NATIONAL QUALITY FORUM

Critical Paths for Creating Data Platforms: Care Coordination

DRAFT REPORT FOR PUBLIC COMMENT

October 1, 2012

Contents

Executive Summary

In 2011, the National Quality Strategy identified improvement in care coordination as a goal requiring focused national attention. The National Quality Forum (NQF) carefully aligned its work with these goals, including focusing on effective communication to coordinate care. Health information technology (IT) – and its ability to capture, aggregate, and report data to enable more standardized and efficient reporting and assessment of performance at both the patient and population levels – will be integral to these efforts.

Studies show that handoffs or transfers of patient care from one provider to another are susceptible to communication failures.[1] More specifically, research indicates that the risk of a breakdown in the work of any critical system is significantly increased during transitions and that the consequences, both in health care and other high-risk environments, can be catastrophic. In a study on hospital discharge communication to primary care, direct communication between the hospital and primary care setting occurred only 3 percent of the time. At discharge, a summary was provided only 12 percent of the time, and this occurrence remained poor at 4 weeks post-discharge, with only 51 percent of practitioners providing a summary. This standard affected quality of care in 25 percent of follow-up visits.[2] NQF is working with the federal government to further use of health IT in health quality measurement to measure and improve care coordination. The goal of this Critical Paths Project is to understand the current state of electronic data readiness for quality measurement and current gaps in data exchange that, if filled, would allow for more robust communication of the care plan during transitions of care.

NQF convened a technical expert panel (TEP) to determine the state of readiness of existing health IT infrastructure to support quality measurement of care planning during transitions of care, as well as provide recommendations for advancing such infrastructure. (See Exhibit A for TEP Member Roster.) The TEP evaluated the steps involved in use of the care plan in transitions of care and also identified data requirements to support quality measurement of care planning during transitions of care. The TEP also identified the need for both patient-centric and team-based care plan data elements.

As they defined the elements required, a framework developed that included characteristics related to business, function, and content factors (see Figure 1).

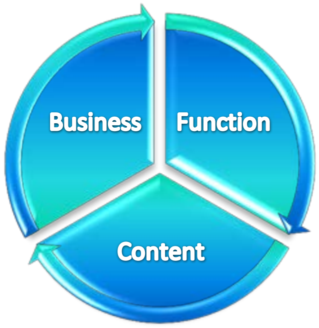

Figure 1: The figure shows three classes of factors that affect the coordination of care: business, function and content.

Business factors include federal, state, and local initiatives, rules, and regulations. This also includes organizational policies and procedures

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[1] Riesenberg, L., Leitzsch, J., & Little, B. (2009a). Systematic Review of Handoff Mnemonics Literature. [Review]. *American Journal of Medical Quality, 24*(3), 196-204.

[2] Dennison, C. R., & Hughes, S. (2009). Progress in Prevention Imperative to Improve Care Transitions for Cardiovascular Patients. *Journal of Cardiovascular Nursing, 24*(3), 29-251.

which can vary by organization, location within the facility and/or care coordination practices.

Function includes those human factors that affect how the care plan is developed, used, and evaluated. These factors include assessment, diagnoses, planning, implementation, and evaluation.

Content includes those factors *intrinsic* to the plan of care (diagnoses (condition/problem), interventions (orders/services), goals, and outcomes), and those *extrinsic* to the plan of care (environmental factors).

The TEP agreed that patient diagnosis (condition, problem), procedure (orders, interventions, services), care goal (expected outcomes), and actual outcome are the main data elements of a care plan. However, these data elements alone would not be sufficient to support communication, understanding, and performance measurement of the care plan in transitions of care. Main elements of the plan of care, along with supporting contextual information, are essential components for transitions of care and performance measurement of those transitions. In addition, given the breadth of patient information needed for care plans, tools to filter and analyze information are needed for quality measurement and reporting.

Based on expert advice and requirements identified by the TEP, an environmental analysis was then conducted to assess the readiness to transmit electronic data, to use HIT systems to perform the data capture, to standardize data, to communicate a patient-centered plan of care, and use data for quality measurement. The results indicate that sites are working to address care coordination demands, but are struggling with lack of interoperability across settings. Many sites are still working to transfer basic discharge summaries electronically between settings. Electronic tools to improve continuity and identify high risk patients are widespread, but are often limited to one healthcare site. The sites cited many examples of low-tech care innovations to complement their high-tech innovations. Several programs used a dedicated case manager to coordinate care for high-risk groups or to transfer information across high-risk discharges into and out of acute care hospitals and emergency departments.

When queried about existing quality measures, the use of data to track performance fell into four broad categories. First, several sites collect data for risk stratification, and they use various tools to identify those patients who, due to higher than average risk for poor outcomes, qualify for more intensive care coordination during and after transitions. Second, most sites track measures that capture failures of care coordination: readmission rates (usually 30 days from discharge), emergency department utilization, and length of stay for readmissions. The third type of quality measurement focuses on ensuring that the right discharge and transition processes occur by conducting post-discharge phone calls to targeted patients. Lastly, some sites use patient surveys to measure the success of discharge processes in promoting patient knowledge and satisfaction.

Across all sites in this scan, it was not the norm to perform electronic documentation of a complete patient-centered, cross-condition care plan, known as a Longitudinal Plan of Care. Moreover, the scan found uneven readiness to implement automated communication of Meaningful Use (MU) Stage 2 care coordination data elements.

As noted in the environmental analysis, the readiness of existing health IT infrastructure to express the data required for quality measurement of care planning during transitions of care is limited, secondary to the lack of: sufficient data and interoperability standards; universally adopted incentives; standard processes; and quality measures. The TEP's recommendations to improve the existing health IT infrastructure for patient centric, team-based measurement of care coordination align around three classes of factors: business, function, and content:

1. Business Factors: *Change Behaviors and Move the Paradigm Forward*
    - The TEP acknowledges the need to align national incentives to change both individual and organizational behavior, thereby advancing the quality data infrastructure necessary for electronic measurement.
    - The MU program is a powerful lever for changing both the technical side, through the ONC certification criteria, and the behavioral side, through CMS payment incentives.
    - With greater adoption of the dynamic, longitudinal plan of care, Clinical Decision Support (CDS) can play a greater role in the electronic environment.
    - MU Stage 2 requirements address many of the technical barriers related to data exchange, including standards and interoperability, and the movement towards definition of common data sets, which sets the foundation for quality measurement of the plan of care.
    - Existing CDS tools could support the creation of a dynamic plan of care that displays the most important and relevant data based on patient (individual) specific characteristics and setting of care. This is especially important in team-based care and for care spanning different organizations where the plan of care needs to be tailored to meet specific needs.
    - Further, the TEP recognizes that CDS includes not only the point of care CDS, but also includes the use of aggregate analytical tools necessary for quality measurement reporting across populations of individuals. This requires a robust terminology infrastructure. The TEP discussed the need for standardized terminologies such as SNOMED and LOINC, and also the utility of the NQF CDS Taxonomy which provides a classification and categorization of the CDS information necessary for quality measurement and reporting across settings and specialties.
    - Increased sophistication around data element "attributes" is needed in the CDS system to assign, order, and refer interventions and tasks. Identifying which providers and clinicians should receive CDS alerts is a complex area for health IT, particularly when there are multiple providers and clinicians involved in care delivery.
    - The TEP identified the need for incentives to expand the scope of a hospital beyond its "walls" to look at how the organization interacts with its environment across the continuum.

2. Function: *Realizing the Potential of Health IT Tools*

- While not the primary focus of this project, the TEP recognized the need for innovative health information systems and applications that can support care plans across organizations.
- The TEP discussed the priority need for a robust data infrastructure which will serve as a precursor for automated electronic functional support for the processes contained within the plan of care. Recent advancements in structured terminology have enabled application functionality.
- The TEP recommends leveraging use of a broad array of health IT that extends beyond the EHR. A person-centered plan of care includes clinical data elements typically found in EHRs, but also includes information found in case management systems, home care systems, and financial applications. The TEP discussed the under-utilization of Personal Health Records (PHRs), which hold great promise for involving patients and family caregivers in coordinating care. PHR capabilities are improving with time and it is expected that with closer integration into hospital and ambulatory practices' systems, PHR use will increase in the future. These application platforms can be built on standards-based interoperable data elements on the backend, and care plan data can be filtered for the needs of the care team members.
- Given the complexity of care planning during transitions of care, the TEP supports incremental movement from the current state to the end goal: standardization of dynamic family-centric, single-source, longitudinal plans of care that incorporate systems for registering, tracking, measuring, reporting, and improving quality.

3. Content: *Data and Interoperability Standards*

- The TEP identified patient diagnosis (condition, problem), procedure (orders, interventions, services), care goal (expected outcomes), and actual outcome as the main data elements of a longitudinal person-centered care plan. However, these data elements alone are not sufficient for either care delivery or quality measurement of the care plan. Additional data elements were identified as being necessary included assessment findings, environmental factors, and patient preferences.
- Although MU 2 will enhance documentation of common data elements related to the plan of care, proposed MU3 measures have an expanded care plan element list for transitions of care. In addition, there are corollary recommendations for MU3 as the common MU data set is quite basic and lacks the necessary granularity for patient-centered, longitudinal care plans.
- Data included for an individual "master" care plan differs based on the patient's needs and care setting (disciplines involved in care team). For this reason, additional granularity in electronic point of care documentation and data attributes is necessary in order to support data presentation.

- Use of the Consolidated CDA standard can lead to greater data interoperability, as well as meeting certification criteria and MU objectives The TEP also noted the need for more specific definitions from the HIT perspective, including the incorporation of patient reported outcomes, taxonomy for goals, and a standard representation of patient beliefs, desires, and intentions in existing vocabularies.
- The TEP recommends identification of a minimum “starter set,” along with an implementation guide on how to use data elements in point of care documentation and quality reporting. The following list of data elements and information reflects industry efforts to date (see Appendix G). This could be used as a starting point for the development of a starter set for transitions of care using the care plan:
    1. Demographics (name, address, sex, DOB, race, ethnicity, preferred language)
    2. Advanced directives
    3. Patient preferences
    4. Medical equipment
    5. Insurance/payers
    6. Practice identifier
    7. Prior and future encounters (episodes of care)
    8. Care team
        a. Roles
        b. Responsibilities
        c. Key owner for the plan of care
        d. Primary contact
        e. Additional contacts
    9. Support
    10. Special alerts/ heads up
    11. Adverse events / unintended events
    12. Shared agreement
    13. Problems/conditions, Orders/Services/Interventions, Goals (expected outcomes)
    14. Past history
    15. Watchful waiting
    16. Certification and Certification period for the clinical team
    17. Environmental factors
        a. Exposures in environment
    18. Observations
        a. Assessment / physical findings / measurement instruments
        b. Actual outcomes
        c. What worked / what didn’t work?
    19. Results
        a. Allergies
        b. Smoking status
        c. Labs
        d. Diagnostic results

        e. Vital signs
    20. Precautions
    21. Orders/Services/Interventions:
    22. Medications (see above categories)

The TEP identified areas of future exploration for data elements that are directly related to electronic quality measurement using point of care data capture and the QDM. The following list is a sample and is not mean to be inclusive:

- Methods for structuring and representing patient, person, or caregiver instructions
- Methods for modeling and tracking care plan responsible parties and their roles
- Standardization of environmental factor content
- Standardization of representation for encounters, episodes of care, and occurrences, so the plan of care could be summarized as one entity or decomposed into encounter/episodes of care views
- Standardized methods for representing medications (pre-admission medications, transfer medications, discharge medications, high risk medications, in-transport medications, admission medications, home/over the counter medications,)
- Definition of identification of the most appropriate term for “therapeutics”, “watchful waiting”, and “heads up information”
- Standards for tracking patient reported outcomes and associated attributes necessary for care delivery and eMeasurement
- Standard representation of clinician certification, alerts, and pending tests
- Patient instructions and the associated relationship to QDM categories, states, and attributes.
- Implications related to capturing information regarding the “care team” and “clinical roles” and associated relationships to the care plan)
- Attribution, as an important component of the care plan warrants further analysis. All parties need to know “who is doing what,” along with the source/recorder, subject/actor, and receiver/target. Attribution data captured is essential for team attribute analysis. It will inform the best team mix to “practice to the top of the license” for the most efficient and effective health care teams, as well as other team attributes (e.g., staffing).

Aligning incentives to change behaviors, promoting data and interoperability standards, and identifying a minimum data “starter set” could greatly advance point of care documentation and quality measurement activities related to care planning at transitions of care.

Introduction

The U.S. healthcare system is fragmented, with patients, families, and caregivers forced to navigate an increasingly complex system filled with inefficiencies. Lack of care coordination can lead to serious complications, including medication errors, preventable hospital readmissions, and unnecessary pain and suffering for patients.

Effective communication and care coordination are essential to achieving better patient outcomes, and have been identified as national priorities for improvement in the National Quality Strategy (NQS) (see figure 2). In 2006, NQF defined care coordination as a “function that helps ensure that the patient’s needs and preferences for health services and information sharing across people, functions, and sites that are met over time.”[3] Transitional care – defined as a set of actions designed to ensure the coordination and continuity of healthcare as patients transfer between different locations or different levels of care within the same location[4]– is an important part of effective care coordination. Transitional care includes the exchange of essential patient information among healthcare providers; essential information is critical knowledge that must be communicated between providers to maintain continuity of care.

Figure 2: National Quality Strategy Goals

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[3] National Quality Forum (NQF), *NQF-Endorsed Definition and Framework for Measuring and Reporting Care Coordination*, Washington, DC; NQF 2006.

[4] Coleman, E. A. (2003). Falling Through the Cracks: Challenges and Opportunities for Improving Transitional Care for Persons with Continuous Complex Care Needs. *Journal of American Geriatrics Society, 51*(4), 549-555.

Studies show that handoffs or transfers of patient care from one provider to another are susceptible to communication failures.[5] More specifically, research indicates that the risk of a breakdown in the work of any critical system is significantly increased during transitions and that the consequences, both in health care and other high-risk environments, can be catastrophic. In a study on hospital discharge communication to primary care, direct communication between the hospital and primary care setting occurred only 3 percent of the time. At discharge, a summary was provided only 12 percent of the time, and this occurrence remained poor at 4 weeks post-discharge, with only 51 percent of practitioners providing a summary. This standard affected quality of care in 25 percent of follow-up visits.[6]

The Office of the National Coordinator for Health Information Technology (ONC) has clearly identified care coordination and transitions as high priority domains for which quality measurement built into electronic systems will be required. As the Health IT Policy Committee and Health IT Standards Committee continue to choose standards and measures for Stage 3 of MU, there will likely be even greater momentum for EHR integration and information exchange to promote care coordination. NQF has carefully aligned its health IT portfolio with these goals. Health IT – and its ability to capture, aggregate, and report data to enable more standardized and efficient quality reporting at both the patient and population levels – will be integral to effective communication and care coordination efforts.

Project Overview

In the *Critical Paths for Creating Data Platforms: Care Coordination* project, NQF looks to assess the readiness of existing health IT infrastructure to support quality measurement of care planning during transitions of care, as well as provide recommendations for advancing such infrastructure. The project will evaluate the ability of existing health IT measurement infrastructure to express the data required for quality measurement of care planning during transitions of care. The end goal is to identify best practices for patient-centric, team-based measurement of care coordination and to encourage standardization for managing plans of care that incorporates systems for registering, tracking, measuring, reporting, and improving quality.[7]

Project Approach

NQF first convened a technical expert panel (TEP) focused on care plan communication, use, and impact during transitions of care to define requirements for measurement and evaluation of readiness for measurement. The TEP completed a review of relevant industry concepts, including:

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[5] Riesenberg, L., Leitzsch, J., & Little, B. (2009a). Systematic Review of Handoff Mnemonics Literature. [Review]. *American Journal of Medical Quality, 24*(3), 196-204.

[6] Dennison, C. R., & Hughes, S. (2009). Progress in Prevention Imperative to Improve Care Transitions for Cardiovascular Patients. *Journal of Cardiovascular Nursing, 24*(3), 29-251.

[7] "Preferred Practice 3" from the National Quality Forum (NQF), *Preferred Practices and Performance Measures for Measuring and Reporting Care Coordination: A Consensus Report,* Washington, DC: NQF; 2010.

- Use of care plans in care coordination, specifically transitions of care;
- Identification of workflow activities and data components related to the plan of care; and
- Characteristics that define plans of care.

The work of the TEP informed an environmental scan, conducted by Brigham and Women's Hospital, to develop a baseline understanding of the use of health IT to support transitions of care and quality measurement. The results indicate that sites are working to address care coordination demands, but are struggling with lack of interoperability across settings. Many sites are still working to transfer basic discharge summaries electronically between settings. Electronic tools to improve continuity and identify high risk patients are widespread, but are often limited to one healthcare site.

This draft report is the summary of the TEP's work and the environmental scan results, and contains the TEPs' recommendations to advance existing health IT infrastructure to support quality measurement of care planning during transitions of care.

To complete this project, NQF will:

- Post the draft report on NQF's website for public comment and host a webinar to encourage public comment for inclusion in the final report
- Review and synthesize comments to help inform a final report on the critical pathways to improve data availability and data capture to measure care planning during transitions of care and thus enable electronic quality measurement
- Recommend enhancements to the Quality Data Model to support plan of care concepts addressing data sources and data standards

Identification of Requirements and Methods for the Environmental Analysis

The TEP, during a series of conference calls and a face to face meeting, initiated the following steps to identify the requirements and methods for the environmental analysis:

- Review of federal and industry initiatives related to the plan of care use in care coordination that may inform quality measurement;
- Identification of use case scenarios pertinent to the scope of work;
- Review of the workflow and data components related to the plan of care during care coordination; and
- Discussion and identification of the characteristics of the plan of care;

Because care coordination is one of the six priorities of the NQS, there are several important federal and industry activities to improve communication of the care planning during transitions of care using a health IT infrastructure. Information and knowledge described in the industry initiatives was shared with the TEP and subsequently used to identify requirements and methods for the environmental analysis.

Related NQF Efforts

NQF works with a diverse set of stakeholders to influence the U.S. healthcare system 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. NQF has several projects designed to support multi-stakeholder collaboration in the area of health IT, including its eMeasure Learning Collaborative[8] and the development of the Quality Data Model (QDM), an "information model" that clearly defines concepts used in quality measures and clinical care and is intended to enable automation of EHR use. [9]

Quality Data Model

The QDM provides a way to describe clinical concepts in a standardized format so individuals (i.e., providers, researchers, measure developers) monitoring clinical performance and outcomes can clearly and concisely communicate necessary information. The QDM organizes and describes information so that EHR and other clinical electronic system vendors can consistently interpret and easily locate the data required. [10]

The QDM provides the potential for more precisely defined, universally adopted electronic quality measures to automate measurement and compare and improve quality using electronic health information. Use of the QDM will enable more standardized, less burdensome quality measurement and reporting and more consistent use and communication of EHRs for direct patient care. In addition to enabling comparisons across performance measures, the QDM can promote delivery of more appropriate, consistent, and evidence-based care through clinical decision support applications. More information on the QDM can be found in Appendix B.

NQF Care Coordination Measure Portfolio

NQF has undertaken several projects to provide guidance and measurement of care coordination, including a 2006 project that yielded an endorsed definition and framework for care coordination measurement. The framework for examining and understanding care coordination identified five key domains: healthcare "home;" proactive plan of care and follow-up; communication; information

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[8] http://www.qualityforum.org/Topics/HIT/eMeasure_Learning_Collaborative/eMeasure_Learning_Collaborative.aspx

[9] http://www.qualityforum.org/QualityDataModel.aspx

[10] Ibid.

systems; and transitions or handoffs.[11] A project completed in 2010 endorsed 25 care coordination practices and 10 performance measures.[12]

The current NQF Care Coordination Endorsement Maintenance project was structured in two phases. The first phase of the project provided the opportunity for the Steering Committee to address the lack of cross-cutting measures of care coordination in the NQF measures portfolio and to identify a Pathway Forward to advance the field of care coordination measurement. Their work was strengthened by the development of a commissioned paper[13] examining electronic capabilities to support care coordination measurement and the findings of an environmental scan. The Pathway Forward and *Call for Measures* released for the second phase of the project reflected the expert opinions of the Committee and addressed gap areas illuminated by the scan and the commissioned paper.

Unfortunately, despite targeted outreach and an extended *Call for Measures* period, no new measures were submitted to the second phase of this project, and the Committee therefore evaluated only the 15 previously-endorsed Care Coordination measures that were scheduled for maintenance review. Twelve of these fifteen measures were recommended by the Committee for continued endorsement. Because of their concern that no new measures were submitted to the project and because they noted significant gaps within the currently endorsed portfolio of measures, the Committee also identified and prioritized future areas for Care Coordination measure development in the second phase of the project.

The TEP used findings from the NQF Care Coordination Endorsement Maintenance project, particularly interoperability methodological issues and applicable data sources to identify characteristics of the plan of care necessary for quality measurement. The TEP initiated a cross-walk between data elements identified from the NQF Care Coordination Endorsement Maintenance project and data elements found in national projects describe below. The results of this effort informed the care plan characteristics described in this report.

NQF Measure Applications Partnership (MAP)

The Measure Applications Partnership (MAP) is a public-private partnership convened by NQF. MAP was created to provide input to HHS on the selection of performance measures for public reporting and performance-based payment programs.[14] MAP promotes alignment of performance measurement across public- and private-sector initiatives that use measures to drive value. As a primary tactic to achieve alignment of performance measurement, MAP has identified families of measures—sets of

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[11] National Quality Forum (NQF), *NQF-Endorsed Definition and Framework for Measuring and Reporting Care Coordination*, Washington, DC; NQF 2006.

[12] NQF, *Preferred Practices and Performance Measures for Measuring and Reporting Care Coordination*. Washington, DC: NQF; 2010. Available at www.qualityforum.org/projects/care_coordination.aspx. Last accessed September 2012.

[13] http://www.qualityforum.org/Projects/c-d/Care_Coordination_Endorsement_Maintenance/Care_Coordination_Endorsement_Maintenance.aspx#t=2&s=&p=5%7C4%7C2%7C. Accessed May 2012.

[14] http://www.qualityforum.org/Setting_Priorities/Partnership/Measure_Applications_Partnership.aspx

related available measures and measure gaps that span programs, care settings, levels of analysis, and populations for specific topic areas related to the NQS priorities and high-impact conditions.[15]

The Care Coordination Family of Measures identifies six priority areas for aligning care coordination quality measurement: avoidable admissions and readmissions, system infrastructure support, care transitions, communication, care planning, and patient safety surveys related to care coordination.[16] In identifying the care coordination measure family, MAP considered a total of 135 measures focusing on the six care coordination topic areas. A set of 62 available measures and a number of measure gaps were identified. MAP also noted the limitations of existing measures and possible modifications that could allow a measure to be applied more broadly or to show more meaningful results.[17]

Related Federal and Industry Efforts

In addition to NQF efforts, national efforts related to care planning and the communication of the care plan during transitions of care were reviewed by the TEP. The knowledge from these efforts helped the TEP identify the types of data necessary for quality measurement, workflow feasibility to capture the data, and methods to evaluate the data sources available within existing EHRs. The national efforts are described below.

AHRQ Care Coordination Measures Atlas

The Agency for Healthcare Research and Quality (AHRQ) identified measures for assessing care coordination interventions in research studies and demonstration projects, particularly those measures focusing on care coordination in ambulatory care. This systematic review, entitled the *Care Coordination Measures Atlas*, originally identified 61 measures of care coordination, of which most were surveys of the patient experience; it was subsequently updated to include 64 measures.[18]

Additionally, the *Atlas* includes a care coordination measurement framework diagramming key domains that are important for measuring care coordination and their relationship to potentially measurable effects. This framework identifies "health IT-enabled coordination" as a broad approach to support coordination. Health IT tools, such as electronic medical records, patient portals, or databases, can be used to communicate information about patients and their care between health care entities or to maintain information over time. [19]

HL7: The Patient Care Workgroup

The goal of the HL7 Patient Care Workgroup is to define the requirements and solutions to support the needs for communicating information regarding the creation, management, execution and quality of

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[15] MAP Families of Measures: Public Comment Draft August 27, 2012.

[16] Ibid, page 17

[17] Ibid, pages 23-34

[18] *Care Coordination Measures Atlas*. AHRQ Publication No. 11-0023-EF, January 2011. Agency for Healthcare Research and Quality, Rockville, MD. http://www.ahrq.gov/qual/careatlas/

[19] Ibid, chapter 3

care provision.[20] The Patient Care Workgroup is completing a care plan domain analysis model, which is an abstract representation of the plan of care, complete enough to allow instantiation of all necessary concrete classes needed to develop design artifacts.[21] This is completed through the development of use cases with actors and an information model. Use cases encompass a list of activities (steps), depicting interactions between actors (a role) and a system, to achieve a goal. The actor can be human or an electronic system. The Patient Care workgroup has become more involved in defining how data are packaged, communicated, and transferred between electronic health systems (HL7 version 3 messaging standards). The core of Patient Care work is a model used to create messages, the Care Provision Domain Message Information Model (D-MIM), which was established as an HL7 Draft Standard for Trial Use in 2007.[22] The HL7 work addresses individual data elements needed at the point of care transitions. Additional effort is needed to identify data elements needed for quality measurement and reporting.

The Patient Care Workgroup has developed a model for the care plan (see Figure 3), which is currently under refinement by HL7. The TEP used the model as a reference to identify key workflow and data requirements for the care plan. This model places the care plan in the context of other workflows and inputs, such as initial assessment and implementation, which contribute to the care but are not part of the care plan itself. The model also allows for discipline-specific definitions of the care plan.

In addition, work underway by HL7 on the Clinical Document Architecture (CDA) standard was reviewed by the TEP. The CDA structure specifies standard content for both human interpretation and software processing, of which the Continuity of Care Document (CCD) describes a core data set of the most relevant information necessary for continuity of care.[23] The structured part of CCD provides a framework for referring to coding systems such as the Systemized Nomenclature of Medicine Clinical Terms (SNOMED) and the Logical Observation Identifiers Names and Codes (LOINC). An HL7 standard more closely tied to quality measurement is the Quality Reporting Data Architecture (QRDA), a QDM-based standard to define explicitly how a Health Quality Measures Format (HQMF) eMeasure can be represented for communication of quality measurement data. The TEP reviewed these standards and associated data because of the close correlation between data elements necessary for care delivery and data elements necessary for quality measurement. For consistent, interoperable electronic quality measurement, there are multiple standards that will be used to support the NQS. The goal is to ensure these standards contain important data and information derived from quality measures in order to use the data captured as byproduct of care delivery for quality measurement.

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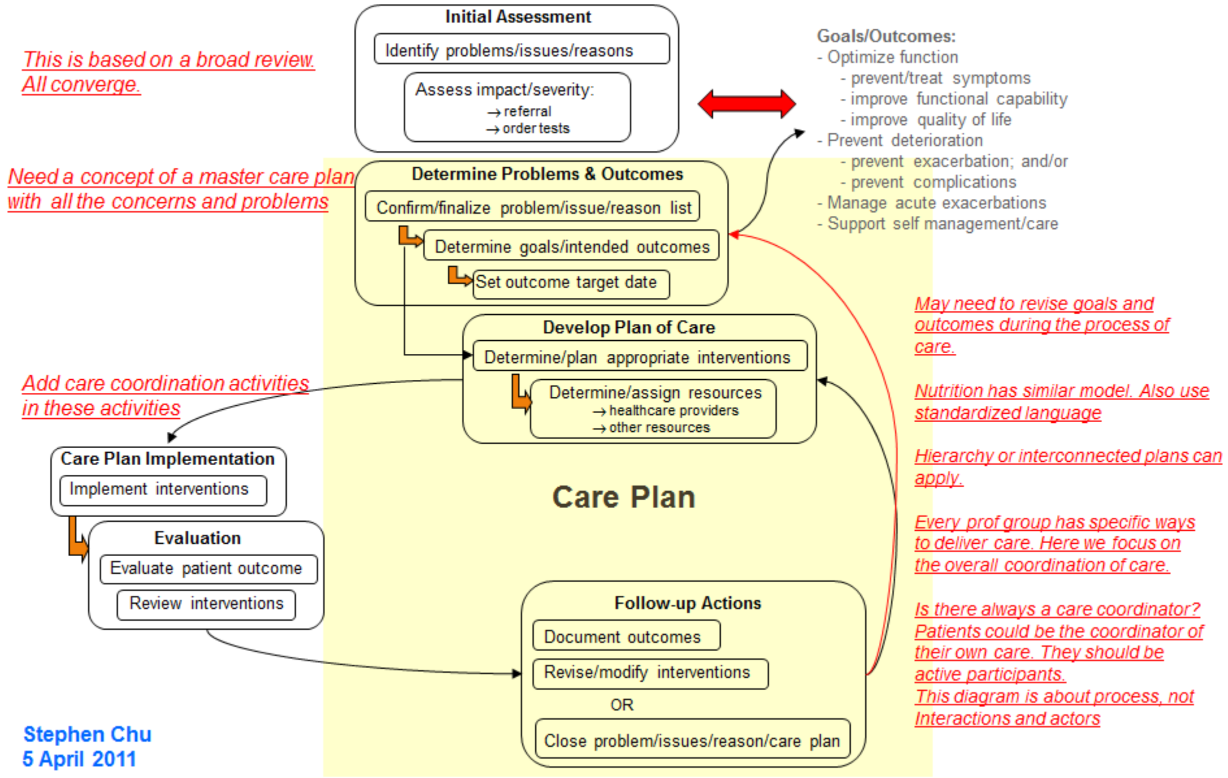
[20] http://www.hl7.org/Special/committees/patientcare/overview.cfm
[21] http://wiki.hl7.org/index.php?title=Domain_Analysis_Model
[22] http://www.hl7.org/Special/committees/patientcare/overview.cfm. Last accessed May 2012.
[23] http://www.hl7.org/implement/standards/product_brief.cfm?product_id=6

Figure 3: HL7 Care Plan- High level Processes



The TEP used HL7's data elements and workflow as the foundation for identification of care plan requirements related to quality measurement. The TEP also compared these data elements and workflow to NQF prior work on care coordination and found consistency between the two efforts.

Integrating the Healthcare Enterprise (IHE) Patient Care Coordination

Integrating the Healthcare Enterprise (IHE) is an initiative by healthcare professionals and industry to improve the way computer systems in healthcare share information.[24] The IHE Patient Care Coordination (IHE PCC) Technical Committee was established to address integration issues that cross providers, patient problems or time. It deals with general clinical care aspects such as document exchange, order processing, and coordination with other specialty domains. IHE provides a detailed implementation and testing process to promote the adoption of standards-based interoperability by vendors and users of healthcare information systems. The process culminates in the Connectathon, a weeklong interoperability-testing event.[25]

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[24] http://www.ihe.net/Technical_Framework/index.cfm

[25] Information about the 2012 Connectathon is available at: http://www.ihe.net/connectathon/. Accessed 14 May 2012.

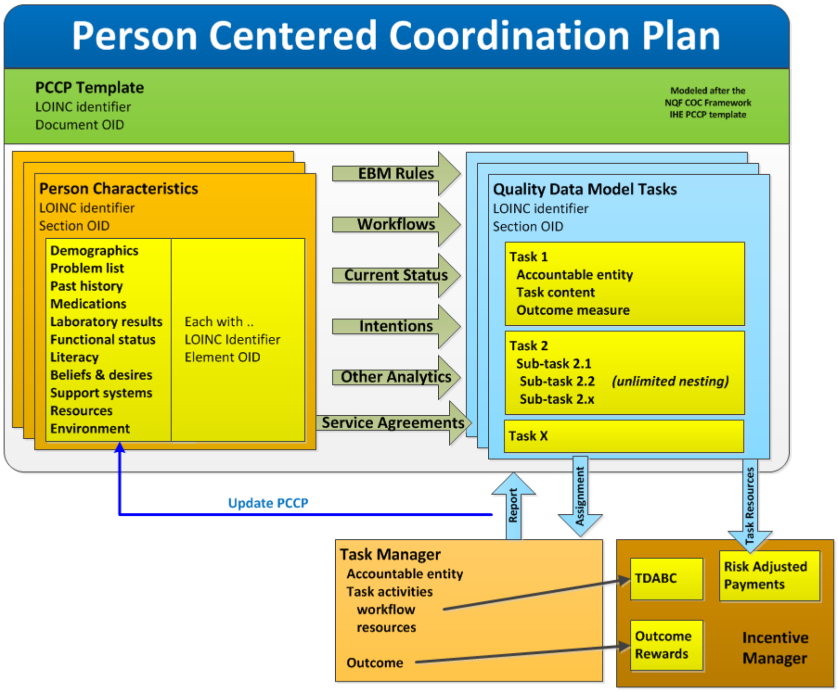
The current IHE PCC projects are technical profiles designed to provide information at specific points of care transitions for patients in hospitals. These profiles informed the efforts of the NQF care coordination TEP and include the following areas:

- Patient Centered Coordination Plan (PCCP)
- Patient Plan of Care (PPOC)[26]
- Nursing e-Summary (Nursing Subcommittee)
- Newborn Discharge Summary (NDS)
- Postpartum Visit Summary (PPVS)
- Antepartum Record (APR)/Labor and Delivery Record (LDR)

Person Centered Coordination Plan

Experts involved in prior NQF-related efforts focused on the QDM have developed models that were integrated into this work. The Person Centered Coordination Plan (PCCP) integrates prior NQF framework reports with the IHE PCCP draft report. The model (see Figure 5), allows for task management by applying the QDM data elements, and focuses on measurable outcomes. The emphasis on tasks enables the appropriate level of resource use by having healthcare professionals working at "the top of their licenses." The PCCP incorporates four basic domains and connecting capabilities: 1) person characteristics, 2) tasks domain, 3) task manager domain, and 4) incentive manager domain. Additionally, the patient characteristics domain includes beliefs and desires to individualize the plan.[27]

Figure 5: Person Centered Coordination Plan (PCCP)



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[26] http://www.ihe.net/Technical_Framework/upload/IHE_PCC_Suppl_PPOC_Rev1-3_TI_2011-09-09.pdf

[27] This model is pre-publication.

The PPCP was valuable to the TEP by identifying the important role of the care plan in sequencing and organizing care activities and the important subsequent role in quality measurement. In addition, the PCCP generated much discussion about the role of the QDM in quality measurement reporting.

While reviewing the PCCP, the TEP had a spirited discussion about the terminology of “tasks.” The data contained within the plan of care can generate evidence-based tasks, which are informed by both clinical judgment and patient preferences, which serve as input into implementation of the plan of care. A core set of baseline patient characteristics and preferences are needed to provide context before the plan can be implemented. The TEP recognized that there are two categories of data: data which informs the care plan and data necessary to execute the care plan.

Standards and Interoperability (S&I) Framework

The Standards and Interoperability (S&I) Framework consists of volunteers focused on developing harmonized interoperability specifications to support national health outcomes and healthcare priorities, including the Nationwide Health Information Network. One of the S&I working groups is the Transitions of Care Working Group, chartered to support Meaningful Use Stage 1 summary of care (Eligible Provider, Eligible Hospital, and Critical Access Hospital) requirements for transition of care and the transition of care to consumer; as a second priority, they supported expected Stage 2 requirements. They were chartered to recommend standards to meet MU requirements related to the exchange of key clinical information among providers of care electronically.[28] The Working Group recommends use of the CDA for standardizing care transitions. CDA is a standard developed by HL7 to define the structure of clinical documents, including text and images contained within discharge summaries, progress notes, and other documents used in care delivery.[29] This standard ensures that patient (consumer) documents can be created and read by any electronic system involved in the delivery of healthcare, an important prerequisite for care coordination and communication of the information between different electronic and healthcare delivery systems.

This effort led to formation of the Longitudinal Coordination of Care Working Group (LCC WG), chartered to identify critical components needed to support patient-centric interoperable information exchange across the post-acute care spectrum.[30] One of the areas of exploration for the Working Group was the longitudinal care plan, which is relevant to the care coordination care plan TEP. The LCC WG is focused on identifying and standardizing the key data elements and providing recommendations for the structure and content of the longitudinal care plan. One of the tasks of this Workgroup is developing functional requirements and use cases that would be supported by a longitudinal care plan, which has been used to inform the NQF TEP’s efforts in defining the data infrastructure for quality reporting of the care plan during transitions of care.

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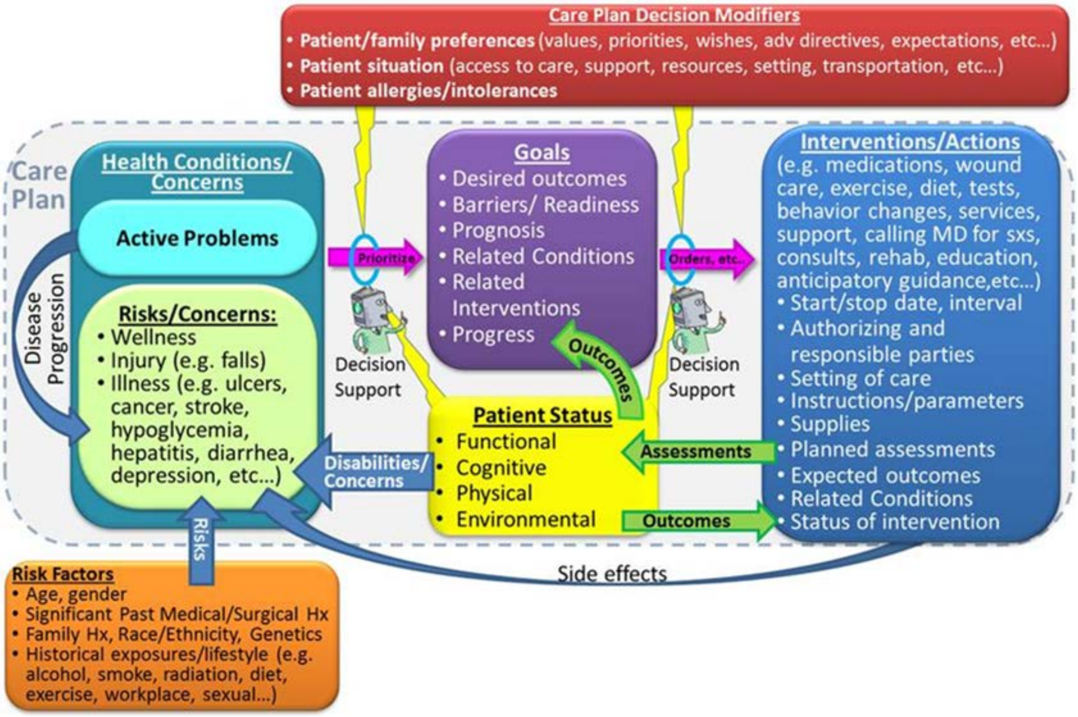
[28] http://wiki.siframework.org/TOC+Ecosystem+Consensus. Accessed 15 May 2012

[29] J Am Med Inform Assoc. 2006 Jan-Feb; 13(1): 30–39. HL7 Clinical Document Architecture, Release 2. Robert H. Dolin, MD, Liora Alschuler, Sandy Boyer, BSP, Calvin Beebe, Fred M. Behlen, PhD, Paul V. Biron, and Amnon Shabo (Shvo), PhD.

[30] http://wiki.siframework.org/Longitudinal+CC+WG+Charter. Accessed 15 May 2012

The LCC WG also authored a whitepaper with recommendations for Stage 3 of the MU requirements to support care planning and transitions of care.[31] Figure 4 describes the care plan as described in the LCC WG whitepaper.[32] The Care Plan, which consists of conditions/concerns, goals, and interventions/ actions, along with risk factors and decision modifiers, iteratively evolve over time. The care plan is filtered, translated, and transported to meet the needs of each participant/setting in the patient's care.

Figure 4: S&I LCC Work Group's vision of Longitudinal Care Planning



CMS CARE Tool

One of the core areas of work for the care coordination TEP focuses on identifying core data elements related to quality measurement of the care plan during transitions of care. To this extent, efforts by CMS related to the CARE tool (Continuity Assessment Record and Evaluation (CARE) tool) will inform enhancement and use of the QDM in quality and performance measurement. The CARE Tool includes core items which are asked of every patient, at discharge, regardless of condition and supplemental items which are condition specific and intended to measure severity or degree of need.[33] Because CARE is designed to measure outcomes in physical and medical treatments while controlling for factors that affect outcomes, such as cognitive impairments and social and environmental factors, it is important for this care coordination TEP project.

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[31] http://wiki.siframework.org/file/view/FINAL+-+LCC+White+Paper+(20120814).docx Accessed September 20, 2012.

[32] An animated presentation of the LCC longitudinal care plan is available at http://wiki.siframework.org/file/view/Longitudinal+Care+Planning+-+Animated+Final.pptx

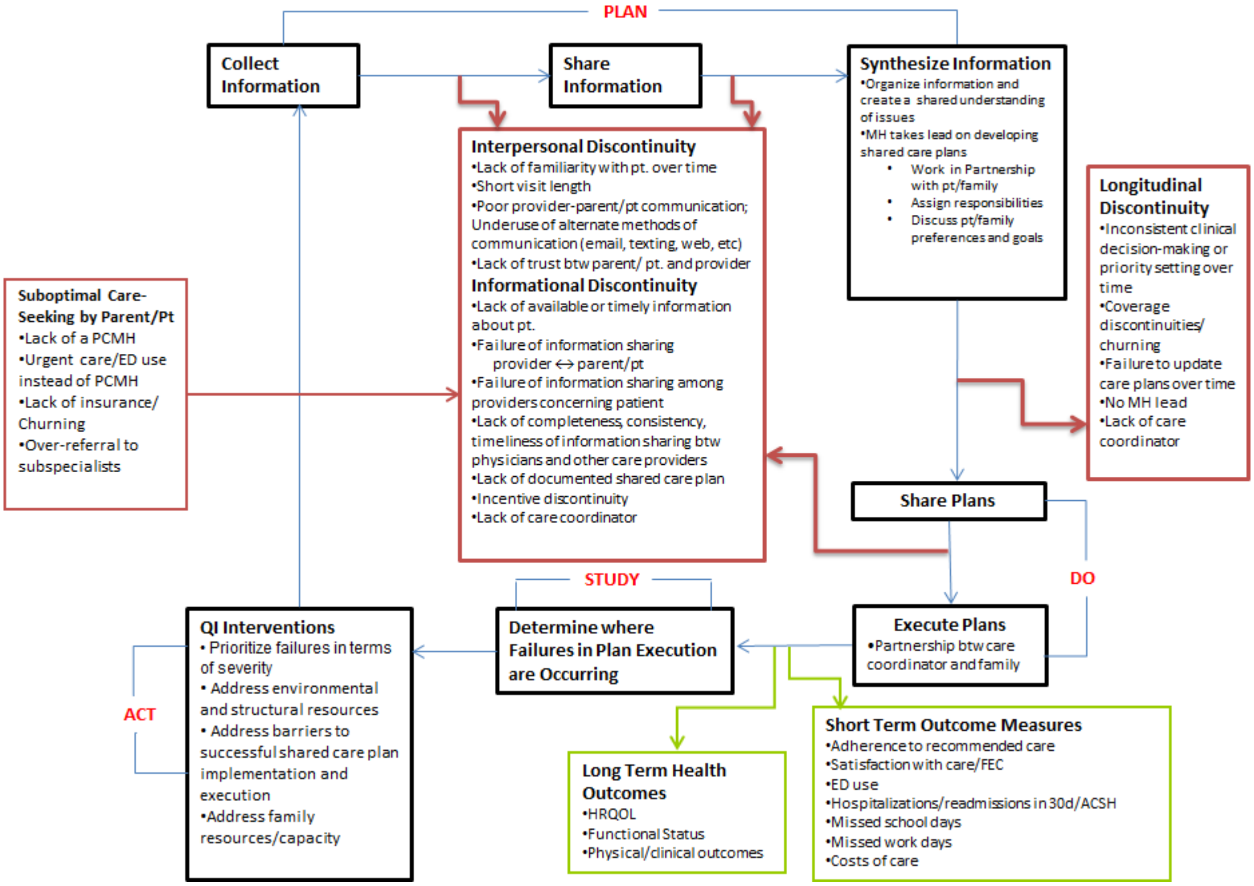
[33] For more information on the CARE tool, see www.pacdemo.rti.org

The TEP will use the CMS CARE Tool data elements in evaluating the results of the environmental scan. The TEP found consistency between the supplemental data elements identified in the CARE Tool and the TEP- identified data elements necessary for interpreting the care plan.

Conceptual Framework for Care Coordination

One of the existing industry-related initiatives reviewed by the TEP included a conceptual framework for care coordination developed by the Center of Excellence on Quality of Care Measures for Children with Complex Needs. This framework was developed within the context of a patient-centered medical home and employs a Plan, Do, Study, Act (PDSA) cycle to develop a shared care plan (see Figure 6). It also incorporates short term and long term measures.[34]

Figure 6: Conceptual Framework for Care Coordination/ Fragmentation in the Context of the Patient-Centered Medical Home



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[34] Mangione-Smith, R., Chung, P., McGlynn, E.A., Schneider, E. and The Center of Excellence on Quality of Care Measures for Children with Complex Needs (COE4CCN). Conceptual Framework for Care Coordination/ Fragmentation in the Context of the Patient-Centered Medical Home for Children with Complex Needs. Under funding from Agency for Healthcare Research and Quality (AHRQ), Grant Number: 1U18HS020506-01

Literature Review

In addition to the review of related NQF, federal, and industry efforts, NQF contracted with Brigham and Women's Hospital to conduct a literature review of interventions designed to improve transfer of information during transitions of care, with a focus on HIT-driven intervention and quality measurement. A systematic search initially identified 173 citations, of which 54 articles were included for full article review. Of these articles, 10 were included for structured data extraction. Appendix C contains a flow diagram of articles included in the systematic review, and Appendix D contains a table summarizing the 10 included articles. Most studies were excluded because they were not studies of interventions to improve information exchange during transitions of care, and few of the studies were specifically designed to examine the effectiveness of HIT interventions on improving transitions of care. Many of the interventions utilized communication methods such as telephone calls, facsimile (fax) of information or case management, rather than HIT.

Electronic Tools for Information Exchange across Transitions

One survey was identified of physicians that assessed the perceived usefulness of two electronic documents that incorporate patient-entered data: an emergency medical card and a continuity of care report.[35] Physicians thought that both documents were useful for medical decision-making. However, the study did not assess objective measures of improvements in care.

A web-based tool for nursing homes to transmit data to an emergency department was evaluated in a pre-post study.[36] The authors examined the rate of electronic referrals, while concurrently surveying clinicians about adequate information in nine categories. There was a large variation in rate of electronic referrals that was unexplained: at one nursing home the electronic referral rate dropped from 73% in the inception month of the study to 11% nine months later. The pre-post study design and the study setting limit the generalizability of the results.

Electronic Tools for Discharge and Post- discharge Communication

A study of a hospital discharge test result management tool surveyed discharging physicians about barriers to use.[37] Nearly half of discharging physicians did not use the tool. The survey revealed problems with results that were not clinically relevant and difficulties incorporating post-discharge results management into workflow. The results are subject to recall bias.

A randomized trial studied an HIT intervention that enabled discharging physicians to send information about diagnoses, medications, and pending test results to outpatient pharmacies and community-based

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[35] Olola, C.H.O., et al., *The perception of medical professionals and medical students on the usefulness of an emergency medical card and a continuity of care report in enhancing continuity of care.* International Journal of Medical Informatics, 2011. 80(6): p. 412-420.

[36] Zamora, Z., et al., *Implementation of a web-based system to improve the transitional care of older adults.* Journal of Nursing Care Quality, 2012. 27(2): p. 182-189.

[37] Dalal, A.K., et al., *Lessons learned from implementation of a computerized application for pending tests at hospital discharge.* Journal of Hospital Medicine, 2011. 6(1): p. 16-21.

providers.[38] The randomization occurred at the level of the discharging physician. The study examined readmission rates and found no significant difference between the intervention group and a control group. The authors discuss a better-than-average medication reconciliation process in the control group that may have nullified the results. They also point to a lack of closed-loop communication with receiving physicians in the outpatient setting as an important gap.

Another study about discharge summaries used audit and surveys to assess different modes of transmitting discharge summaries to primary care providers (PCPs), including email, fax, mail, and patient hand delivery.[39] The investigators called PCPs 7 days post-discharge to determine the receipt rate and found that email and fax were superior to mail or patient hand delivery. PCPs preferred fax over mail, email, or patient hand delivery.

A study of post-discharge telephone calls for 10 acute care hospitals assessed the number of attempted patient calls; the number of successful patient contacts; types of advice given to patients; and patient satisfaction.[40] The number of attempted calls was 26,803, representing 92% of all discharges; 35% of these calls were successful patient contacts. The types of advice given to patients were clarification of medication and/or home care instructions (n = 346, 34%), reminders for follow-up appointments or assistance with referrals (n = 314, 30%), return to the ED or their primary care physician (n = 346, 33%). There were 29 patients requiring immediate escalation of care. Patient satisfaction increased at one hospital with the mean score for “likelihood to recommend” increasing 2.5 points on a 100 point scale.

Another study of post-discharge telephone calls at one acute care hospital examined the number of successful patient contacts; the number of unmet clinical, appointment, or administrative needs; changes in the number of unmet needs by department over time; and patient satisfaction according to a survey.[41] They reported 69% successful contacts out of 2,927 patients; 14% of these contacts identified an unmet need. There was a five point increase in patient satisfaction on a 100 point scale. Though the telephone call program achieved a high contact rate, the characteristics of non-respondents suggest bias. The survey non-respondents are not described.

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[38] Graumlich, J.F., et al., *Patient readmissions, emergency visits, and adverse events after software-assisted discharge from hospital: cluster randomized trial.* Journal of Hospital Medicine: an official publication of the Society of Hospital Medicine, 2009. 4(7): p. E11-9.

[39] Chen, Y., N. Brennan, and F. Magrabi, *Is email an effective method for hospital discharge communication? A randomized controlled trial to examine delivery of computer-generated discharge summaries by email, fax, post and patient hand delivery.* International journal of medical informatics, 2010. 79(3): p. 167-172.

[40] Cochran, V.Y., et al., *Lessons Learned From Implementation of Postdischarge Telephone Calls at Baylor Health Care System.* Journal of Nursing Administration, 2012. 42(1): p. 40-46.

[41] Gombeski, W.R., Jr., et al., *Patient callback program: a quality improvement, customer service, and marketing tool.* Journal of Health Care Marketing, 1993. 13(3): p. 60-5.

Nurse Practitioner Case Management Programs

A randomized controlled trial of a nurse practitioner-led (NP) care coordination intervention assessed whether patients had a PCP appointment within 21 days, readmission within 31 days, ED visit within 31 days, and the authors assessed completion of hospital-recommended outpatient diagnostic work-ups.[42] They found a significant improvement in the number of patients who followed-up with their PCP within 21 days, as well as a significant improvement in a composite measure of all four outcomes.

Another study of an NP-led intervention for homebound elders was designed as an observational study.[43] The intervention included electronic documentation by the NP in the inpatient setting, electronic communication between the NP and the PCP while the patient was hospitalized, and electronic documentation by the NP about a post-discharge home visit in the outpatient record. The 30-day re-hospitalization rate did not significantly decrease (16.6% to 15.8%) and mean hospital length of stay increased, but not significantly, from 6.15 days to 6.45. The annual cost to the program for the 1.6 FTE NPs was $197,000. Together, the two NPs generated $37,642 in billable services annually, representing 19% of their direct costs. Another observational study of a nurse-led intervention for children with complex care needs reported a significant decrease in emergency department visits from 470 to 398, a significant decrease in hospital admissions from 410 to 375, and a significant decrease in hospital bed days from 3,699 to 1,598 days.[44] Economic analysis indicated a cost savings of Australian $1.9 million per annum.

Results of the Technical Expert Panel

Definition of Scope

The Technical Expert Panel discussed the background initiatives presented in the above sections. Through discussion, the TEP evaluated the steps involved in care coordination and determined the most effective data elements required for quality measurement are those reviewed and used at transitions of care. The TEP also identified the need for both patient-centric and team based care plan data elements. As they defined the elements required, a framework developed that included characteristics related to business (organizational policies), function (use of the care plan), and content factors (information contained within the care plan). Given the breadth and depth of data elements related to the care plan, the framework helped to facilitate discussion on data necessary for quality measurement of transitions of care using the care plan. In addition, requirements for the environmental analysis were based on the framework to guide exploration of data readiness and areas of need.

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[42] Balaban, R.B., et al., *Redefining and redesigning hospital discharge to enhance patient care: a randomized controlled study.* Journal of General Internal Medicine, 2008. 23(8): p. 1228-33.

[43] Ornstein, K., et al. *To the hospital and back home again: A nurse practitioner-based transitional care program for hospitalized homebound people.* Journal of the American Geriatrics Society, 2011. 59(3): p. 544-551.

[44] Peter, S., et al., *Care coordination for children with complex care needs significantly reduces hospital utilization.* Journal for Specialists in Pediatric Nursing, 2011. 16(4): p. 305-312.

Use Case Scenarios

In order to identify data and define workflow processes related to the plan of care during transitions of care, the TEP developed case scenarios. Three use case scenarios[45] were proposed:

1. Skilled nursing facility (SNF) transition of care to an acute care setting where responsibility for patient care is transferred.
2. Discharge of a patient from an acute care to healthcare home setting where responsibility for care is transferred.
3. Discharge of a pediatric patient to the community environment where responsibility for care may be shared.

Defining the Characteristics of the Plan of Care

After reviewing data and processes associated with the first use case, the TEP agreed that patient diagnosis (condition, problem), procedure (orders, interventions, services), care goal (expected outcomes), and actual outcome are the main data elements of a care plan. However, these data elements alone would not be sufficient to support communication, understanding, and performance measurement of the care plan in transitions of care. The TEP concurred that the plan of care is specifically valuable as an artifact of the health record; it provides the linkage to essential data required by the healthcare team such as laboratory results and physical assessment findings. However, use of the plan of care, in and of itself, is limited without these other essential data elements. Interpretation and use of the plan of care without contextual support is nearly impossible and can lead to gaps in care, duplicate care, and excessive cost. Main elements of the plan of care (diagnoses, orders, goals, outcomes) along with supporting contextual information are essential components for transitions of care and performance measurement of those transitions. In addition, given the breadth of patient information needed for care plans, tools to filter and analyze the information are needed for quality measurement and reporting.

Required Data Elements

The TEP identified a significant number of data elements that could support quality measurement related to the care plan during care coordination, specifically transitions of care. The elements corresponded to three general types of factors: business, function, and content (see Figure 7).

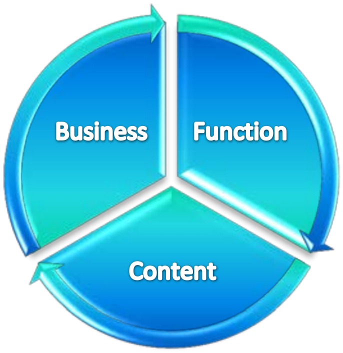

Figure 7. The figure shows three classes of factors that affect the coordination of care: business, function and content.

Business factors include federal, state, and local initiatives, rules, and regulations. This also includes organizational policies and

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[45] A use case (a case in the use of a system) is a list of steps, typically defining interactions between a role (known in UML as an "actor") and a system, to achieve a goal. The actor can be a human or an external system.

procedures which can vary by organization, location within the facility and/or care coordination practices.

Function includes those human factors that affect how the care plan is developed, used, and evaluated. These factors include assessment, diagnoses, planning, implementation, and evaluation.

Content includes those factors *intrinsic* to the plan of care (diagnoses (condition/problem), interventions (orders/services), goals, and outcomes), and those *extrinsic* to the plan of care (environmental factors).

In addition to identifying baseline information needed for the care plan, the TEP began to develop a list of the business, functional, and content characteristics of the plan of care in transitions of care. The plan of care should contain the elements described in the following care plan characteristics.

Care Plan Characteristics

Business

1. There is one patient-centered care plan with input and participation from multiple collaborating parties (patient, consumer, provider, significant others, insurance company, etc.). The collaborating parties may require different views or representations of the care plan depending on their role and intended use of the care plan.
2. Although the care plan belongs to the patient (consumer), there may be a steward[46] who is managing, overseeing, and ensuring that the care plan is executed upon in a timely and safe manner.
3. In addition to the steward of the care plan, there is a need for a care coordinator who assumes ownership for updating the plan, with input from all the stakeholders involved in defining the care plan.
4. In order to ensure the care plan is updated, the healthcare delivery system needs a governance structure and processes to ensure this activity is performed with safety and quality. The process involves updating the care plan and then subsequently reconciling all major components of the care plan (diagnoses, problems, conditions, orders, goals, and outcomes). Training for this role is required.
5. Successful development, execution, and management of the care plan requires a single source of responsibility and accountability. Each clinician involved in the plan of care should practice at the "top of their license."
6. Attribution is an important component of the care plan. All parties need to know "who is doing what," along with the source/recorder, subject/actor, and receiver/target. Attribution data captured is essential for team attribute analysis. It will inform the best team mix to "practice to

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[46] A steward is a person who manages another's property or financial affairs; one who administers anything as the agent of another or others. http://dictionary.reference.com/browse/steward?s=t. Accessed May 14, 2012

the top of the license" for the most efficient and effective health care teams, as well as other team attributes (e.g., staffing).

7. The care plan could be informed by service agreements between providers intended to guarantee access to and appropriateness of care. When patients give healthcare teams permission to interact with community organizations data must be transferred securely, according to a standard format, and according to a service agreement.

Function

1. A key function of the care plan is to enhance the care process and care process support.
2. A care plan supports episodes of care while also supporting healthcare for life. There should be an overarching care plan that goes through episodes during the person's life-cycle.
3. The care plan must be interoperable with external knowledge sources (such as evidence-based clinical practice or healthcare rules, personalized self-care actualization cues, hospital policies, regulations, etc.), as well as other systems (such as federated nodes in the healthcare system or community and or electronic systems).
4. The care plan must be patient-centered, current, actionable, dynamic, safe, and iterative with on-going data collection.
5. The care plan must support alerting, notifying, tracking, reporting, and activity/task management.
6. An important aspect of the care plan is clinical decision support which involves:
    a. Triggers: events or actions that initiate a clinical decision support rule
    b. Input data: the additional data from the patient record or other source, used as background to modify or constrain the clinical decision support rule
    c. Interventions: the possible actions taken by decision support to provide information when the conditions, identified risk, or change in status specified in the rule are met; and
    d. Action steps: any action or event presented to the user of the care plan that could lead to successful completion (or realization) of the intended mission of the rule
7. The care plan uses industry standards for content (vocabularies/ontology), decision support, and messaging between systems.
8. The care plan is a "single source of truth" that is created based on multiple input sources that are entered once and used many times, and is organized and user-friendly to better achieve patient-centered goals.
9. The data within the care plan must be structured and organized to support performance measurement, safety, professional certification and research.
    a. The care plan must be analyzable and computable.
10. The care plan must be usable to support current care, timely clinical effectiveness research, including practice-based research, as well as other retrospective analysis.

Content

1. The care plan contains core information: diagnoses (conditions/problems), prognosis, orders (interventions/services), goals (expected outcomes) and actual outcomes.

2. In addition to the core care plan elements, the care plan functions must support patient-centered care, which is the intersection of:
    a. Individual Characteristics
    b. Community/ environmental characteristics and resources
    c. Clinical data (observations, results, and findings)
    d. Health related experience- lessons learned
    e. Care giver needs
    f. Quality measures
    g. Best practices for quality measurement and practice
    h. Reliable and valid assessment and risk screening scales and tools (when available)
    i. Supplemental information that not only provides context but is necessary for parties to manage, execute and evaluate the plan of care. This includes personal characteristics- socio-demographics, and other information to answer the question, “What do we need to know about you to care for you?”
3. The care plan must support levels of intervention/task management, including:
    a. Task/intervention assignment
    b. Task/intervention execution
    c. Completed tasks/interventions
    d. Future tasks
    e. Canceled and/or discontinued tasks

Environmental Analysis

NQF contracted with Brigham and Women’s Hospital to perform an environmental analysis to develop a baseline understanding of the use of HIT to support transitions of care and quality measurement. The environmental scan consisted of an online survey and follow-up interviews with six sites that represented a diverse range of electronic capabilities and geographic regions. Each site interview was able to provide information on four different types of healthcare facilities: emergency department (ED), acute care hospital (ACH), skilled nursing facility (SNF), and home health agency (HHA). The goal was to garner information on two specific unidirectional care transitions: a SNF sending patients to the ED, or an ACH sending patients to an HHA. This specificity regarding a unidirectional transfer stems from the concept that there are site-specific data elements in each transfer. For example, the set of information needed by a receiving clinician in the ED differs from the set of information needed by a receiving clinician in the ACH.[47]

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[47] Kelly NA, M.D., Bonner A., O'Malley T., *Use of transitional minimum data set (TMDS) to improve communication between nursing home and emergency department providers.* J Am Med Dir Assoc., 2012. 13(1): p. 85.e9-15.

Utilizing templates created by the Improving Massachusetts Post-Acute Care Transfers (IMPACT) project,[48] four versions of a survey were constructed that queried the site about approximately 250 specific data elements. For each data element, the site was asked whether it sends or receives the data element (depending on which type of facility and which unidirectional transfer described above). If the site transfers the data elements, do they send the information on paper or electronically? The site was also asked if there was variation between departments and providers when sending or receiving data and also sending or receiving methods (paper or electronic).

One-hour interviews were conducted with the six sites from the six regions. A semi-structured interview guide was prepared based on a review of the literature, previous experience conducting qualitative interviews, and the investigators experience as clinicians. The interviews explored electronic data readiness for measurement of care coordination, and areas of need, gaps and barriers. Site visits were also conducted at two sites. The data therefore represents multiple transitions types (e.g., ED to ACH, ACH to HHA). During these visits, additional data were gathered on care innovations and electronic tools, as well as paper forms for care transitions and communication of the plan of care.

Electronic Tools for Care Coordination

The main objective was to assess the readiness of respondent organizations to transmit electronic data, to use HIT systems to perform the data capture, to standardize data, to communicate a patient-centered plan of care and use data for quality measurement. The results indicate that organizations are working to address care coordination demands, but are struggling with a patchwork of homegrown and commercial systems across settings, few of which connect and exchange data. Many organizations are still working to transfer basic discharge summaries electronically between settings. Organizations are using multiple methods for communicating and extracting the data that they need for care transitions. Where more comprehensive electronic methods do exist they tend to be discipline-specific and focused on high risk patients.

Discharge Summaries

Many sites have electronic discharge summaries implemented in EHRs, but because of lack of interfaces to other systems, they often print or fax them to receiving organizations. Sometimes electronic discharge summaries may be directly accessed and viewed within an organization’s EHR when a receiving site uses the same software system or has been given access privileges.

Interview 4 and Interview 5 typically document inpatient discharge summaries in their EHR, but a paper copy is given to the patient and faxed to the PCP. The site of Interview 5 has been trying to increase the use of direct system access by their PCP population, but their clinicians have been slow to adopt this method. Rather than allowing each physician to use a different discharge summary format, Interview 6 is pleased to have recently developed a standardized electronic discharge summary (including a post-

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[48] IMPACT is an ONC grant-funded project designed to improve care transitions using an enhanced electronic Universal Transfer Form (UTF) and electronic health information exchange. See http://www.maehi.org/what-we-do/hie/impact. Accessed September 2012.

discharge plan of care and patient instructions), which they report has greatly improved communication across settings. For affiliated organizations using the same EHR, this discharge summary data can be accessed in the system directly; otherwise, it is printed and faxed. The Interview 4 Emergency Department has been printing out paper discharge instructions with follow-up care documentation, but currently a pilot is underway to give external sites access to the electronic version. The acute care hospital of Interview 3 requires a discharge summary with follow-up instructions to be electronically completed before patients can go to another facility. For organizations within their system, this information is accessed directly in the EHR without any person-to-person communication required. If outside of the system, the discharge summary is printed or e-faxed. For some of their contracted hospitals, Interview 6 site has required their own system EHR be used to document the inpatient discharge summaries so that they can be available the same day to their providers. But then to import the discharge summary into the contracted hospital's EHR, a copy of the discharge summary is printed out and scanned into their EHR system.

In addition to discharge summaries, pre-admission assessments may also be created electronically. These assessments are not shared electronically. The Interview 2 health system has a tablet PC pre-admission clinical evaluation tool used by clinical liaisons of the HHA, but it is in a separate system not integrated with the EHR. Once information is entered into this tool, it is sent as a PDF and tagged as a document in the patient's EHR folder. The health system of Interview 1 has an electronic web-based care plan and tracking tool focusing on geriatric issues (e.g., falls, cognitive impairment) that complements primary care information. This information can be accessed by some SNFs, but for others it must be printed out, faxed, or scanned and sent by email. An electronic progress note is used by the Interview 5 site for medically complex children that can be accessed directly.

Accessing Data in EHRs and Duplicate Data Entry

Even in integrated delivery systems, different care settings are often using separate EHRs. They may be able to access the EHR from another setting, but do not have electronic interfaces to their own systems. This requires that care team members review and extract data from the EHR of one setting, and then re-enter the information into their own systems to build their patients' care plans. The interview sites mentioned this process was utilized, in particular, by a number of their HHAs.

Interview 3 noted the HHA nurses look in a variety of places including the hospital's discharge planning module, medication administration and order entry system, and outpatient EHR in order to collect the information they need. They re-enter these data within their own home care EHR systems. This requires considerable duplicate data entry. They indicated, however, that they are glad that they are able to access this information, because with outside referrals, much less information is available. Interview 4's HHA reported that no plan of care is transferred from facility to facility. A discharge referral and synopsis of the visit is sent, but then they are required to read the patient record to identify the site-specific elements needed to take care of the patient. The data is referred to as "Page One" information based on the Patient Care Referral Form. Page One includes information on demographics, diagnosis, and physician orders for medications, treatments, diets, physical therapy, and requested home health services. The HHA of the Interview 6 site uses the same EHR so that when they accept an electronic referral with only the basic information required by CMS, it is imported into their home care module.

Staff review the EHR data and the electronic discharge summary, but then they need to develop a separate home health plan of care.

Affiliated or external organizations may have the ability to access the same hospital or ambulatory EHR, but this access is often read-only, preventing these clinicians from contributing to a more comprehensive view of the patient across settings. There are some examples of where other care settings also have “write” privileges. The Interview 4 HHA has the ability for managers and telemedicine staff to write in the ambulatory EHR and to report information relating to telemedicine care (e.g., patient vital signs). Interview 4 reported their SNF has read and write privileges to contribute discharge information directly into an ambulatory care EHR, but they also typically email and fax information to the patient’s PCP to ensure the information gets communicated.

To facilitate the exchange of data between different organizations within their own healthcare system (including long term post-acute care, hospitals, nursing centers, and home health), the Interview 2 site is working to make all of their clinical information systems (both established and those they are currently implementing) capable of producing a CCD by the end of the year. Interview 2 indicated their organization had tried some direct interfaces between systems in the past, but had turned them off because of poor data quality.

The Interview 6 site has a mechanism in place for external organizations to view data in their EHR. They allow some external organizations to directly access selected components of their hospital EHR through the use of the vendor’s software interface. Use of a statewide Health Information Exchange (HIE) to access patient data was mentioned by only one respondent—Interview 1. Organizations participating in the HIE (including SNFs, EDs, hospitals, and physician practices) have access to important pieces of patient data generated by each participating setting, including laboratory test results, consult notes, discharge summaries that could be helpful in building a patient’s care plan.

Phone, Email, and Fax Are Still Common

For out-of-network patients, all sites except Interview 6 described considerable problems with health IT interoperability and were using faxed or hand-carrying paper records (via ambulance personnel) to convey relevant information for transfers across care settings. Interview 6 is a large integrated delivery system with almost all patients cared for in-network and a shared EHR that is easily accessible to clinicians across the continuum of care. However, the same problems exist for patients transferred from outside facilities.

The Interview 2 site uses a number of different paper forms to transmit information used by different settings within the system. For these settings, they use a paper discharge packet and then caregiver to caregiver phone report with “heads up” information – information that is important to highlight from the set of information being sent. Some departments in this system use a Universal Transfer Form

(UTF)[49] that contains a “heads up” field that users find very helpful. This is something that the CCD or the pre-admission assessment form in use in their system does not have. The Interview 2 site also uses a standard patient care referral form that includes many elements of a transition care plan when they are sending patients from their LPAC to HHA. The Interview 3 site HHA collects information over the phone and sends out a form to physician offices to be completed and sent back. Their ED has the capability of sending automatic emails with ED visit information and follow-up instructions to patients’ PCPs if they are within their medical system. The EHR message center of the Interview 5 site automatically pushes laboratory results out to the provider associated with the patient. They also have an ED information management system, which sends a limited summary to PCP via fax. The Interview 5 site also indicated that they use secure email messaging to communicate with physicians either at discharge, or in the interim between hospitalizations and clinic visits. One HHA indicated that they use email a lot in exchanging information and expressed concern that typically they are not saved to the EHR.

SNF settings are the least electronically connected and the majority of information exchange is occurring through paper forms and phone calls. The Interview 3 site has created a specific form for communication between their SNF and ED, but it all happens on paper because they have different systems. SNF communications in Interview 6 site are primarily by phone, because the SNFs are not on their same system. Exchange of information from the SNF to ED in the Interview 2 site system is done through a paper-based discharge packet sent with the EMS. They use IMPACT forms to identify and organize what to send. This packet does not include extensive information, because it is thought that only a subset of data is needed for an initial focused ED visit from a SNF. More comprehensive care plans are needed between other settings (such as long-term post-acute setting to HHA) or once the patient is being admitted to the site from the ED. The Interview 4 site has SNFs with read-only access to inpatient EHRs and ordering systems where they can look for information, but they often still call or email for clarification of information.

Transition of Care Data Elements Surveys

When considering the specific transition of care data elements, many are communicated either through paper-based methods or direct access to electronic systems to view discharge summaries or patient data. We did not receive any responses indicating direct electronic transfer of these data. However, there are some transition data elements that are *less likely* to be shared between settings whether by paper or electronically, although their availability may vary by referring site, including:

- Name and contact information for referring or receiving clinician responsible for the patient, clinicians managing high risk medications, and who to contact with questions;
- Items relating to advance directives or immunizations;
- Items relating to pain status and associated treatment with pain medication;

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[49] The Universal Transfer Form (UTF) is a form to promote effective transitions between acute care providers and post-acute care settings such as nursing facilities, home health agencies, community health centers and patient-centered medical homes.

- Reason for medication, changes between pre-admission and discharge medications;
- Details needed to manage high risk medications, such as target INR for warfarin.
- Areas relating to cognition, such as ability to comprehend, memory, capacity to consent to treatment, and areas relating to impairments, particularly sensation.
- Patient centered care plan elements, particularly patient likes and dislikes, goals and expectations, and self-management plan, as is further discussed in the section on Longitudinal Plan of Care.

As these elements were not transferred, either in paper-based nor electronic form, the value of this information and the workflow processes involved in compiling these data should be further assessed. Such foundational work will contribute to data availability at the time of transfer, and to meaningful quality measurement.

Care Plans

In order to probe for information about a longitudinal plan of care, the six sites were queried about comprehensive, longitudinal, interdisciplinary care plans (see Longitudinal Plan of Care section below). To the extent that more developed electronic care plans exist, they tend to be discipline-specific and site-specific and are often focused on specific high risk populations. The six sites focused on the conditions and populations that drive high re-admission rates (e.g., frail elderly, congestive heart failure, medically complex children). For example, the Interview 6 site has specific palliative care plans including patient goals. Their EHR includes special needs care plans meeting CMS regulations. They are experimenting with life plans for frail and high risk elders. As discussed previously, a number of the six sites reported that clinicians in their HHA facilities create care plans within their own electronic systems using data that they extract from other systems.

However, with the increasing focus on care coordination, efforts are beginning to emerge to address the need for a comprehensive, longitudinal, interdisciplinary plan for patient care that involves input from patients and their families. The Interview 5 site is currently conducting a study in which a comprehensive care plan template is completed in one electronic system and then populates into their EHR in free text. This care plan is then accessible to care providers across disciplines and can be shared with patients and external settings in paper form. Although it cannot be dynamically updated, it can be electronically copied and carried forward in the record when the plan is revised. The Interview 6 site is developing a “Patient Profile” document that will present the plan of care across the continuum integrating EHR inpatient and outpatient data, and that will be accessible across settings. The Interview 3 site is starting to look into a Knowledge-based Charting product that supports development of a patient-centered daily plan of care. Patients can indicate questions and concerns which are subsequently addressed in the daily rounds.

Electronic Tools for Risk Stratification

Providers are working on developing tools that help to identify, track and manage high risk patients that require more intensive care coordination. For example, at the site of Interview 5 there is an email triggered by the hospital's EHR when a medically complex child is admitted by the institution. Varying types of risk assessment tools, both paper-based and electronic, are in use across the sites in order to produce a patient's re-admission risk score. The score may be imported into the EHR or other tools to identify high risk patients for more intensive interventions. A paper-based risk assessment tool is used by the Interview 4 HHA to calculate a score that then is manually entered into their EHR to generate reports to track care. The Interview 2 site uses a vendor product based on InterQual criteria. It has a point and click algorithm that results in a risk score and, if high, the clinicians develop a transition of care plan. In the Interview 6 site, they use an electronic tool to calculate a risk score that uses data from the EHR along with some manual input. The risk score then appears on the face sheet. The Interview 1 site uses a risk assessment tool but feels there are limitations in their ability to accurately identify risk level in their geriatric population because the tool does not take into account more nuanced variations in cognitive functioning.

Once a patient is identified as high risk, sites are using low-tech interventions to reduce risk of re-admissions. The Interview 6 site has experimented with a bright colored banner on patients' inpatient records identifying them as high risk for re-admission. The ACH from Interview 3 uses a color code on ACH unit bed boards to indicate that the current admission is a readmission within 30 days. Case managers and social workers round on these patients to assist in care coordination. If the Interview 3 ACH identifies a patient at high risk of returning within 30 days through their intake assessment, the patient is given a special wrist band.

All sites are monitoring their readmissions and some sites have automated flags to alert care providers. Interview 3 ED reported that if a patient has had more than three ED visits in a month, an alert is presented in the ED EHR record to the triage staff. If that patient is admitted, an automatic email is sent to case managers. An inpatient readmission report generated from the EHR is produced every morning identifying patients readmitted within 30 days. This site is also working on developing a risk assessment tool to identify patients at risk of readmission based on both ED EHR and inpatient EHR data.

Although much work remains before electronic exchange of data between care settings can be accomplished, the interviews also revealed that innovative efforts are underway to develop policies, procedures, and tools to improve care coordination and quality measurement.

Care Coordination Innovations

Though the main objective of data collection was to gather data on electronic tools and electronic data transfer and tools, a large amount of data was also collected on non-electronic care innovations and programs. This information is included because it may serve as a foundation for future electronic care coordination tools. This section will summarize results of interviews where sites described innovative policies, procedures, and research protocols to improve care coordination.

All surveyed sites were engaged in piloting innovative approaches to improving care coordination but only a handful were able to achieve high reliability in deploying interventions across large segments of their patient population. Lack of interoperability of HIT across different care settings and concerns about violating patient privacy regulations emerged as major barriers to innovation in several interviews. In light of these factors, many innovations were confined to patients belonging to a single provider organization or network – usually with a shared EHR or email system. The following themes were identified during interviews.

Dedicated Case Manager for Transfers Into and Out of ACHs and EDs

A dedicated case manager, usually an RN, assists the inpatient team with care coordination needs during transition into or out of the hospital. Interview sites 1 and 3 use a case manager and social worker to help inpatient teams integrate care with outpatient geriatrics teams and link with community-based resources for high risk elderly patients; very little HIT is used to facilitate this work. The Interview 2 site uses RNs in a similar role in long-term acute care hospital. Interview sites 3, 4, and 5 use RNs to coordinate care in the emergency department, including making follow-up appointments and arranging transfer back to sub-acute facilities. A case manager liaised with HHAs and functioned as an agent for information exchange, frequently filling in the gaps where information could not be reliably transmitted electronically.

Dedicated Case Manager for Coordinating Care for High-Risk Groups

A dedicated case manager, usually an RN, assists primary care practices with care coordination for patients with complex clinical and psychosocial needs. The Interview 1 site described a successful program utilizing teams of NPs and social workers to coordinate care for elderly patients as they transitioned into and out of the hospital, including visiting patients while hospitalized and communicating verbally with inpatient care teams. Interview sites 3 and 4 described disease management programs for heart failure patients that were run by RNs located centrally and, in the case of Interview 4, using telemedicine. All of the HHAs described having RN liaisons stationed in acute care hospitals to screen patients and obtain information from inpatient care teams and the inpatient EHR.

For in-network patients, physicians were likely to use secure email to exchange patient-related information, with the use of telephone communication for patients deemed especially high risk for readmission. Nurses were more apt to communicate via telephone when needed and helped ensure reliable facsimile transmission of discharge-related information. Limited access to the EHR was available to clinicians at sub-acute facilities for Interview sites 3 and 4. In addition, Interview sites 2 and 3 use structured paper forms to succinctly convey pertinent information for sub-acute to acute in-network transfers.

Quality Measurement

The interviews revealed several common themes in the approach to measurement and tracking of care coordination. In general, this is clearly an area of opportunity for many institutions that do not yet track all of the processes and outcomes needed to ensure seamless care. All sites recognized the importance of careful tracking of performance and that they need to improve in this area.

Use of data to track performance fell into four broad categories. First, several sites collect data for risk stratification. They use various tools to identify those patients who, due to higher than average risk for poor outcomes, qualify for more intensive care coordination during and after transitions. The Interview 1 site uses an informal process – those inpatients identified as needing an “Acute Care for the Elderly” consult are automatically considered high-risk. These inpatient consults are usually called for patients with deficits in cognition or activities of daily living (ADLs). Patients identified as high risk are eligible for the "Geriatric Resources for Assessment and Care of the Elderly" program, in which a nurse practitioner and social worker conduct home visits post-discharge. Other sites use different electronic risk stratification methods. The Interview 2 site uses a software tool – Interqual – to identify patients who need more intensive discharge planning. Interview 3, Visiting Nurse Association (VNA) gathers data electronically on number of admissions, medications, and chronic conditions to develop a risk score; patients with high scores have two 'front-loaded' home visits soon after discharge. The Interview 6 site included multiple settings of care, all of whom use a risk-stratification tool. Some use the validated LACE tool,[50] while other settings employ other algorithms.

Second, most sites track measures that capture failures of care coordination: readmission rates (usually 30 days from discharge), Emergency Department utilization, and length of stay for readmissions. In addition to tracking these metrics, Interview 3 acute care hospital has a system to identify patients in the Emergency Department. These patients are identified in real-time if they are being readmitted within 30 days or if they present to the Emergency Department for the third time in a month. These notifications allow the care coordinators to be involved more quickly in the patient's care. An HHA is notified when a patient is readmitted, so they can investigate. In addition to readmission rates, the Interview 2 site tracks all hospital admissions from its long-term care facilities and SNFs. Interview 4 SNF and HHA also track rates of Emergency Department visits for their residents.

The third type of quality measurement focuses on ensuring that the right discharge and transition processes occur. Several sites conduct post-discharge phone calls to targeted patients, and measure whether they occur. Interview 3 VNA tracks compliance with their "Transitional Care Plan," which focuses on the patient's understanding of their conditions. It also measures its success in front-loading visits to high-risk patients, as above. The Interview 6 site has a six-element transitions protocol, and tracks the rate of completion of each element.

Several sites track whether follow-up appointments are made with outpatient physicians. Interview 6 and Interview 1 sites, as well as Interview 3 VNA, track whether patients show up to their appointments. The Interview 1 site tracks the percentage of primary care appointments that are with the patient's actual PCP. Interview 3 (acute care) and Interview 6 sites both track whether the HHA visits patients in the time frame expected, or whether patients were not at home at the time of attempted visits or refused care. Interview 1 and Interview 6 sites track referral rates to condition-specific programs, such as heart failure and palliative care.

Lastly, some sites use patient surveys to measure the success of discharge processes in promoting patient knowledge and satisfaction. Interview 5 and Interview 1 sites survey patients and/or families to

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[50] C van Walraven, IA Dhalla, C Bell, E Etchells, IG Stiell, K Zarnke, PC Austin, AJ Forster. "Derivation and validation of an index to predict early death or unplanned readmission after discharge from hospital to the community." *CMAJ*. 2010 Apr 6;182(6):551-7. Epub 2010 Mar 1.

assess their satisfaction with transitions. The Interview 2 site is considering this approach as well. Interview 4 SNFs are planning a pilot study to track the completeness of information contained in transfers to the Emergency Department and to home care using chart review. Certain departments within the Interview 6 site are doing chart reviews for all patients readmitted, to better understand whether and how the readmission might have been prevented.

The use of data to track quality performance at these sites directly correlates to the NQF Preferred Practices for measuring care coordination around the areas of managing high risk populations, evaluating transition outcomes across settings of care, proactive decision-making and planning for transitions of care, and using appropriate follow-up protocols that ensure understanding by the patient and his or her designees.

An Electronic Longitudinal Plan of Care

The surveys and interviews emphasized patient-centered data elements (see Appendix E and F). This section is a synthesis of the data from the interviews related to communication of a longitudinal plan of care (LPOC), and is supplementary to the information presented in the above subsection on Care Plans.

We define the LPOC as a single, integrated plan that is comprehensive, patient-centered, and reflects patient's values and preferences. All team members, including the patient and family caregivers, are actively involved in formulating and updating the care plan and the associated self-management goals. The longitudinal care plan supports achievement of patient goals along the continuum of care, including chronic, acute, and episodic care, home health, ongoing self-management, and supports cohesive transitions in care. A LPOC that is comprised of structured data could provide a platform to measure coordination activities and the effect of these activities on patient self-management goals.

A number of barriers exist to realization of the LPOC. Plans of care originate within the discipline of nursing and the majority of research, to date, has focused on the development of plan of care applications for use by that discipline. There is limited consensus regarding plan of care workflows, the process for interdisciplinary collaboration, and patient involvement in problem identification and goal setting is variable. While interdisciplinary plans of care are a requirement for accreditation and reimbursement, there is lack of clarity regarding which data elements constitute a plan of care. Standards for sharing, updating, and reconciling plans of care are lacking.

The Proposed Rule for the Stage 2 Meaningful Use (Stage 2 MU) requirements describes the care plan as "the structure used to define the management actions for the various conditions, problems, or issues."[51] Documentation of patient problems, goals, patient instructions, and responsible clinicians is required to demonstrate compliance. However, to document and measure a longitudinal plan of care as defined above, inclusion of additional data elements are needed including data elements to represent the

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[51] At the time the Environmental Analysis was conducted, the Final Rule was not yet released. Subsequent comparison between the Proposed Rule and Final Rule shows this definition is unchanged. CMS. Medicare and Medicaid Programs; Electronic Health Record Incentive Program—Stage 2 Final Rule. Federal Register Vol. 77, No. 171: September 4, 2012, p. 54001.

following: patient preferences, proposed interventions and procedures, patient self-management plan, follow-up diagnostic and therapeutic plans related to patient goals, tests pending, information on following up care, and orders for treatments and interventions.

While several sites described interdisciplinary workflows within a healthcare facility, few portrayed a plan of care as a resource used by clinicians across levels of care. Existing plan of care processes and workflows remain in silos. The most common approach found is for each discipline to develop a plan of care to address patient goals relative to a domain of practice. For example, a physical therapist would develop a plan of care addressing only physical rehabilitation needs. Very few examples were noted where the plan of care was coordinated between all providers and the patient within a single level of care. Plan of care information sent from one level of care to the next was transmitted on paper or in free text fields. Interview participants generally described the plan of care as a reference and reported that there is not a process in place for reconciling patient problems or goals across settings.

While patient problems and instructions are commonly sent from the hospital to home care, rehabilitation and SNFs, survey sites reported that plan of care information was less likely to be sent to the ED and is not available for patients coming from home. Interview 4 noted that information received by the ED is highly variable, based on the site and the person transferring the patient. This team reported that there is no standard physician-to-physician communication related to a patient received from rehabilitation and SNFs. However, for patients coming from a facility within the integrated delivery system, the sending physician writes a transfer note in the outpatient medical record. The receiving ACH physician accesses the EHR and reads the note. In this site, the ED nurse routinely calls the sending facility for a verbal report.

Information needed, but often not available in the emergency department include the reason for the transfer, tests, procedures, medications completed prior to the transfer, results, and contextual information (i.e., length of time the patient was at the facility, mental status, bedbound status, functional status, activity level, swallowing status, DNR status). The verbal information transfer is inadequate because by the time the nurse makes the call, the sending nurse is often no longer available. Emergency department staff reported that when they do receive information related to the plan of care, it is generally paper-based and problem lists are often outdated. Emergency department staff described “workarounds” that they use to secure information such as searching the EHR to find information about the patient from previous admissions or from outpatient visits.

Using the proposed Stage 2 MU criteria, this analysis found uneven readiness of targeted organizations for automated communication of the Stage 2 MU plan of care (e.g., problems, goals, and clinical instructions, responsible team members). Most of the acute care hospitals reported that they had the capability to send information about patient problems electronically, though receiving facilities do not have the ability to receive electronically. Several sites have the capability to send patient instructions electronically. Only one of the sites surveyed reported that they were able to send information about patient goals electronically and only two organizations reported sending information about responsible team members electronically. None of the sites had a mechanism in place that allowed patients to electronically update their plan of care or self-management goals. All sites reported that even when they have the capability to send information electronically, the ability of many long-term care and HHA to receive data electronically is limited. Therefore, sending fax or paper documents are the most common ways that participating organizations communicate plan of care information to the patient or to the next level of care.

While site visits and interviews revealed examples of advanced electronic systems to support communication of care transition information, many limitations exist with regard to the ability to communicate LPOC data across sites. Within a single site, we found advanced care coordination tools that were available on inpatient units and not available in the ED. None of the sites had the capability to transfer structured data across all sites and levels of care. Even when sophisticated discharge and care transition modules were in place, clinicians copied and pasted notes and other free text documentation.

Participants reported several best practice examples of existing plan of care functionality or workflows. The electronic LPOC developed to support the “Geriatric Resources for Assessment and Care of Elders” program is one best practice example. The program aims to optimize care for high-risk elderly and an LPOC of care is used to maximize the quality and efficiency of the care provided. An interdisciplinary team develops the LPOC in a web-based system. Standard disease-specific protocols are selected based on the patient’s goals and the plan is tailored to patient-specific determinants of risk. A core interdisciplinary team follows the patient across settings and the regularly updated LPOC is available to all care team members to exchange essential information and to ensure a cohesive plan across transitions.

Participants from several sites described strategies for engaging patients in their LPOC. One strategy is the use of patient portals as communication and engagement tools. While the portals are primarily for communication, appointment scheduling, and for securing medication renewals, the future vision is to engage the patient in a longitudinal plan of care within the web-based patient portal. One site described a paper daily plan of care given to the patient while in the hospital. The patient reviews the plan and writes down questions or concerns. Patient modifications to the plan occur during interdisciplinary rounds. Patients are encouraged to bring the plan to their follow-up appointment after discharge.

As noted above, the barriers to automated communication of the LPOC are multifaceted and include fragmented workflows, lack of standards for plan of care components and data elements, documentation of plan of care data using free text fields or paper, and limited interoperability of existing electronic systems. The most difficult barriers relate to existing workflows.

The Stage 2 MU requirements address many of the technical barriers related to data exchange including standards and interoperability. Adoption and integration of the proposed Stage 2 MU plan of care data elements will include data related to patient problems, goals, instructions, and responsible care team members, each of which are elements of an LPOC. In addition, the Consolidated Clinical Document

Architecture (CCDA)[52] includes the core set of data and information needed by both providers and patients to support transitions and is proposed as the standard archetype for electronic data exchange at care transitions. Consistent electronic representation of LPOC data using the proposed standards will overcome many of the barriers and provide a means to automate measurement of plan of care communication. However, unless these standards are adopted across all settings and levels of care, the vision of the longitudinal POC will not become a reality.

Future Vision and Ideas for Improved Systems

The six sites provided a tremendous amount of information in addition to what we have summarized thus far about electronic tools, care innovations, quality measures, and longitudinal patient-centered plan of care. The sites were asked about their vision of the future. Rather than describing the desire for more electronic tools in the future, the sites typically suggested that a low-tech solution, such as making a phone call, is the ideal state. The future was often a mixture of low-tech and high-tech.

One interview site noted the utility of email as well as “a handoff with voice to voice, doc to doc communication.” They made a point about ER transfers: “We especially use that when we’re trying to do a direct admit from the ER. When patients leave the hospital after they’ve been admitted, they get a very lengthy but helpful packet of information and the hospital is very used to discharging patients. In the ER, that’s sort of an unusual event to discharge someone directly into a nursing facility, and getting the right information including accurate medication lists can be challenging. So, in our facility, the Admitting Department will alert me and I’ll actually have a live conversation with a clinician in the ER just to make sure that we get the right information, so there are no dramatic surprises.”

The Interview 4 site visit to a SNF noted that the verbal communication with the ACH nurse is important in order to learn about a unique patient context, such as the fact that the patient does not take medications as prescribed, the involvement of family members as patient advocates, and other psychosocial context. These opinions clearly support a low-tech component to information transfer across care transitions.

The Interview 5 site expressed a different opinion, “The ideal state for us is secure messaging within the EHR so you don’t have to call the physician, interrupt your day, maybe get their voicemail, and maybe get their nurse. The discharge papers, which are actually now electronic but we still fax to their office, would be able to be sent electronically.”

The Interview 3 site echoed the future vision of totally electronic communication, stating: “From my perspective and I’m not sure it’ll ever happen, if we can come up with a set of standardized tools both inter-agency facility and also patient tools, because we’re all using something different, and I think that if we can come up with something standard we could build it electronically.” Another site stated, “For our health system, since we get most of our patients out of our health system, a good start for us would be an interface between the hospital systems that you heard me mentioning, into our system, and to just have some of that basic demographic data, who the physician is, what the insurance is, what the

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[52] HL7. *HL7 Implementation Guide for CDA® Release 2: IHE Health Story Consolidation, Release 1 - US Realm*. 2012 [cited 2012 July 2]; Available from: http://www.hl7.org/implement/standards/product_brief.cfm?product_id=258.

discharge date is, you know, some of that stuff that I watch or home care and hospice coordinators just double enter.” The site added, “So what you see is with the work flow you end up having clinical people, nurses doing a lot of clerical work because in some ways, it’s almost how do you divide that work flow up, they’re the one combing through the chart to find it.” These responses support a standardized electronic information transfer in order to reduce duplicate data entry.

The Interview 6 site suggested an innovative concept to aid clinicians as well as patients: “We would like to have views that everyone can see along the entire continuum of care that is updated and accurate and contextual and based on the newest information.... I can see in the future us creating views that are specific to the care manager or the physical therapist or if the physicians want to see information and the inpatient nurse wants to see other information…. The other thing I can foresee happening is that we’re really moving towards interactive patient care technology where the patient can enter information…. So if they enter information that is sensitive about their mood or about their pain scale or about the patient’s goal for today, because eventually we will be putting what’s now a white erase board...that will eventually become part of the care technology.”

An example of a future vision for a blend of verbal communication and electronic tools was described by the Interview 2 site. They described an electronic document that would allow two people to collaboratively review information during a verbal handoff over the telephone. They added, “…in some ways there’s nothing that substitutes for a really good verbal communication and so it may be that, you know, two people at a distance looking at the same electronic document and then talking about what’s there and not there, and one having provided the care and the other one about to be providing the care with the patient. Hopefully that will be a robust and rich exchange that really supports a good handoff.”

By utilizing such a tool, the sender and receiver could take advantage of the large volume of information stored in an electronic record, but at the same time the sender could reduce information overload by directing the receiver to the most pertinent information. By communicating with the sender in real-time, the receiver would be able to prioritize the most pressing questions.

The problem of missing data is that, as one site noted, “We don’t know what we don’t know.” Interview 5 ED explained, “It is not uncommon to have missing pieces of information for a variety of children whether it’s an otherwise healthy child who has an acute illness transferred from an outside facility or a complex child transferred from home or from an outside facility. Often they are things like laboratory studies or x-rays or maybe all of their correct medication doses…My ideal state would be that even if that child went to Florida on a Make a Wish trip and ended up in an Emergency Room, those Emergency Medicine doctors would be able to have remote access to their care plan, so some kind of database that is not limited to one particular hospital, or at least accessible by multiple providers in different states.”

Another site expressed concerns about health IT that does not support caregiver needs, “In a lot of the work, the role of the caregiver is not explicitly highlighted, and when we work with our patients a lot of the time the information and communication loop is with the caregiver and then they have challenges in terms of accessing some of our resources or it’s not tailored for them.” Another zeroed in on the ideal medium for patient discharge instructions, “…a busy hospital setting where the nurse may have a few minutes to review the discharge plan and the medications…But I think technology can really support that by—like the [avatar project] where the patients could just replay it as often as they want.” Another site would like to see the discharge instructions somehow recorded and or skyped, for retrieval after the patient arrives home.

In summary, the environmental analysis results indicate that sites are working to address care coordination demands, but are struggling with lack of interoperability across settings. Many sites are still working to transfer basic discharge summaries electronically between settings. Electronic tools to improve continuity and identify high risk patients are widespread, but are often limited to one healthcare site. When queried about future vision, many sites described a mixture of verbal communication and electronic communication solution.

Recommendations

As noted in the environmental analysis, the readiness of existing health IT infrastructure to express the data required for quality measurement of care planning during transitions of care is limited, secondary to the lack of: sufficient data and interoperability standards; universally adopted incentives; standardized transitional care planning processes; and endorsed quality measures. The TEPs recommendations to improve the existing health IT infrastructure for patient centric, team-based measurement of care coordination align around three classes of factors: business, function, and content, as described in the Required Data Elements section. The TEP used the concept of a longitudinal lifetime plan of care as the foundation for developing the recommendations.

Business Factors: Change Behaviors and Move the Paradigm Forward

The TEP acknowledges the need to align national incentives to change the adoption of health IT and individual and organizational behavior, thereby advancing the quality data infrastructure necessary for electronic measurement. National incentives requiring shared accountability for patients will increase the demand for interoperable systems between EHR-enabled practices, hospitals, home care, long-term care, and community organizations. Alignment of national initiatives requires an equal parallel path to advance evidence-based practices and develop quality measures to support measurement of transitional care planning. There are multiple approaches to address these areas. Current national initiatives underway could be leveraged and expanded to move the quality measurement paradigm forward.

To strengthen signals about desired changes and to provide stronger incentives to providers and clinicians, the MAP care coordination measure family can be used to align performance measurement across both public- and private-sector initiatives (see Related NQF Efforts section above). A set of 62 available measures and a number of measure gaps were identified. To address these measure gaps, MAP developed a three-year strategic plan that includes tactics for addressing measure gaps which act as a catalyzing agent engaging measure developers and private entities to develop solutions to the barriers.[53] The TEP used the MAP work to discuss the role of health IT tools to capture and exchange data related to care coordination, around high impact areas across all settings of care.

Another powerful lever for change is the MU program. MU includes changing both the health IT side as well as the behavioral side, through the ONC certification criteria and CMS payment incentives. MU Stage 2 requirements address many of the technical barriers related to data exchange, including

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[53] MAP Strategic Plan: 2012-2015 Public Comment Draft. August 27, 2012.

standards and interoperability, and the movement towards definition of common data sets. Adoption and integration of MU Stage 2 provide a useful, incremental step toward the end goal of having a data infrastructure that supports quality measurement of care planning during transitions of care. MU2 requirements set the foundation for adoption of the plan of care, which were also identified by the TEP as high priorities for the plan of care. Furthermore, MU is engaging the use of electronic clinical decision support (CDS)[54], which was also identified by the TEP as being a fundamental requirement for dynamic creation of a unique plan of care based on patient conditions, discipline, and role in the healthcare team. In the Final Rule for certified EHR Technology, ONC states that "a CDS intervention is not simply an alert, notification, or explicit care suggestion. Rather, it should be more broadly interpreted as the user-facing representation of evidence-based clinical guidance."[55]

With greater adoption of the dynamic, longitudinal plan of care, CDS can play a greater role in the electronic environment. The guidance offered by evidence-based rules in CDS offer a starting point. The plan of care contains many different contextual data elements, which vary based on patient condition and healthcare setting. CDS could support the creation of a dynamic plan of care that displays the most important and relevant data based on patient (individual) specific characteristics and setting of care. This is especially important in team-based care and for care spanning different organizations where the plan of care needs to be tailored to meet specific needs.

As an example of an application of CDS, the TEP discussed the importance of tracking and measuring patient refusal of a referral and the impact of referrals on post-acute services on readmission rates. CDS can prompt the discharge planner to recommend a referral, and then track whether the referral was offered and whether the patient accepted it. Moreover, the CDS tool can be objectively shown to the patient to demonstrate the evidence-base for the referral offering the potential to increase patient engagement and acceptance of care plan interventions. Patient characteristics in the care plan can also inform the most appropriate referral decision. For example, insurance coverage and co-pays can be a barrier for referral follow-through; through interoperability between clinical and financial systems, providers can make the most informed decision in the best interest of the patient.

Further, the TEP recognizes that CDS includes not only the point of care CDS, but also includes the use of aggregate analytical tools necessary for quality measurement reporting across populations of individuals. This requires a robust terminology infrastructure. The TEP discussed the need for standardized terminologies such as SNOMED and LOINC, and also the utility of the NQF CDS Taxonomy

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[54] Clinical Decision Support (CDS) is health IT functionality that builds upon the foundation of an EHR to provide persons involved in care decisions with general and person-specific information, intelligently filtered and organized, at point of care, to enhance health and health care.

[55] ONCHIT. Health Information Technology: Standards, Implementation Specifications, and Certification Criteria for Electronic Health Record Technology, 2014 Edition; Revisions to the Permanent Certification Program for Health Information Technology. 54212 Federal Register Vol. 77, No. 171. September 4, 2012.

which provides a classification and categorization of the CDS information necessary for quality measurement and reporting across settings and specialties.

While several data infrastructure tools exist to support CDS, standards are needed to support decision-making across care organizations during transitions of care. HL7 Arden Syntax for Medical Logic Systems is a standard for representing and sharing clinical knowledge for electronic decisions and alerts, and is used by several commercial vendors.[56] HL7 also developed GELLO, a standard query and expression language for decision support that is independent of specific vendor or platform implementations.[57] Additionally, the S&I Framework Health eDecisions Initiative was charged "to identify, define, and harmonize standards that facilitate the emergence of systems and services whereby shareable CDS interventions can be implemented."[58] However, the lack of generally accepted definitions for some artifact types—including plans of care—led to the decision to eliminate these artifacts from their initial scope of work.[59] The TEP supports continued work to address plan of care within this context, especially in light of the inclusion of care plan in Summary of Care and Visit Summary requirements in MU Stage 2.

In addition, the TEP discussed Accountable Care Organization (ACO) financial incentives as a mechanism to encourage interoperability between ACOs, insurance plans, referral centers, and community-based healthcare settings. The TEP identified service agreements as a necessary business characteristic of the care plan; service agreements between providers in an ACO or Medical Home model define the accountable entity and expected outcome. These service agreements can be encoded to be computable thereby enabling care planning processes related to the transition of care. However, increased sophistication around data element "attributes" is needed in the CDS system to assign, order, and refer interventions and tasks. Identifying which providers and clinicians should receive CDS alerts is a complex area for health IT, particularly when there are multiple providers and clinicians involved in care delivery. Furthermore, a method for systematically tracking referrals against targeted outcomes of care is an area of future work.

Another incentive for change is the accreditation process for healthcare organizations. The Joint Commission, for example, is considering expanding the scope of a hospital beyond its "walls" to look at how the organization interacts with its environment. The Joint Commission is also providing resources to healthcare organizations on topics related to transitions of care, such as the Transitions of Care Portal[60] and a "Hot Topics" whitepaper.[61]

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[56] http://www.hl7.org/implement/standards/product_brief.cfm?product_id=268. Accessed September 20, 2012.

[57] http://wiki.hl7.org/index.php?title=Product_GELLO. Access September 20, 2012.

[58] http://wiki.siframework.org/Health+eDecisions+Project+Charter+and+Members. Access September 20, 2012.

[59] Standards & Interoperability Framework. Use Case and Functional Requirements Development for Interoperability CDS Artifact Sharing Use Case. 9/13/2012.

[60] http://www.jointcommission.org/toc.aspx. Accessed September 7, 2012.

[61] http://www.jointcommission.org/hot_topics_toc/. Accessed September 7, 2012.

Function: Enable Collaboration and Data Capture with Health IT

While not the primary focus of this project, the TEP recognized the need for innovative health information systems and applications that can support care plans across organizations. These application platforms are not limited exclusively to EHRs, but also include other health IT systems including Personal Health Records (PHRs). A person-centered plan of care includes clinical data elements typically found in EHRs, but also includes information found in case management systems, home care systems, and financial applications. The TEP discussed the under-utilization of PHRs, which hold great promise for involving patients and family caregivers in coordinating care. PHR capabilities are improving with time and it is expected that with closer integration into hospital and ambulatory practices' systems, PHR use will increase in the future.

As the data infrastructure becomes more robust, health IT electronic applications can utilize the data to enable inter-professional communication and collaboration, while also engaging the patient in the process. The electronic applications can use the data to guide decision-making through user friendly screens that present the right information at the right time. The TEP acknowledges the challenges to provider workflow that can be created by increased data needs. Addressing workflow concerns is critical to the adoption of inter-professional care planning. When properly designed and implemented, these health IT solutions can reduce the workflow burden on the care provider at the point of care. Because multiple sources of data in the care plan force disciplines to work together, developing a workflow for data capture can increase efficiency and collaboration.

Because many care environments have common workflows, these common workflows can be integrated into electronic applications to seamlessly guide clinicians in acting upon the tasks and interventions contained within the care plan. Through use of workflow engines, tasks can be initiated behind the scenes to reduce workflow burden on clinicians. For example, automatically placing a patient education task within the electronic clinical workflow, can help to increase efficiency while also helping clinicians adhere to evidence-based care contained within quality measures.

Given the complexity of care planning during transitions of care, the TEP supports incremental movement from the current state to the end goal: standardization of dynamic family-centric, single-source, longitudinal plans of care that incorporate systems for registering, tracking, measuring, reporting, and improving quality. The results of the environmental scan highlight the need to advance the current state of data capture and data exchange for care planning. The Conceptual Framework for Care Coordination reviewed by the TEP (in the Related Federal and Industry Efforts section) serves as an example roadmap for a shared care plan; of particular value, this framework highlights potential fail points and roadblocks to full implementation. It also serves as an incremental future model, with several components that are not fully automated and require human intervention.

Content: Data and Interoperability Standards

The primary focus for this project is to advance the data infrastructure needed to support electronic quality measurement related to transitions of care and the plan of care. As discussed in the Required Data Elements section of this report, the TEP identified patient diagnosis (condition, problem), procedure (orders, interventions, services), care goal (expected outcomes), and actual outcome as the main data elements of a longitudinal person-centered care plan. However, these data elements alone are not sufficient for either care delivery or quality measurement of transitions of care and the care plan. As the TEP worked through use case scenarios, additional data elements were identified as being necessary for care plan interpretation and use. These data elements spanned a broad array of information such as assessment findings, environmental factors, and patient preferences. For a detailed list of the data elements, please reference Appendix G. Although these additional data elements were characterized as "supporting," they are essential components for transitions of care and performance measurement of those transitions. The TEP referred to them as supporting because depending on the specific patient condition, setting, and need, supporting data elements will come in and out of the forefront of decision-making. Data included for an individual "master" care plan differs based on the patient's needs and care setting (disciplines involved in care team). For this reason, additional granularity in electronic point of care documentation and data attributes is necessary in order to support data presentation. This could be a complex process for patients with multiple chronic conditions. However, on the other end of the spectrum are healthy people who should not be encumbered with a complex care plan; "maintain health" may be sufficient.

Although MU 2 will enhance documentation of common data elements related to the plan of care, proposed MU3 measures have an expanded care plan element list for transitions of care: medical diagnoses and stages; functional status, including ADLs; relevant social and financial information (free text); relevant environmental factors impacting the patient's health (free text); most likely course of illness or condition, in broad terms (free text); Cross-setting care team member list, including the primary contact from each active provider setting, including primary care, relevant specialists, and caregiver; the patient's long-term goal(s) for care, including time frame (not specific to setting) and initial steps toward meeting these goals; and specific advance care plan and the care setting in which it was executed. As noted, several of these elements will not be required as structured data but rather captured as free text. Another proposed measure will "close the loop" by having the referred provider acknowledge receipt of external information and provide referral results to the requesting provider.[62]

As the plan of care becomes more sophisticated, there will be an increased level of level of data granularity in the plan of care. Based on the data elements defined by the Care Coordination TEP, the QDM update June 2012 was used to convert the data elements identified into possible electronic measurement elements. Additionally, given the volume of activity in the landscape related to the plan of care, the TEP developed a data element crosswalk. Included are the IHE PPOC data elements, the Common MU data set as defined in the Final Rule, data elements specified in the S&I Framework LCC MU3 Recommendations, CCD, and S&I Home Health Data Set (LCC Use Case). As noted in previous sections of this report, use of the Consolidated CDA standard can lead to greater data interoperability, as well as meeting certification criteria and MU objectives. The mapping exercise is included in Appendix G.

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[62] http://healthit.hhs.gov/portal/server.pt/document/958208/application_vnd_openxmlformats-officedocument_presentationml_presentation. Accessed September 2012.

In addition, there are corollary recommendations for MU3, as the common MU data set is quite basic and lacks the necessary granularity for patient-centered, longitudinal care plans. Policies should expand the standard set of plan of care data elements to be more patient-centric by including data elements that represent patient values, patient status, and access to care. The TEP also noted the need for more specific definitions from the HIT perspective, including the incorporation of patient reported outcomes, taxonomy for goals, and a standard representation of patient beliefs, desires, and intentions in existing vocabularies. These requirements will be communicated to the respective areas including the QDM, HL7, S&I Framework, and MU.

The TEP recommends identification of a minimum "starter set," along with an implementation guide on how to use data elements in point of care documentation and quality reporting. The following list of data elements and information reflects industry efforts to date (see Appendix G). This could be used as a starting point for the development of a starter set for transitions of care using the care plan:

1. Demographics (name, address, sex, DOB, race, ethnicity, preferred language)
2. Advanced directives
3. Patient preferences
4. Medical equipment
5. Insurance/payers
6. Practice identifier
7. Prior and future encounters (episodes of care)
8. Care team
    a. Roles
    b. Responsibilities
    c. Key owner for the plan of care
    d. Primary contact
    e. Additional contacts
9. Support
10. Special alerts/ heads up
11. Adverse events / unintended events
12. Shared agreement
13. Problems/conditions, Orders/Services/Interventions, Goals (expected outcomes)
14. Past history
15. Watchful waiting
16. Certification and Certification period for the clinical team
17. Environmental factors
    a. Exposures in environment
18. Observations
    a. Assessment / physical findings / measurement instruments
    b. Actual outcomes
    c. What worked / what didn't work?
19. Results
    a. Allergies
    b. Smoking status
    c. Labs
    d. Diagnostic results

        e. Vital signs
20. Precautions
21. Orders/Services/Interventions:
22. Medications (see above categories)

The TEP identified areas of future exploration for data elements that are directly related to electronic quality measurement using point of care data capture and the QDM. The following list is a sample and is not mean to be inclusive:

- Methods for structuring and representing patient, person, or caregiver instructions
- Methods for modeling and tracking care plan responsible parties and their roles
- Standardization of environmental factor content
- Standardization of representation for encounters, episodes of care, and occurrences, so the plan of care could be summarized as one entity or decomposed into encounter/episodes of care views.
- Standardized methods for representing medications (pre-admission medications, transfer medications, discharge medications, high risk medications, in-transport medications, admission medications, home/over the counter medications,)
- Definition of identification of the most appropriate term for “therapeutics”, “watchful waiting”, and “heads up information”
- Standards for tracking patient reported outcomes and associated attributes necessary for care delivery and eMeasurement
- Standard representation of clinician certification, alerts, and pending tests
- Patient instructions and the associated relationship to QDM categories, states, and attributes.
- Implications related to capturing information regarding the “care team” and “clinical roles” and associated relationships to the care plan)
- Attribution, as an important component of the care plan warrants further analysis. All parties need to know “who is doing what,” along with the source/recorder, subject/actor, and receiver/target. Attribution data captured is essential for team attribute analysis. It will inform the best team mix to “practice to the top of the license” for the most efficient and effective health care teams, as well as other team attributes (e.g., staffing).

Conclusion

The Critical Paths Care Coordination project set out to establish a baseline understanding of current electronic data capture processes and data exchange involving communication of the plan of care, and to recommend the action steps necessary to advance current capabilities to the desired future state. The TEP evaluated the steps involved in care coordination and determined the most effective data elements required for quality measurement are those reviewed and used at transitions of care. The TEP also identified the need for both patient-centric and team-based care plan data elements. As they defined the elements required, a framework developed that included characteristics related to business, function, and content factors.

Building on this work, the environmental analysis found that sites are working to address care coordination demands, but are struggling with lack of interoperability across settings. Many sites are still working to transfer basic discharge summaries electronically between settings. While the environmental scan did not find evidence that a single, integrated plan of care presently exists, it is a common vision for the future.

The framework of business, function, and content factors is a useful schema for not only organizing the needed characteristics of the plan of care, but also the actions that can be taken to move toward the ideal vision. The TEP’s recommendations leverage and build on many existing industry activities; in particular, the momentum of the MU program offers an opportunity for collective action. Aligning incentives to change behaviors, promoting data and interoperability standards, and identifying a minimum data “starter set” could greatly advance point of care documentation and quality measurement activities related to care planning at transitions of care.

Appendix A: TEP Roster

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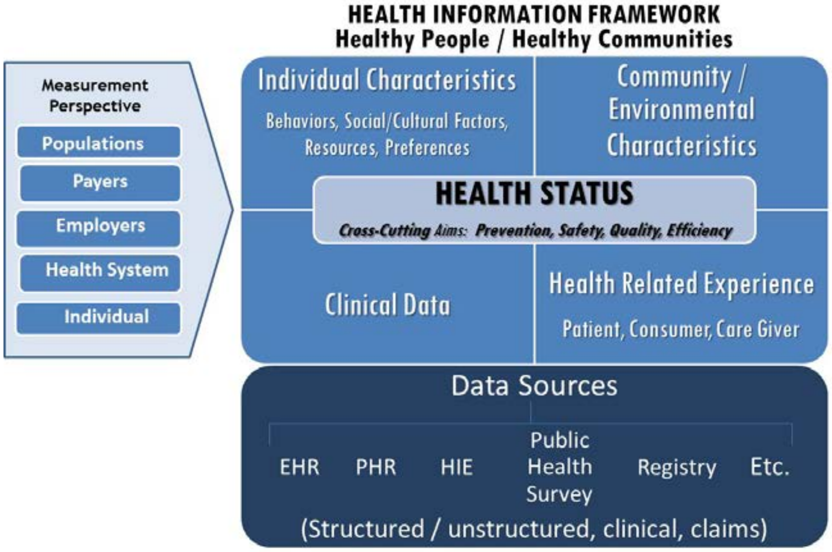
Appendix B: QDM Health Information Framework

NQF's Health Information Technology Advisory Committee (HITAC) developed a QDM Health Information Framework (see Figure 8) to describe the breadth of information needed to measure health.[63] The framework was envisioned to assist in the development of the national data platform that would provide the information necessary to support health improvement and measurement efforts. The framework provides the basis for a common model that can be used to describe data that are reusable for different purposes (a model of meaning).[64] The framework helps to identify the requirements and methods necessary to describe, capture and access reusable data for purposes of quality measurement.

Figure 8: HITAC QDM Health Information Framework



The HITAC QDM Health Information Framework (Framework) incorporates four domains of information that enable a broader reach for data and encourage attention to the entire spectrum of potential data sources: Individual Characteristics (encompassing the Behaviors, Social / Cultural Factors, Preferences, and Personal Resources), Health Related Experience (with the perspectives of patient, consumer, and care giver), Clinical Care Process (including proteomic and genomic data), and Community / Environmental Characteristics. Each of these dimensions has an individual consumer, a population (previously, community), and health system dimension – factors that can be attributed to the individual

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[63] Quality Data Model June 2012 Update, Pre-publication Release.

[64] A model of meaning represents the underlying meaning in a way that is common to, and reusable between, different use cases. In contrast, a model of use represents the underlying meaning in a way that is determined by a limited set use cases. Excerpted from International Health Terminology Standards Development Organization (IHTSDO) Glossary, January 2012 International Release. Available at: http://www.ihtsdo.org/fileadmin/user_upload/doc/tig/glsct/glsct_ss_ModelOfUse.html#_c0cc3aca-4e72-40ba-af25-116e04a36fad, accessed 25 April 2012.

and factors that are influenced by local community and population demographics. It is likely that any comprehensive measure of health should address each of the dimensions. The information requirements for each dimension are grounded in sources such as EHRs, personal health records (PHRs), HIEs, public health surveys, and other sources.

The Framework is the conceptual platform on which the QDM structure is built. It encompasses data from EHRs and other sources to manage measures of health for populations, health plan members, health system participants (or an individual provider's panel of patients), employers, or for measures of individual health for consumers. Examples of the many data sources are listed in Figure 2 (EHRs, PHRs, HIEs, public health surveys, and registries), but these are not intended to be exclusive. Information obtained from social media, hand-held and other devices will be increasingly significant for measuring health. The QDM is a model, or a grammar, to describe the information requirements (the model of meaning), based on the Framework, that can encourage innovation in data capture (multiple models of use) to enable easier access to data and an analysis of health. It is based on a patient-centered approach to health with careful attention to outcomes and patient engagement. The Framework is intended to encourage a more data-driven approach to health information applications to allow greater data sharing and transparency of health outcomes through measurement.

Figure 9: Flow of Activities for Critical Paths for Creating Data Platform Project

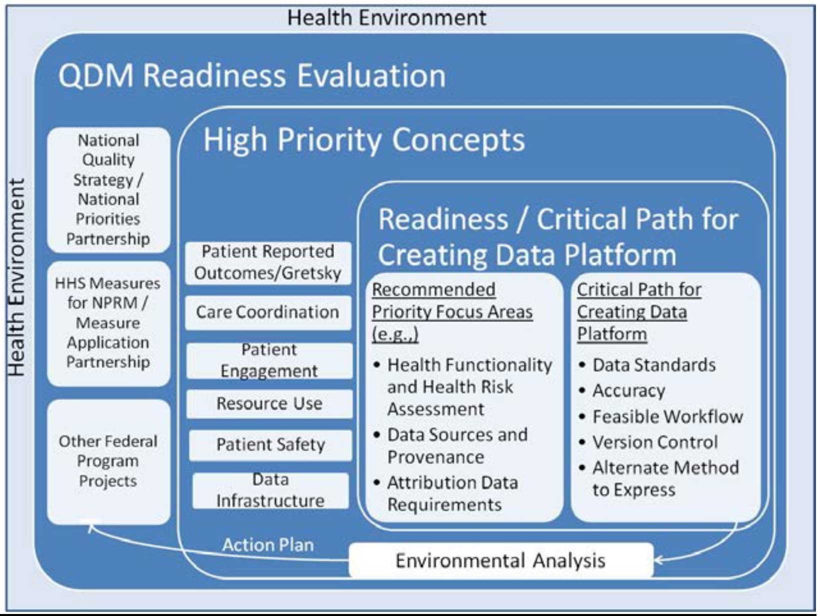
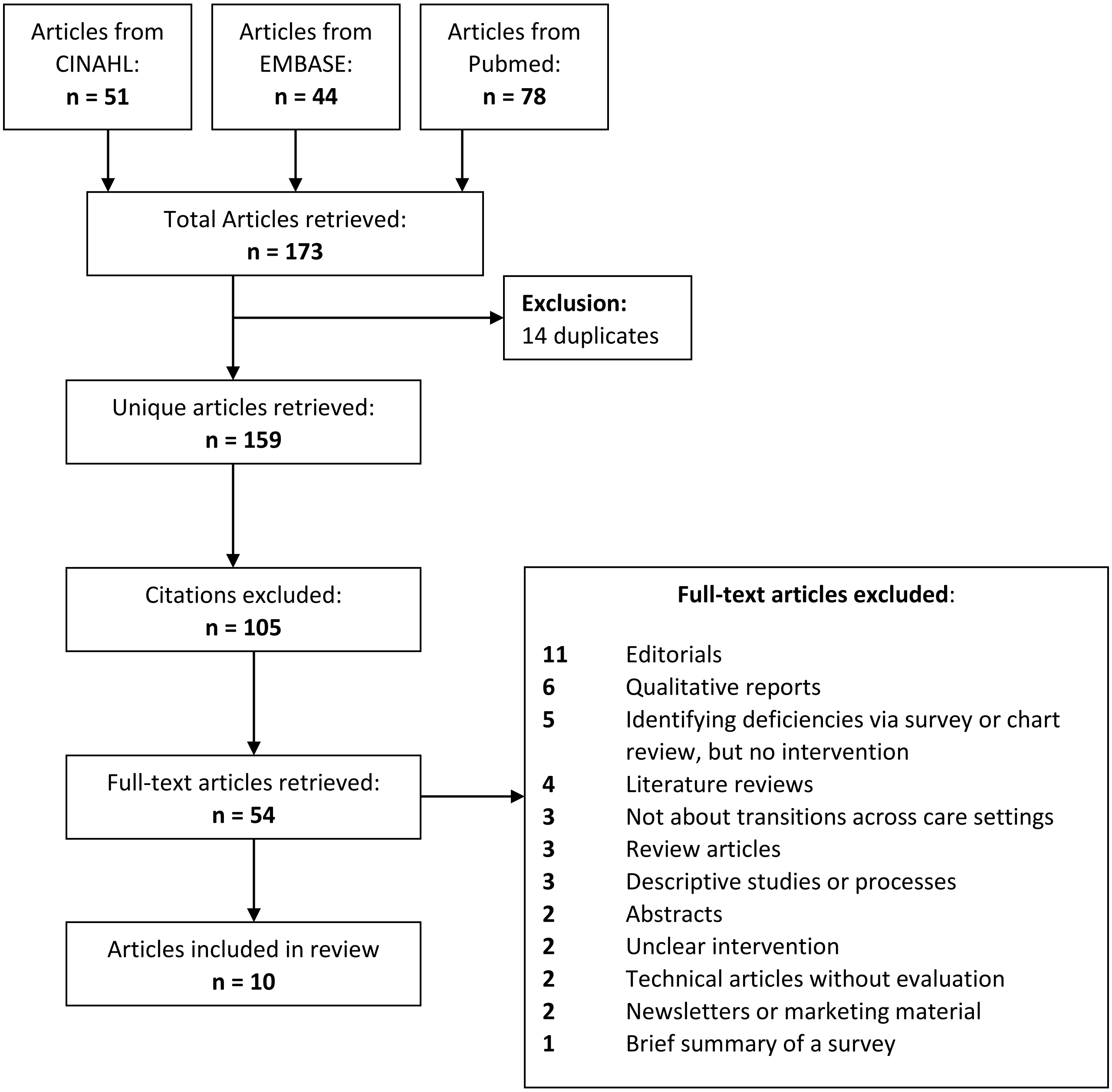


Figure 9 shows some examples of high priority concepts – patient reported outcomes, care coordination, patient engagement, resource use, patient safety, and data infrastructure. This project addresses care coordination, specifically focusing on communication of the plan of care during transitions of care.

Appendix C: PRISMA diagram of articles included in the systematic review



Appendix D: Results of Literature Review

Authors	Title	Year	Study Design	N	Population	Intervention	Outcomes	Results
Balaban RB, Weissman JS, Samuel PA, Woolhandler S.	Redefining and redesigning hospital discharge to enhance patient care: a randomized controlled study	2008	RCT	96	Patients w/ PCP at 1 of 2 Massachusetts practices, admitted to Mass. hospital	4-step: 1) user-friendly discharge form; 2) electronic transfer of discharge form to RNs at PCP practice; 3) phone contact by primary care RN to patient 4) PCP review and modification of discharge plan	4 undesirable outcomes: 1) no outpatient appointment within 21 days; 2) 31-day readmission; 3) ED visits within 31 days; 4) failure to follow up on work-up recommended by inpatient team	Reduction in undesirable outcomes through intervention. 25.5% in intervention group, vs. 55.1% in control, and 55% in historical control
Chen Y, Brennan N, Magrabi F.	Is email an effective method for hospital discharge communication?	2010	RCT	168	Acute care hospita and 75 PCP practices of discharged patients, Sydney, Australia	Email discharge summary (control conditions: fax, mail, patient hand delivery)	% of discharge summaries received by PCP; survey of PCP practices	Fax and email were received at comparable rates (73.9% and 69.4%, respectively); both were significantly more effective than mail or patient hand delivery. 43 of 52 PCP (82.7%) practices responding to survey preferred fax.

Authors	Title	Year	Study Design	N	Population	Intervention	Outcomes	Results
Cochran VY, Blair B, Wissinger L, Nuss TD.	Lessons Learned From Implementation of Postdischarge Telephone Calls at Baylor Health Care System	2012	Description of QI project	26,803	10 Acute Care Hospitals, Texas	Post-discharge patient phone call	% of attempted patient calls, % of successful patient contacts; types of advice given to patients; patient satisfaction	82%-100% attempted calls across hospitals, 20%-69% successful contacts; clarification of medication and/or home care instructions (n = 346, 34%), reminders for follow-up appointments or assistance with referrals (n = 314, 30%), return to the ED or their PCP (n = 346, 33%)
Dalal AK, Poon EG, Karson AS, Gandhi TK, Roy CL.	Lessons learned from implementation of a computerized application for pending tests at hospital discharge.	2011	Pilot intervention	35	35 MDs at 2 Massachusetts hospitals	MDs tested using results manager to manage results of tests pending at discharge; survey of MDs	Frequency of use of results manager; barriers to use	48% of MDs never used the application. Reasons include forgetting; seeing clinically irrelevant results; did not fit into workflow, too little time

Authors	Title	Year	Study Design	N	Population	Intervention	Outcomes	Results
Gombeski WR, Jr., Miller PJ, Hahn JH, Gillette CM, Belinson JL, Bravo LN, et al.	Patient callback program: a quality improvement, customer service, and marketing tool.	1993	Description of QI project	2927	Patients discharged from overnight surgery stay at Ohio hospital	Follow-up phone call 21 days later, by trained interviewer using interview guide	% of patients reached, % with clinical needs	69.3% reached. Of those reached, 14% had unmet clinical need.
Graumlich JF, Novotny NL, Stephen Nace G, Kaushal H, Ibrahim-Ali W, Thei-vanayagam S, et al	Patient readmissions, emergency visits, and adverse events after software-assisted discharge from hospital: cluster randomized trial	2009	RCT	70 MDs; 631 patients	Tertiary care hospital in Illinois; randomized at MD level	New software program enabling discharge provider to send outpatient pharmacist and community MD info on meds, pending tests, diagnoses	Readmission within 6 months	No difference at 6 months between intervention and control discharges in hospital readmissions, emergency department visits, or 1-month adverse events
Olola CHO, Narus S, Nebeker J, Poynton M, Hales J, Rowan B, et al.	The perception of medical professionals and medical students on the usefulness of an emergency medical card and a continuity of care report in enhancing continuity of care.	2011	Survey	31	Outpatient MDs and 4th-year med. students, Utah	2 electronic documents to support clinical decision-making incorporating pt-entered data	Usefulness of the documents	71% MDs and 78% students found the tools to be useful in influencing medical decision making at point of care, in particular: decisions about medications/ treatment decisions and ordering new labs.

Authors	Title	Year	Study Design	N	Population	Intervention	Outcomes	Results
Ornstein K, Smith KL, Foer DH, Lopez-Cantor MT, Soriano T.	To the hospital and back home again: A nurse practitioner-based transitional care program for hospitalized homebound people.	2011	Pre-post intervention study	532	Homebound elders (1,088 admissions over 27 month period), New York	NP sees patient in hospital; as post discharge home visit, NP writes inpatient progress note after admission to transmit outpatient information to the inpatient team, NP writes an electronic message to the outpatient team, NP writes a note in the outpatient record about the post discharge visit	Rehospitalization rate, length of stay, cost of the program	30-day rehospitalization rate decreased from 16.6% to 15.8% (not significant). Mean LOS increased by 4.9%; no differences in mean LOS before/after for first time admits, 30-day admissions. Annual cost for the 1.6 FTE NPs = $197,000. The 2 NPs generated $37,642 in billable services annually, representing 19% of their direct costs.
Peter S, Chaney G, Zappia T, Van Veldhuisen C, Pereira S, Santamaria N.	Care coordination for children with complex care needs significantly reduces hospital utilization.	2011	Pre-post intervention study	101	Children with high utilization & complex needs at a Parth, West Australia, pediatric tertiary care hospital	Telephone support, detailed care plan, proactive outreach and management	ED utilization, hospital admissions, LOS	Significant decreases in ED (15%), hospital admissions (9%), and hospital bed days (43%). Cost savings of $A1.9 million /year

Authors	Title	Year	Study Design	N	Population	Intervention	Outcomes	Results
Zamora Z, McCall B, Patel L, Biese K, Lamantia M, Platts-Mills T, et al.	Implementation of a web-based system to improve the transitional care of older adults.	2012	Retrospective intervention evaluation	313	ED and 4 surrounding SNFs in North Carolina	Web-based connection between hospital EHR and SNFs. 17 key elements could be entered by SNF in patient transfer, which would appear in EHR. SNF could also see ED info entered into system.	Compliance (using system); ED MDs satisfaction surveys	Compliance was 22.7% (i.e., using the system for referrals). Adequacy of info transferred improved based on ED MD surveys

ED – Emergency Department LOS – Length of Stay SNF – SNF NP – Nurse Practitioner PCP – Primary Care Physician RCT – Randomized Controlled Trial RN – Registered Nurse QI – Quality Improvement

Appendix E: Excerpt from Site-specific Survey

INSTRUCTIONS: There are 3 questions. Please select only 1 answer per question by marking with an "X" or, where relevant, by entering the applicable number. Feel free to add additional comments to box below survey. Information RECEIVED by Home Health Agencies (HHA) from Acute Care Hospital (ACH)	1. Do you personally RECEIVE this information from ACH with patient transfers?			2. If No, does someone else at your site RECEIVE this information from ACH with patient transfers?		
	NO	YES		NO	YES	
		PAPER	ELECTRONIC		PAPER	ELECTRONIC
Section 4: Patient Plan of Care						
Patient likes and dislikes						
Patient's goals/expectations of care						
Proposed interventions and procedures for patient after transfer/discharge related to patient goals						
Patient self-management plan						
Follow-up plans related to patient goals						
Clinical instructions given to patient						
Identified Learner for education if patient is unable to receive education						
Information for patient on tests pending at Discharge/transfer						
Who is responsible for following up						
Number(s) to call for results						
Orders						

Appendix F: Interview Guide

1. Tell us about how you try to improve care coordination at your organizations. Probe for strategies and approaches.

2. What structures do you have in place to coordinate care?

   Cue for the following:

   - assigning patients to a PCP or patient-centered medical home before discharge
   - identifying high risk patients who need intensive care coordination

3. What electronic tools are available to coordinate care?

   Cue for the following:

   - electronic tracking tools within a care team
   - electronic information exchange
   - risk stratification tools
   - electronic tools for patient engagement

4. Are there any other tools you think would be helpful? Probe for availability—whether something is in the organization but the specific team does not have. Cue for tools in the ideal state. Search for anything that can be used as a trigger.

5. What tasks must be completed when there is missing information at the time of transfer? How do you obtain the missing information you need? Ultimately, who is responsible if information is missing?

6. How does your organization implement a longitudinal plan of care?

7. How is the longitudinal POC integrated with the care coordination tools described above?

8. How do you to track care coordination? Probe for specific metrics.

What else would you like us to know about how you plan for care transitions?

Appendix G: Data Mapping

TEP Data Elements	IHE PPOC	MU2	S&I Framework LCC MU3 Recommendations	QDM June 2012 Update (category, state: value set (attribute if needed))	CCD	S&I Home Health Data set (LCC Use Case)
		Patient Name		Characteristics, documented: value set (patient)		Patient Identification and Demographics
		Sex		Characteristics, documented: value set (patient)		
		DOB		Characteristics, documented: value set (patient)		
		Race= OMB Directive No. 15		Characteristics, documented: value set (patient)		
		Ethnicity= OMB Directive No. 15		Characteristics, documented: value set (patient)		

TEP Data Elements	IHE PPOC	MU2	S&I Framework LCC MU3 Recommendations	QDM June 2012 Update (category, state: value set (attribute if needed))	CCD	S&I Home Health Data set (LCC Use Case)
Patient Preferences		Preferred Language= Library of Congress ISO 639-2 alpha-3 codes limited to those that also have a corresponding alpha-2 code in ISO 639-1		Characteristics, documented: value set (patient)		Culturally Sensitive Patient Care, Patient Preferences

TEP Data Elements	IHE PPOC	MU2	S&I Framework LCC MU3 Recommendations	QDM June 2012 Update (category, state: value set (attribute if needed))	CCD	S&I Home Health Data set (LCC Use Case)
		Smoking Status= SNOMED CT Current every day smoker 449868002 Current some day smoker 428041000124106 Former smoker 8517006 Never smoker 266919005 Smoker, current status unknown 77176002 Unknown if ever smoked 266927001 Heavy tobacco smoker 428071000124103 Light tobacco smoker 428061000124105		Characteristics, documented: value set (patient)		

TEP Data Elements	IHE PPOC	MU2	S&I Framework LCC MU3 Recommendations	QDM June 2012 Update (category, state: value set (attribute if needed))	CCD	S&I Home Health Data set (LCC Use Case)
Problem List	Active Problems	Problems= ICD-9, SNOMED-CT	Medical diagnoses and stages	Condition/ Diagnosis/ Problem, documented: value set	Problems	Active Problems
	Medications Administered	Medications= RxNorm		Medication, active: value set	Medications	Active Medications, Pre-admission Medication, Elective Admission Medication, In-transport Medication, Discharge Medication, High Risk Medications
	Allergies and other Adverse Reaction Section	Medication Allergies= RxNorm		Adverse effect: Allergy, documented: value set	Alerts (e.g. Allergies, Adverse Events)	Allergies and Intolerances, Known Adverse Events, Potential Adverse Events

TEP Data Elements	IHE PPOC	MU2	S&I Framework LCC MU3 Recommendations	QDM June 2012 Update (category, state: value set (attribute if needed))	CCD	S&I Home Health Data set (LCC Use Case)
		Laboratory Test(s)= LOINC		Laboratory test, performed or ordered: value set		
	Coded Results	Lab value(s)/result(s)		Laboratory test, performed or ordered: value set (result)	Results	
		VS - height		Characteristics, documented: value set (patient)	Vital Signs	
		VS - weight		Characteristics, documented: value set (patient)	Vital Signs	
		VS - BP		Characteristics, documented: value set (patient)	Vital Signs	
		VS - BMI		Characteristics, documented: value set (patient)	Vital Signs	

TEP Data Elements	IHE PPOC	MU2	S&I Framework LCC MU3 Recommendations	QDM June 2012 Update (category, state: value set (attribute if needed))	CCD	S&I Home Health Data set (LCC Use Case)
Patient goals (shared agreement with goals by patient/family caregivers and providers	Treatment Plan	CP goals	The patient's long-term goal(s) for care, including time frame (not specific to setting) and initial steps toward meeting these goals	Care Goal, documented: value set		Major Goals (longevity, function, comfort), Desired outcomes, Milestones, goal start date/stop date, goal status, Goals/Rehabilitation potential
	Patient Instructions	CP Instructions		No simple way to do this in the QDM		Patient Instructions (to the patient), Patient Discharge Instructions (to receiving Provider), Medication Administration Instructions, Procedures

TEP Data Elements	IHE PPOC	MU2	S&I Framework LCC MU3 Recommendations	QDM June 2012 Update (category, state: value set (attribute if needed))	CCD	S&I Home Health Data set (LCC Use Case)
Interventions (Interdisciplinary/ Patient/Family Caregiver) to reach goals (patient must have means to communicate interventions and progress towards goals specifically related to self-management plan).	Procedures and Interventions	Procedures= ICD-9, combination of HCPCS and CPT-4, Code on Dental Procedures and Nomenclature, ICD-10		Procedure, performed or ordered: value set	Procedures	Therapeutics
		Care Team Members	Cross-setting care team member list, including the primary contact from each active provider setting, including primary care, relevant specialists, and caregiver	No simple way to do this in the QDM; actors can be used as attributes of a category		Care Team Information including Physician

TEP Data Elements	IHE PPOC	MU2	S&I Framework LCC MU3 Recommendations	QDM June 2012 Update (category, state: value set (attribute if needed))	CCD	S&I Home Health Data set (LCC Use Case)
Evaluation of progress towards goals and resolution of goals	Assessments			Physical Examination, Performed		Head to Toe Assessment, Other Assessments, Pain Assessment, Progress, Evaluations
Evaluation of progress towards goals and resolution of goals	Physical Examination			Physical Examination, Performed		Progress, Evaluations
	Medical Devices, External Devices			Device, applied	Medical Equipment	Durable Medical Equipment, oxygen, medical Devices
	Review of Systems			Physical Examination, Performed		Review of Systems
	Coded Functional Status Assessment		Functional status, including ADLs	Functional Status, Performed	Functional Status	Function, Cognition, Impairments (Activities Permitted),

TEP Data Elements	IHE PPOC	MU2	S&I Framework LCC MU3 Recommendations	QDM June 2012 Update (category, state: value set (attribute if needed))	CCD	S&I Home Health Data set (LCC Use Case)
	Family History			Family History, Documented	Family History	Family History
	Social History		Relevant social and financial information (free text)	Health Record Component, Documented	Social History	Social History
	Chief Complaint			Symptom, active		
	Provider Orders			Found in the metadata surrounding the Order: Medication, Ordered for example		Order Information, Unique Order Identifier (Sequence Number)
	Advance Directives Section		Specific advance care plan (POLST) and the care setting in which it was executed	Health Record Component, Documented	Advance Directives	Advance Directive Document (MOLST Document), Advance Care Instructions (MOLST data elements)

TEP Data Elements	IHE PPOC	MU2	S&I Framework LCC MU3 Recommendations	QDM June 2012 Update (category, state: value set (attribute if needed))	CCD	S&I Home Health Data set (LCC Use Case)
	Diet and Nutrition			Substance, Active or Ordered		Nutritional Supports, Nutritional Requirements,
	Hospital Admission Diagnosis			Diagnosis, active : value set specifies admitting or discharge		Admitting Diagnosis
	Discharge Diagnosis			Diagnosis, active : value set specifies admitting or discharge		Discharging Diagnosis
	Intake and Output					
	Fluids Administered					
	History of Past Illness Section					
	Immunization Section			Medication, administered: vaccine value set	Immunizations	Immunizations

TEP Data Elements	IHE PPOC	MU2	S&I Framework LCC MU3 Recommendations	QDM June 2012 Update (category, state: value set (attribute if needed))	CCD	S&I Home Health Data set (LCC Use Case)
			Relevant environmental factors impacting patient’s health (free text)			
			Most likely course of illness or condition, in broad terms (free text)			Prognosis
				Characteristic, active: payer value set (patient specific)	Payers	Payer Information
					Support	Patient Support Identification
				Encounter	Encounters	
				Care Goal	Plan of Care	
				Metadata surrounding category selected		Document ID

TEP Data Elements	IHE PPOC	MU2	S&I Framework LCC MU3 Recommendations	QDM June 2012 Update (category, state: value set (attribute if needed))	CCD	S&I Home Health Data set (LCC Use Case)
				Metadata surrounding category selected		Type
				Metadata surrounding category selected		Dates(s)
				Metadata surrounding category selected		Purpose of this communication (discharge, referral, etc.)
				Characteristic, active: value set (patient specific)		Patient Information
				Characteristic, active: value set (patient specific)		Patient Identifiers
				Characteristic, active: value set (patient specific)		Demographics

TEP Data Elements	IHE PPOC	MU2	S&I Framework LCC MU3 Recommendations	QDM June 2012 Update (category, state: value set (attribute if needed))	CCD	S&I Home Health Data set (LCC Use Case)
				Characteristic, active: value set (patient specific)		Patient Contact Information
				Characteristic, active: value set (patient specific)		Personal Electronic Address (PHR, email, etc.)
						Healthcare Agent
						Primary Care Giver
				Characteristic, active: value set (patient specific)		Contacts
				Characteristic, active: value set (patient specific)		Primary Contact
				Characteristic, active: value set (patient specific)		Additional Contact

TEP Data Elements	IHE PPOC	MU2	S&I Framework LCC MU3 Recommendations	QDM June 2012 Update (category, state: value set (attribute if needed))	CCD	S&I Home Health Data set (LCC Use Case)
				Characteristic, active: value set (patient specific)		Address
				Characteristic, active: value set (patient specific)		Service Address
				Characteristic, active: value set (patient specific)		Home Address
				Characteristic, active: value set (patient specific)		Providers/Contacts
				Metadata surrounding category selected		NPI
				Metadata surrounding category selected		Practice Identifier
				Metadata surrounding category selected		Location Identifier

TEP Data Elements	IHE PPOC	MU2	S&I Framework LCC MU3 Recommendations	QDM June 2012 Update (category, state: value set (attribute if needed))	CCD	S&I Home Health Data set (LCC Use Case)
						Clinical Role
						Homecare Provider Information
				Characteristic, active: value set (patient specific)		Insurance
						History of Present Illness
				Alerted is a state available for use with many QDM categories: allergies, meds, etc.		Special Alerts
						Heads Up
				Characteristic, active: value set (patient specific)		Homebound - Medicare

TEP Data Elements	IHE PPOC	MU2	S&I Framework LCC MU3 Recommendations	QDM June 2012 Update (category, state: value set (attribute if needed))	CCD	S&I Home Health Data set (LCC Use Case)
				Characteristic, active: value set (patient specific)		F2F Medicare
						Accidents and Exposures
						Environmental
						Behavioral
				Symptom, active		Wound(s)
				Diagnosis, active		Medical Diagnosis
				Symptom, active		Patient Self-reported Observations
				Diagnosis, active		Functional Diagnosis
						Condition Specific Information
				Diagnosis, active: CHF		CHF

TEP Data Elements	IHE PPOC	MU2	S&I Framework LCC MU3 Recommendations	QDM June 2012 Update (category, state: value set (attribute if needed))	CCD	S&I Home Health Data set (LCC Use Case)
				Diagnosis, active: psychosis		Psychosis
				Diagnosis, active: severe depression		Severe depression
				Diagnostic, active: bipolar		Bipolar
						Barriers
				Diagnostic test, performed		Diagnostic Testing
						Prognostic Testing
						Watchful waiting
						Patient Monitoring
						Patient Caregiver Education
						Skilled Services

TEP Data Elements	IHE PPOC	MU2	S&I Framework LCC MU3 Recommendations	QDM June 2012 Update (category, state: value set (attribute if needed))	CCD	S&I Home Health Data set (LCC Use Case)
						Setting Decision/Change
						Lifestyle Modifications (Exercise etc.)
						Personal Supportive Services (ADLs, IADLs)
						Restorative Services
						Order Listing
				Intervention, performed: value set diabetes care		Diabetes Care
				Intervention, performed: value set wound care		Wound Care

TEP Data Elements	IHE PPOC	MU2	S&I Framework LCC MU3 Recommendations	QDM June 2012 Update (category, state: value set (attribute if needed))	CCD	S&I Home Health Data set (LCC Use Case)
				Intervention, performed: value set central line care		Central Line Care
				Intervention, performed: value set GT care		GT Care
				Intervention, performed: value set urinary catheter care		Urinary Catheter Care
				Intervention, performed: value set postpartum care		Postpartum Care
				Intervention, performed: value set newborn care		Newborn Care
						Administrative Orders

TEP Data Elements	IHE PPOC	MU2	S&I Framework LCC MU3 Recommendations	QDM June 2012 Update (category, state: value set (attribute if needed))	CCD	S&I Home Health Data set (LCC Use Case)
						Physician Certification
				Metadata surrounding category selected		Physician e-Signature
						Certification Period
						Medical Supplies
						Precaution
						Intervention Results
						Medical History
						Physical Activity
						Women's Health

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MU3: http://healthit.hhs.gov/portal/server.pt/document/958208/application_vnd_openxmlformats-officedocument_presentationml_presentation

QDM: QDM Update June 2012 available at http://www.qualityforum.org/QualityDataModel.aspx#t=2&s=&p=6%7C

CCD: HL7/ASTM Implementation Guide for CDA Release 2 -Continuity of Care Document (CCD®) Release 1 Available at: http://www.hl7.org/implement/standards/product_brief.cfm?product_id=6

S&I Home Health Data Set (LCC Use Case): http://wiki.siframework.org/LCC+WG+Use+Case+%26+Functional+Requirements

Appendix H. Glossary of Terms and Acronyms

TERM	**DEFINITION**
Acute Care	Providing or concerned with short-term medical care especially for serious acute disease or trauma.[65]
ACH	Acute care hospital
Alarm	Notification of an event that is not anticipated[66]
ACO	Accountable Care Organization, an organization of health care providers that agrees to be accountable for the quality, cost, and overall care of assigned Medicare beneficiaries
ADL	Activities of Daily Living
Alert	Programmed notification that occurs at specific points, such as the end of a programmed infusion [67]
Care Coordination	A function that helps ensure that the patient's needs and preferences for health services and information sharing across people, functions, and sites that are met over time.[68]
Care plan	The plan of care (care plan) is the structure used by all stakeholders, including the patient, to define the management actions for the various conditions, problems, or issues identified for the target of the plan. It is the structure through which the goals and care planning actions and processes can be organized, planned, communicated, and checked for completion Specifically, a care plan is composed of the following elements: "Problem" is another data type "Intervention" may be a procedure, medication, substance… (any data type that is an action) The "goal" is what is expected to happen. The "outcome" is what happened which can be shown by other data types[69] See also Longitudinal Care Plan
CCD	Continuity of Care Document, an HL7 standard containing a core data set of the most relevant information necessary for continuity of care.

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[66] Care Fusion. Safety and Clinical Excellence. Perspectives. Available from: http://www.carefusion.com/safety-clinical-excellence/perspectives/medication_management.aspx

[67] Ibid.

[68] National Quality Forum (NQF), *NQF-Endorsed Definition and Framework for Measuring and Reporting Care Coordination*, Washington, DC; NQF 2006.

[69] Health Information Technology Standards Panel

TERM	**DEFINITION**
CDA	Clinical Document Architecture, an HL7 standard in XML-based markup intended to specify the encoding, structure and semantics of clinical documents for exchange. CDA is part of the HL7 version 3 standard.[70]
Clinical decision support (CDS)	A process for enhancing health-related decisions and actions with pertinent, organized clinical knowledge and patient information to improve health and healthcare delivery. The information delivered can include general clinical knowledge and guidance, intelligently processed patient data, or a mixture of both. Information delivery formats can include data and order entry facilitators, filtered data displays, reference information, alerts, and others.[71]
CMS	Centers for Medicare & Medicaid Services, in the US Department of Health and Human Services
Connectathon	A weeklong interoperability-testing event.[72]
Critical Path	An algorithm for scheduling a set of project activities. It is an important tool for effective project management. [73]
Data Capture	Collecting and entering data in a computer, or the conversion of data into a form compatible with computers
Data Element	The atomic unit of data for which the definition, identification, representation and permissible values are specified by a set of attributes, or metadata.[74]
Data exchange	The process of sending and receiving data in such a manner that the information content or meaning assigned to the data is not altered during the transmission
Data Element Feasibility	The likelihood that data elements are available and a significant number of organizations can capture and access the data element in a consistent manner.
Data Infrastructure	Technology, processes, tools, and standards needed to promote data sharing and consumption
ED	Emergency Department

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[70] http://hl7book.net/index.php?title=CDA

[71] Improving outcomes with clinical decision support: an implementer's guide. Second Edition. HIMSS. 2011 (in press). Available from: http://www.himss.org/asp/topics_clinicaldecision.asp.

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TERM	**DEFINITION**
Electronic Health Record (EHR)	A longitudinal electronic record of patient health information generated by one or more encounters in any care delivery setting. Included in this information are patient demographics, progress notes, problems, medications, vital signs, past medical history, immunizations, laboratory data and radiology reports. The EHR automates and streamlines the clinician's workflow. The EHR has the ability to generate a complete record of a clinical patient encounter - as well as supporting other care-related activities directly or indirectly via interface - including evidence-based decision support, quality management, and outcomes reporting.[75]
Electronic Measure (eMeasure)	Standardized performance measures in an electronic format [76]
Extrinsic factors	Modifiable factors associated with central line insertion or maintenance or the patient care environment.
Goal	A defined target or measure to be achieved in the process of patient care. A typical goal is expressed as an observation scheduled for some time in the future with a particular value[77]
Health Information Exchange (HIE)	A term used to describe both the sharing of health information electronically among two or more entities and also an organization which provides services that enable the sharing electronically of health information.[78]
Healthcare Quality Measure Format (HQMF)	A standard for representing a health quality measure as an electronic document.
Health Level 7 (HL7)	A not-for-profit, ANSI-accredited standards developing organization dedicated to providing a comprehensive framework and related standards for the exchange, integration, sharing, and retrieval of electronic health information that supports clinical practice and the management, delivery and evaluation of health services.[79]
HIT	Health Information Technology
HHA	Home health agency
IHE	Integrating the Healthcare Enterprise
IHE PPOC	IHE Patient Plan of Care

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[75] HIMSS EHR Definition. Available from: http://www.himss.org/asp/topics_ehr.asp.

[76] National Quality Forum. Electronic Quality Measures (eMeasures). Available from: http://www.qualityforum.org/Projects/e-g/eMeasures/Electronic_Quality_Measures.aspx

[77] Health Information Technology Standards Panel

[78] HIMSS Health Information Exchange Steering Committee August 2009. Overview of Health Information Exchange (HIE). Available from: http://www.himss.org/content/files/RHIO/RHIO_HIE_GeneralPresentation.pdf.

[79] HL7 International. About HL7. Available from: http://www.hl7.org/about/index.cfm?ref=nav.

TERM	**DEFINITION**
Interoperability	The ability of health information systems to work together within and across organizational boundaries in order to advance the effective delivery of healthcare for individuals and communities.[80]
Intrinsic factors	Non-Modifiable Patient Characteristics
ISO	International Standards Organization
LOINC	Logical Observation Identifiers Names and Codes
LPAC or LTPAC	Long-term post-acute care
Longitudinal Care Plan	A single, integrated plan that is patient-centered and reflects patient's values and preferences. All team members, including the patient and family caregivers, are actively involved in formulating and updating the care plan and the associated self-management goals. The longitudinal care plan supports achievement of patient goals along the continuum of care, including chronic, acute, and episodic care, home health, ongoing self-management, and supports cohesive transitions in care. The longitudinal care plan should include a mechanism for capturing important elements such as: • Patient preferences • Problem list • Patient goals (shared agreement with goals by patient/family caregivers and providers) • Interventions (Interdisciplinary/Patient/Family Caregiver) to reach goals (patient must have means to communicate interventions and progress towards goals specifically related to self-management plan). • Evaluation of progress towards goals and resolution of goals See also care plan
Meaningful Use	The American Recovery and Reinvestment Act of 2009 authorizes the Centers for Medicare & Medicaid Services (CMS) to provide incentive payments to eligible professionals (EPs) and hospitals who adopt, implement, upgrade, or demonstrate meaningful use of certified electronic health record (EHR) technology.[81]
Metadata	Data that provides information about other data.[82]

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[82] Merriam-Webster Online Dictionary. Metadata. Available from: http://mw1.merriam-webster.com/dictionary/metadata.

TERM	**DEFINITION**
NP	Nurse Practitioner
NQF	National Quality Forum
NQF-endorsed measures	Standards that are evaluated through the Consensus Development Process for measuring and publicly reporting on the performance of different aspects of the healthcare system. Standards endorsed by NQF are widely viewed as the "gold standard" for the measurement of healthcare quality.[83]
NQS	National Quality Strategy
ONC	Office of the National Coordinator for Health Information Technology, in the US Department of Health and Human Services
Open source	A development method for software that harnesses the power of distributed peer review and transparency of process. The promise of open source is better quality, higher reliability, more flexibility, lower cost, and an end to predatory vendor lock-in.[84]
PCP	Primary care provider
PCMH	Patient-Centered Medical Home
Plan of care	See care plan and longitudinal care plan
Quality Data Model (QDM)	An information model that defines and describes clinical concepts in a standardized format to clearly and consistently represent concepts for use across all quality measures.
Quality measures	A mechanism to assign a quantity to quality of care by comparison to a criterion.[85]
QRDA	Quality Reporting Data Architecture, a QDM- based standard to define explicitly how an HQMF eMeasure can be represented for communication of quality measurement data.
SNF	Skilled Nursing facility
Systematized Nomenclature of Medicine-Clinical Terms (SNOMED-CT)	A comprehensive clinical terminology, owned, maintained, and distributed by the International Health Terminology Standards Development Organisation (IHTSDO) [86]
Taxonomy	The study of the general principles of scientific classification.[87]
Transitional care	A set of actions designed to ensure the coordination and continuity of healthcare as patients transfer between different locations or different levels of care within the same location[88]

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TERM	**DEFINITION**
UTF	Universal Transfer Form
Workflow	The sequence of clinical steps in care delivery

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