Environmental Analysis of Health Information Technology to Support Care Coordination and Care Transitions

Commissioned Paper

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Background

The Importance of Care Coordination Performance Measurement

The National Quality Strategy has identified effective communication and coordination as a high priority area for the nation[1]. In addition, the Office of the National Coordinator has clearly identified care coordination and transitions as high priority domains for which quality measurement built into electronic systems will be required[2].

The development and assessment of care coordination performance measures and related health information technology (HIT) structures and processes requires a framework capable of accounting for all essential care coordination activities as well as the outcome sought by reduced fragmentation and integration—better patient care. The National Quality Forum's (NQF) original 2006 Care Coordination Framework identified Information Technology as one of six critical domains for care coordination measurement[3]. This framework, however, was conceived at a time before widespread use of HIT, and the construct did not foresee the foundational role that HIT could play in care coordination. Subsequently in 2010, the Agency for Healthcare Research and Quality commissioned an environmental scan of care coordination measures that also produced a new framework of care coordination measurement that identified *Health IT-Enabled Coordination* as a broad approach necessary for care coordination[4]. This evolution in care coordination strategy was further supported by the 2010 publication of NQF's Preferred Practices for Care Coordination, which identified HIT as a recurrent platform necessary for successful care coordination[5]. At the time of these publications, however, the AHRQ Atlas of Care Coordination, a systematic review, identified 61 measures of care coordination, of which most were surveys of the patient experience. No electronic measures collected through automatic data aggregation from clinical information systems (eMeasures) were identified through this review.

Subsequent to the initial care coordination measurement work described above, Singer et al. developed a framework for ‘integrated care measurement.’ This framework considers both care coordination activities, as well as patient centeredness[6]. This framework was used to describe data needs for future care coordination measurement and served as the foundation for ensuring that this subsequent environmental analysis was able to capture gaps in measurement that exist in current electronic data sources.

Advancing Care Coordination Performance Measurement through HIT

In 2011, the NQF once again began to address care coordination measurement by initiating a Consensus Development Project that includes a Call for Measures as well as measure maintenance and re-evaluation following the work completed in 2010. In phase I of this project, an environmental scan of care coordination measures revealed 124 measures in the peer-reviewed and grey literature, of which 86 had been specified in the literature[7]. In this environmental scan, none of the published measures were specified for use with electronic health records (EHRs), while 32 eMeasure concepts were identified. This scan demonstrated the need for further exploratory work directed at identifying potential care coordination measures in current use.

The Agency for Healthcare Research in Quality commissioned a follow-on report in 2012 entitled *Prospects for Care Coordination Measurement Using Electronic Data*

Sources that utilized a Technical Expert Panel to focus measure development efforts on "the most fertile grounds" that "rely on electronic date sources"[8]. This report identified six challenges to measuring care coordination using electronic data including: underutilization of HIT systems, lack of data standardization and interoperability, unknown electronic clinical data quality, data linkage limitations, technical data access hurdles and competitive business models. In prior work this year, our group published a paper commissioned by the NQF entitled *Health Information Technology to Support Care Coordination and Care Transitions: Data Needs, Capabilities, Technical and Organizational Barriers, and Approaches to Improvement*[9]. This paper described the data and elements required to support care coordination activities as called for in the AHRQ report. In addition, we described the organizational and technical barriers to developing the clinical information systems needed for effective care coordination measurement. That work was utilized by an NQF convened Technical Expert Panel as part of the Critical Paths Project to outline the "cross-talk" between measures endorsed by the NQF Care Coordination Endorsement Maintenance Project and national projects including: HL7, Integrating the Healthcare Enterprise Patient Care Coordination, Standards and Interoperability Framework, CMS CARE Tool, and the Patient Centered Care Plan (PCCP).

The measures evaluated by the NQF Care Coordination Endorsement Steering Committee included 15 previously endorsed measures of care coordination, nine of which focused on care transitions. There were no new measures submitted by the public during this cycle. The paucity of new measure submissions to the NQF as well as the lack of electronic specification (particularly in HL7 as supported by the NQF Measure Authoring

Tool) demonstrated the need for further exploration of the barriers and potential solutions to HIT-enabled measurement of care coordination.

This Critical Paths Project is designed to "assess the readiness of electronic data and health IT systems to perform the data capture, normalization and standardization necessary to support care coordination reporting and evaluation across clinical information systems (e.g., EHRs, health information exchanges, etc.)"[10]. Based on the initial technical expert panel review, the NQF commissioned this work to extend the environmental analysis of care coordination measurement from the previous NQF and AHRQ efforts that were limited to published literature. The environmental analysis combined structured interviews with formal literature review to assess best practices that can be used to describe the readiness of HIT for care coordination measurement.

Future Directions for HIT in Care Coordination Measurement

The objective of this work was to assess and demonstrate the current capabilities for care coordination measurement from electronic data sources across a wide range of healthcare facilities in diverse regions of the US. These findings will be used to inform future policy and regulatory efforts designed to facilitate HIT adoption, data standardization and interoperability, and clinical process improvement.

Literature Review

Objectives:

Our objective was to identify studies of interventions designed to improve transfer of information during transitions of care, with a focus on HIT driven intervention.

Data Sources:

We searched MEDLINE®, CINHAHL®, and Embase with no date restrictions. The search strategy was improved iteratively based on consensus between research team members (available upon request).

Methods:

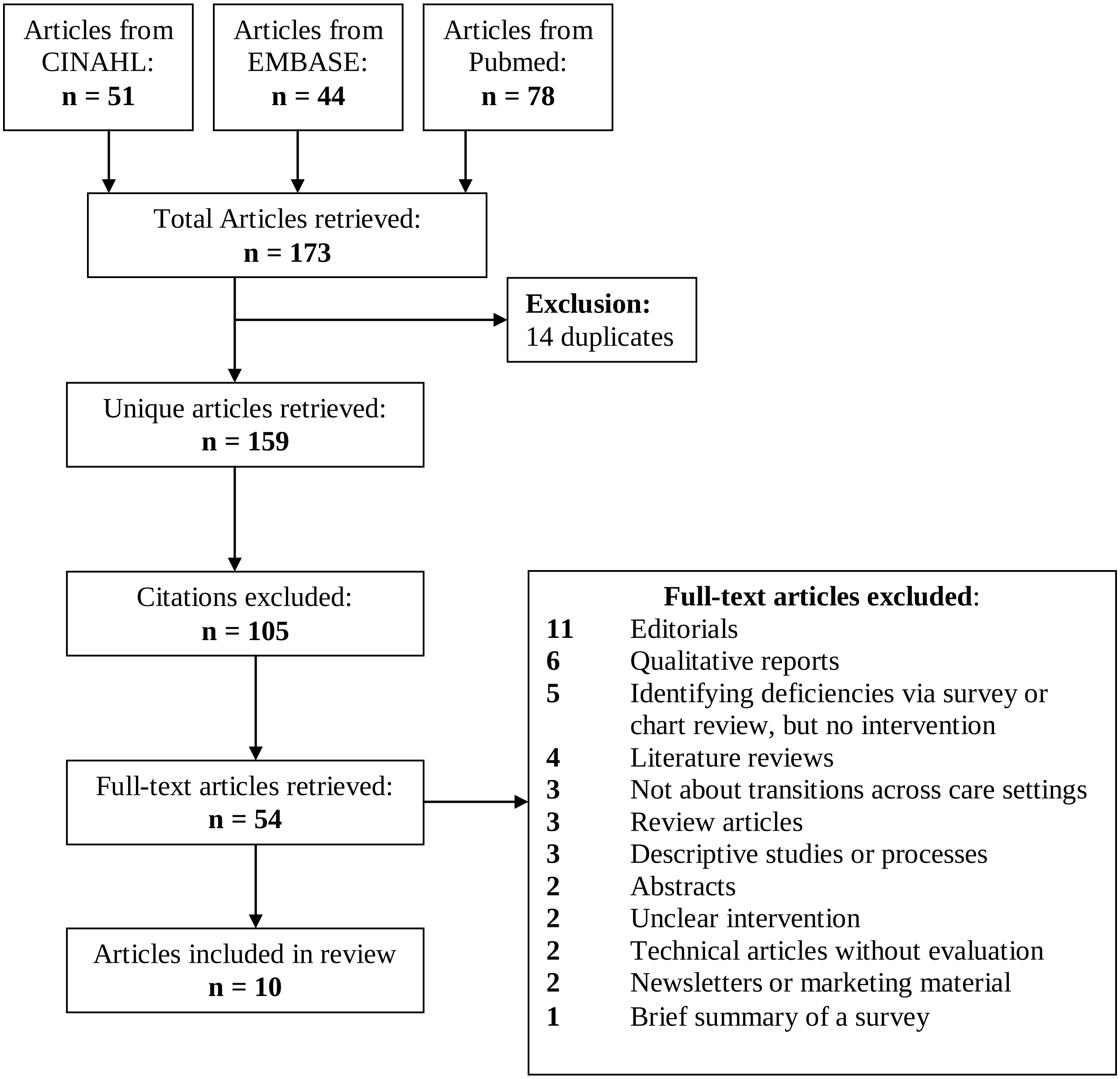
Each retrieved article was first reviewed by two reviewers in title/abstract format. The full text of included articles were reviewed by two reviewers. We included studies that examined the impact of interventions to improve information exchange during transitions of care. We excluded qualitative studies, review articles, technical reports, and editorials. We also excluded descriptive studies utilizing either surveys or chart reviews in order to identify deficiencies of discharge documents.

We utilized a standardized data collection instrument to extract pertinent data elements from each study including: study design, number of patients, population, setting, intervention, control condition, outcome measures, and results. Outcomes which were extracted included: clinician perceptions of usefulness of care coordination interventions, rate of use of electronic tools for care coordination, effect on process outcomes (e.g., time to post discharge primary care visit, 30 day readmission rate, healthcare costs, length of stay), and other measures of quality.

Results:

Our 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. Most studies were excluded due to the fact that they were not studies of interventions to improve information exchange during transitions of care (see Figure 1). 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.

Figure 1. PRISMA diagram of articles included in the systematic review



Studies of electronic tools which incorporate patient-entered data for information exchange across transitions

We found one survey 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[11]. Physicians thought that both documents were useful for medical decision-making. However, the study did not assess objective measures of improvements in care.

Studies of electronic tools for information exchange across the transition from a nursing home to an emergency department

A web-based tool for nursing homes to transmit data to an emergency department was evaluated in a pre-post study[12]. 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 referal 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.

Studies of electronic tool to track hospital-based test results after discharge from the hospital

A study of a hospital discharge test result management tool surveyed discharging physicians about barriers to use[13]. 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.

Studies of electronic tools for hospital physicians to communicate with outpatient pharmacies and community-based providers

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 providers[14]. 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[15]. 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.

Studies of post-discharge telephone call programs

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[16]. 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[17]. 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 nonrespondents suggest bias. The survey nonrespondents are not described.

Studies of 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[18]. 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[19]. 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 rehospitalization 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[20]. Economic analysis indicated a cost savings of Australian $1.9 million per annum.

Table 1: 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 hospital 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.
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
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	The perception of medical professionals and medical students on	2011	Survey	31	Outpatient MDs and 4th-year med. students, Utah	2 electronic documents to support clinical decision-making	Usefulness of the documents	71% MDs and 78% students found the tools to be useful in influencing medical

B, et al.	the usefulness of an emergency medical card and a continuity of care report in enhancing continuity of care.					incorporating pt-entered data		decision making at point of care, in particular: decisions about medications/ treatment decisions and ordering new labs.
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
Zamora Z, McCall B, Patel L, Biese K,	Implementation of a web-based system to improve the	2012	Retrospe-ctive intervention evaluation	313	ED and 4 surrounding SNFs in North Carolina	Web-based connection between hospital	Compliance (using system); ED MDs satisfaction surveys	Compliance was 22.7% (i.e., using the system for referrals).

Lamantia M, Platts-Mills T, et al.	transitional care of older adults.					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.		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

Primary Data Collection Methods and Results

<u>Objective and Methods:</u>

Our objective in the primary data collection of the project was to gather novel data on the use of HIT to support transitions of care. We decided to employ multiple methods of data collection including interviews and confirmatory data gathering through surveys and site visits. After discussion with the NQF Technical Expert Panel (TEP) and the NQF project leaders, we chose six regions of the country that represented a diverse range of electronic capabilities and geographic regions (see Box 1). Within each region we identified representatives from four different types of healthcare facilities: emergency department (ED), acute care hospital (ACH), skilled nursing facility (SNF), and home health agency (HHA). Our goal was to interview clinicians from these four types of healthcare facilities who actively participate in one of two specific unidirectional care transitions: a clinician in a SNF sending patients to a clinician in the ED, or a clinician in an ACH sending patients to an HHA. This specificity regarding a unidirectional transfer stems from the IMPACT group’s concept that there are site-specific data elements in each transfer (personal

Box 1: Characteristics of Respondents

Interview 1: University health system in Midwest region, respondents from acute care hospital and skilled nursing facility

Interview 2: National healthcare company with hospital, nursing center, and rehabilitation divisions, respondents from IT and skilled nursing facility in New England

Interview 3: Midatlantic region, respondents from an emergency department, an acute care hospital and a home health agency

Interview 4: Integrated delivery system in New England, respondents from skilled nursing facilities, acute care hospital, and home health agency

Interview 5: University pediatric department in Northwest region, respondents from an emergency department, an acute care hospital and a home health agency

Interview 6: National integrated delivery system, respondents from IT, an acute care hospital and a home health agency communication, Terrence O’Malley). 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[21].

We used our own contacts, contacts identified by the TEP, and the Internet to identify interested parties. Then, we used a ‘snowball’ method in order to recruit more subjects. We purposefully selected respondents within the same region who were regularly transferring patients to each other’s facilities.

Table 2. 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.

	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?		
		YES			YES	
Information RECEIVED by Home Health Agencies (HHA) from Acute Care Hospital (ACH)	NO	PAPER	ELECTRONIC	NO	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						

Surveys

Utilizing templates created by the IMPACT project, we constructed four versions of a survey that queried the respondent about approximately 250 specific data elements. For each data element we asked whether the respondent sends or receives the data element (depending on which type of facility and which unidirectional transfer described above). If he or she transfers the data elements, does he or she send the information on paper or electronically? We also asked whether the respondent knew if another person in the organization sends or receives this data, and whether it is sent on paper or electronically.

Interviews with stakeholder organizations

We conducted one-hour focus group style interviews with representatives from these healthcare facilities within these six regions. We prepared a semi-structured interview guide based on a review of the literature, previous experience conducting qualitative interviews, and our own experience as clinicians (see Box 2). The interviews explored electronic data readiness for measurement of care coordination, and areas of need, gaps and barriers.

Box 2: 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 pt 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.
9. What else would you like us to know about how you plan for care transitions?

Site visits

We conducted full-day site visits in two regions. We conducted visits to different sites within the region. The data therefore represents multiple transitions types (e.g., ED to ACH, ACH to HHA). During these visits we gathered additional data on care innovations and electronic tools, as well as paper forms for care transitions and communication of the plan of care.

Overview of Results

We attempted to contact 56 people from six regions via email. Eventually 42 people were successfully recruited. We received demographics forms from 22 respondents. We received 16 surveys. We conducted one-hour focus group style interviews with 29 people. We interacted with 14 respondents during site visits in two regions (Interview 4 and Interview 5).

Table 3: Summary of demographics forms.

	N	
1. Age – range in years	22	(24-69)
2. Gender	5	23% Male
	17	77% Female
3. Ethnic Group		
	0	0% Hispanic
	19	86% Non-Hispanic
	3	14% Not reporting
4. Race:		
	0	0% American Indian/Alaska Native
	2	9% Asian
	0	0% Native Hawaiian or Pacific Islander
	0	0% Black or African American
	20	91% White
	0	0% More than one race
	0	0% Not reporting
5. Interdisciplinary Provider Type:		
	12	55% Nurse
	0	0% Nurse Practitioner
	5	23% Physician
	1	5% Physical Therapist
	0	0% Pharmacist
	0	0% Occupational Therapist
	0	0% Registered Dietician
	0	0% Speech and Language Pathologist
	4	18% Other
6. How long have you been a health care professional? – range in years	21	(2-50)
7. Years working at this institution?	22	(2-25)
8. Highest Professional Degree:		
	1	5% Diploma
	0	0% AD
	4	18% BS/BA
	9	41% MA/MS

	8	36% Doctoral Degree
9. Compared to your peers, how do you rate your computer skills?	9 10 3	41% above average 45% average 14% below average

Electronic Tools for Care Coordination

Our 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. 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.

The staff of Interview 4 and Interview 5 regions 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-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 region 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 (e.g., Meditech).

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 an iPad-based pre-admission clinical evaluation tool used by clinical liaisons of 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. This process was mentioned, in particular, by a number of the home health agency (HHA) interviewees.

Interview 3 region 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. The HHA of Interview 4 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 (BRIGGS Form 1203 A-C). 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 region 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 reviews 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). The SNF of Interview 4 reported they have 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 region is working to make all of their clinical information systems (both established and those they are currently implementing) capable of producing a Continuity of Care Document (CCD) by the end of the year. One of the respondents in 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 EPIC's "Care Anywhere" 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 respondents except Interview 6 described considerable problems with HIT 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 region 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 organizations in this system use a Universal Transfer Form (UTF) 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 region also uses the "Page One, Two, Three" 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 region 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 region automatically pushes laboratory results out to the provider associated with the patient. They also have an ED information management system, FirstNet®, which sends a limited summary to PCP via fax. The Interview 5 region 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 interviewee 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 region 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 region 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 region 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 system 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. These include:

- 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;
- 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, we must assess the value of this information and the workflow processes involved in compiling these data. 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, we queried organizations 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. Organizations have 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 region 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 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 region is currently conducting a study in which a comprehensive care plan template is completed in one electronic 3M system and then populates into their Cerner 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 can not be dynamically updated, it can be electronically copied and carried forward in the record when the plan is revised.

The Interview 6 region 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 region is starting to look into an AllScripts Knowledge-based Charting (KBC) product that supports development of a patient-centered daily plan of care. Patients can indicate questions and concerns so that they can be addressed in 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 regions 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 region uses a McKesson 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 region, 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 region 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 region 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 we accomplish electronic exchange of data between care settings, our interviews also revealed that innovative efforts are underway to develop policies, procedures, and tools to improve care coordination.

Care Coordination Innovations

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

All surveyed organizations 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 regions 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 region uses RNs in a similar role in long-term acute care hospitals and Interview regions 3, 4, and 5 uses 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 home health agencies 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 region 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 regions 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 home health agencies 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 regions 3 and 4. In addition, Interview sites 2 and 3 uses 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 institutions 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 institutions 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 region 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. 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 institutions use different electronic risk stratification methods. The Interview 2 region uses a McKesson 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 region included organizations from different regions, all of whom use a risk-stratification tool. Some use the validated LACE tool, while other organizations employ other algorithms.

Second, most institutions 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 company 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 institutions 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 region has a six-element transitions protocol, and tracks the rate of completion of each element.

Several institutions track whether follow-up appointments are made with outpatient physicians. Interview 6 and Interview 1 regions, as well as Interview 3 VNA, track whether patients show up to their appointments. The Interview 1 region tracks the percentage of primary care appointments that are with the patient's actual PCP. Interview 3 (acute care) and Interview 6 regions 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 regions track referral rates to condition-specific programs, such as heart failure and palliative care.

Lastly, some institutions use patient surveys to measure the success of discharge processes in promoting patient knowledge and satisfaction. Interview 5 and Interview 1 regions survey patients and/or families to assess their satisfaction with transitions. The Interview 2 region 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 organizations within the Interview 6 region, are doing chart reviews for all patients readmitted, to better understand whether and how the readmission might have been prevented.

An Electronic Longitudinal Plan of Care

We emphasized patient-centered data elements during the surveys and interviews (see Table 2 and Box 2). 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 Electronic data exchange and tools 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 Stage 2 Meaningful Use (Stage 2 MU) requirements describe the plan of care as “the structure used to define the management actions for the various conditions, problems, or issues [22].” 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 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 organizations 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 respondents reported that plan of care information was less likely to be sent to the ED and is not available for patients coming from home. During Interview 4, participants 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 region, 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 electronic medical record to find information about the patient from previous admissions or from outpatient visits.

Using the proposed Stage 2 MU criteria, we 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 hospitals have the capability to send patient instructions electronically. Only one of the hospitals 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 organizations had a mechanism in place that allowed patients to electronically update their plan of care or self-management goals. All hospitals 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 organization, we found advanced care coordination tools that were available on inpatient units and not available in the ED. None of the organizations 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)[23] 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

Interview respondents 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. We asked interviewees about their vision of the future. Rather than describing the desire for more electronic tools in the future, respondents 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 example of mixing low-tech and high-tech was described during Interview 1. One clinician emphasized that verbal communication fulfills a data-gathering role, but also contributes to improvements in personal performance for the clinicians involved. When asked what he would personally do if he received a transfer with incomplete information, the clinician responded, “I would say essentially 100% of the information we get on patients (that we don’t already have) needs to come from a phone call. So calling that facility, talking to them, and then having them fax us that information… I always feel like there’s room for improvement and I can do a better job. We have a very close network, so if I’m sending a person to [a doctor] in house calls, I’ll shoot him an email or give him a page. And similarly, [a doctor in a skilled nursing facility] and I often communicate and not only about the good stuff but if something went wrong we are very accountable to each other and let each other know ‘this didn’t go as smoothly as it might have seemed,’ and that way we can always hope to better our programs for patient care.”

During this same interview, a clinician described the workflow of the inpatient geriatric consult team, “Every consult comes to us through our Gopher electronic medical record - they’re printed off in the office. At the end of the morning, after the consult is done and our opinions have been rendered, our house staff, or ourselves in the case of no house staff, will call the housestaff referring team to let them know. So they hear a verbal opinion of our primary recommendations. But we really also enter everything in great detail in the EHR, so that by the end of the afternoon, the team knows exactly, spelled out, verbally and in written form exactly what we'd like them to do."

An SNF physician responded similarly about the utility of email as well as, "a handoff with voice to voice, doc to doc communication." The respondent made a point about ED 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 Emergency Room, 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, one thing we do here is Admitting 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, there's no dramatic surprises."

A respondent from 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.

Other respondents expressed a different opinion, such as an ACH physician in the Interview 5 region, "The ideal state for me is secure messaging within the EHR so you don’t have to call the physician, interrupt your day, maybe get their voicemail, maybe get their nurse. The discharge papers, which is actually now electronic, but we still fax to their office, would be able to be sent electronically.”

Respondents from the Interview 3 region echoed the future vision of totally electronic communication. One HHA respondent said, “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 HHA clinician added, “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, such as Canopy and Sunrise, into our system, and to just have some of that basic demographic data that, who the physician is, what the insurance is, what the discharge date is, you know, some of that stuff that I watch or home care and hospice coordinators just double enter.” The clinician continued, “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, you know, it 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.

Numerous responses from HHA representatives emphasized the amount of data which is reviewed for each patient, typically on paper. An IT representative from the Interview 6 region 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 respondents from the Interview 2 region. A clinician described an electronic document that would allow two people to collaboratively review information during a verbal handoff over the telephone. An IT expert 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 respondent noted, "We don't know what we don't know. A respondent from the 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 clinician expressed concerns about HIT 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." A hospital clinician added, "What I'd like to see is the discharge instructions somehow recorded, skyped, something so that when the patients go home, since they're in such a high anxiety state in the hospital... I was thinking let's say a video, or something that they could pick up and listen to. Sometimes the learning is not that good on a piece of paper and sometime the piece of paper gets lost in the shuffle of all the papers that they get when they go home. We've had patients come to us that either can't read or they've lost it or they don't understand the written word and so I was just trying to think based on their learning, how they learn, is there another way that they could listen and see the nurse talk to them or the physician, just another mode of learning."

Conclusion

As the Background section illustrates, this research project is timely. The information synthesized in this report may be relevant to HIT developers, care coordination innovators, healthcare providers, health insurance payers, policy makers, and other organizations within the healthcare industry that seek to measure quality in order to improve patient-centered care. The literature review shows that few interventions to address deficits in information transfer have been rigorously tested. Many interventions rely on low-tech, high-touch programs. The study results are generally positive when the program or electronic tool is used consistently.

In terms of primary data collection, we chose a mixed methods approach in order to gather opinions and ideas for future improvements. We surveyed and interviewed respondents from multiple facility types (ED, ACH, SNF, HHA) in six diverse regions.

The results indicate that organizations are working to address care coordination demands, but are struggling with lack of interoperability across settings. Many organizations 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.

We received many responses related to low-tech care innovations and we synthesized data on these programs in addition to the high-tech innovations . We found programs where a dedicated case manager works to coordinate care for high-risk groups or to transfer information across high-risk discharges into and out of ACHs and EDs.

When queried about existing quality measures, respondents described mechanisms to collect data for risk stratification. Most institutions track measures that capture failures of care coordination: readmission rates (usually 30 days from discharge), ED utilization, and length of stay for readmissions. Another type of quality measurement focuses on ensuring that the right discharge and transition processes occur. Some institutions use patient surveys to measure the success of discharge processes in promoting patient knowledge and satisfaction.

It is not the norm to perform electronic documentation of a complete patient-centered, cross-condition care plan, or what we refer to as a Longitudinal Plan of Care. Using the proposed Stage 2 MU criteria, we found uneven readiness of targeted organizations for automated communication of Stage 2 MU care coordination data elements (e.g., problems, goals, and clinical instructions, responsible team members).

When queried about future vision, many respondents described a mixture of verbal communication and electronic communication. Others desire electronic transfer of information citing the inconvenience of verbal handoffs, duplicate data entry, and the impact of incomplete information on quality of care. Clinicians voiced concern for the applicability of electronic tools to caregiver needs. Another concern was the inclusion of patients with low literacy or a verbal learning style. This data is particularly valuable as it comes directly from front-line clinicians.

Specific Recommendations

- New measures are needed to address the effectiveness of care coordination. Process measures should assess scheduling of appointments, no-show rates, and information exchange between hospitals, VNA, HHA, and outpatient providers. Outcome measures should include readmission rates and emergency department utilization. Support for development of these measures is needed from federal sources, which would enable measure developers to build them, and the National Quality Forum should house them.
- Research to expand our knowledge of the effectiveness of interventions to improve care coordination is vital, and it should be supported by the Agency for Healthcare Research and Quality and other research funders.
- New terms to enable a more precise indexing system for published articles addressing care transitions across settings as well as other aspects of quality improvement in clinical care and patient safety would be beneficial, which could be supported by the National Library of Medicine.
- Policies which support the LPOC should be created. Specific standards are needed for key elements of care coordination, and development of these standards should be supported by the Office of the National Coordinator. Policies should expand the standard set of POC data elements to be more patient-centric by including data elements that represent patient values, patient status, and access to care. Barriers to achieving goals should be supported by Department of Health and Human Services.

- EHR vendors should integrate LPOC standards into EHRs designed for all levels of care to improve the capability of electronic exchange of a LPOC and reconciliation of patient problems and goals across settings.
- Healthcare organizations should be incentivized to share information relating to care coordination, probably at a level even greater than that currently involved with meaningful use, through the Centers for Medicare and Medicaid Services. Payment should support care models which reward more coordinated care.

In conclusion, collaboration by all team members including patients, family, and caregivers, requires fundamental improvements in EHRs. Similar to medication reconciliation, plan of care reconciliation should occur at care transitions. A standardized format for an LPOC would help clinicians to collect and transmit complete information. In order to develop the patient-centered content of the LPOC, a taxonomy of patient goals and patient-reported measures should be developed. Clinical decision support may prompt clinician adoption of a standardized electronic LPOC. A cultural shift to an acceptance of team-based care, as well as the engagement of patients, family, and caregivers will likely speed the improvement of care coordination processes. EHR interoperability and bidirectional communication will drive meaningful quality measurement across regions.

Glossary

Care Coordination: The deliberate organization of information and patient care activities between two or more participants in order to facilitate the appropriate delivery of health care services. Organizing care involves the marshalling of personnel and other resources needed to carry out all required patient care activities and is often managed by the exchange of information among participants responsible for different aspects of care[8].

Transition of Care: The movement of a patient from one setting of care (hospital, ambulatory primary care practice, ambulatory specialty care practice, long-term care, home health, rehabilitation facility) to another.

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

References

1. Services, U.S.D.o.H.H. *National Strategy for Quality Improvement in Health Care*. Report to Congress 2011 [cited 2012; Available from: http://www.healthcare.gov/law/resources/reports/nationalqualitystrategy032011.pdf.
2. Services, U.S.D.o.H.a.H. *The Office of the National Coordinator for Health Information Technology (ONC)*. 2012 5/21/2012 [cited 2012; Available from: http://healthit.hhs.gov/portal/server.pt/community/healthit_hhs_gov__onc/1200.
3. Forum, N.Q. *NQF-Endorsed Definition and Framework for Measuring and Reporting Care Coordination*. 2006 June 2011]; Available from: www.qualityforum.org/projects/care_coordination.aspx.
4. Quality, A.f.H.R.a. *Environmental Scan: Health Risk Appraisals in Primary Care*. 2010; Available from: http://www.ahrq.gov/clinic/enviroscan/.
5. (NQF), N.Q.F., *Preferred Practices and Performance Measures for Measuring and Reporting Care Coordination: A Consensus Report*, 2010, NQF: Wasthington, DC.
6. Singer, S.J., Friedberg, J.B., M., et al., *Defining and Measuring Integrated Patient Care: Promoting the Next Frontier in Health care Delivery.* Medical Care Research and Review, 2010.
7. Forum, N.Q. *Consensus Development Projects*. Measuring Performance 2012.
8. McDonald, K.M., et al., *Prospects for Care Coordination Measurement Using Electronic Data Sources (Prepared by Stanford University under subcontract to Battelle on Contract No. 290-04-0020--AHRQ SQI-II.)*, 2012, Agency for Healthcare Research and Quality.: Rockville, MD.
9. Samal L, H.O., Venkatesh AK, Volk LA, Bates DW. *Health Information Technology to Support Care Coordination and Care Transitions: Data Needs, Capabilities, Technical and Organizational Barriers, and Approaches to Improvement*. 2012; Available from: http://www.qualityforum.org/Projects/c-d/Care_Coordination_Endorsement_Maintenance/Care_Coordination_Commissioned_Paper_Final_(1).aspx.
10. Forum, N.Q. *Critical Paths for Creating Data Platforms: Care Coordination*. 2012; Available from: http://www.qualityforum.org/About_NQF/Critical_Paths_for_Creating_Data_Platforms__Care_Coordination.aspx
11. 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.
12. 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.

13. 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.
14. 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.
15. 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.
16. 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.
17. 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.
18. 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.
19. 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.
20. 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.
21. 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.
22. CMS, *Medicare and Medicaid Programs; Electronic Health Record Incentive Program—Stage 2 Proposed rule*, 2012, Centers for Medicare & Medicaid Services: Washington, DC. p. 13698-13829.
23. 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.