibility queries to private payers
13. Transmit insurance eligibility queries to public payers
14. Transmit query to immunization registries for updates to immunization registries
15. Transmit "reportable" laboratory results to public health
16. Transmit syndrome-based public health information
17. Transmit the number of alerts responded to by a user
18. Transmit to other provider diagnostic test results
19. Transmit to other provider immunizations

20. Transmit to other provider medication allergy list
21. Transmit to other provider medication list
22. Transmit to other provider problem list
23. Transmit to other provider procedures performed
24. Transmit to patient summary record from other providers

Action #20. Update—Definition: To provide someone or something with the most recent information or with more recent information than was previously available.

1. Update allergy list
2. Update childhood immunizations
3. Update individual high-profile order in order set
4. Update medication allergy on allergy list
5. Update medication allergy on medication allergy list
6. Update medication list
7. Update medication order to comply with formulary
8. Update medication order to use generic medication
9. Update medications on active medication list
10. Update non-medication allergy on allergy list
11. Update order for medication on medication list
12. Update patient demographic data
13. Update patients record based on laboratory test result
14. Update problem (condition) definition on problem list
15. Update problem (condition) status on problem list
16. Update problem list over multiple visits (longitudinal care)
17. Update problem on problem list
18. Update smoking status
19. Update vital signs

Appendix E
National Voluntary Consensus Standards for HIT: Structural Measures 2008

E-prescribing

- Adoption of medication e-prescribing
- EHR with EDI prescribing used in encounters in which a prescribing event occurred

Interoperable EHRs

- Adoption of health IT
- The ability for providers with health IT to receive laboratory data electronically directly into their qualified/certified EHR system as discrete searchable data elements

Care management

- The ability to use health IT to perform care management at the point of care
- Tracking of clinical results between visits

Quality registries

- Participation in a practice-based or individual quality database registry with a standard measure set
- Participation by a physician or other clinician in systematic clinical database registry that includes consensus endorsed quality measures

Medical home

- Medical Home System Survey

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