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# Assessing Organizational Capacity for Achieving Meaningful Use of Electronic Health Records

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## Abstract

**Background—**Health care institutions are scrambling to manage the complex organizational change required for achieving meaningful use (MU) of electronic health records (EHR). Assessing baseline organizational capacity for the change can be a useful step toward effective planning and resource allocation.

**Purpose—**This article describes an adaptable method and tool for assessing organizational capacity for achieving MU of EHR. Data on organizational capacity (people, processes, and technology resources) and barriers are presented from outpatient clinics within one integrated health care delivery system; thus, the focus is on MU requirements for eligible professionals, not eligible hospitals.

**Methods—**We conducted 109 interviews with representatives from 46 outpatient clinics.

**Findings—**Most clinics had core elements of the people domain of capacity in place. However, the process domain was problematic for many clinics, specifically, capturing problem lists as structured data and having standard processes for maintaining the problem list in the EHR. Also, nearly half of all clinics did not have methods for tracking compliance with their existing processes. Finally, most clinics maintained clinical information in multiple systems, not just the

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EHR. The most common perceived barriers to MU for eligible professionals included EHR functionality, changes to workflows, increased workload, and resistance to change.

**Practice Implications—**Organizational capacity assessments provide a broad institutional perspective and an in-depth clinic-level perspective useful for making resource decisions and tailoring strategies to support the MU change effort for eligible professionals.

### Keywords

Electronic Health Record; Meaningful Use; Organizational Capacity; Organizational Change

## INTRODUCTION

The Health Information Technology for Economic and Clinical Health Act (HITECH) authorized incentive payments through the Centers for Medicare and Medicaid Services (CMS) to clinicians and hospitals for adopting electronic health records (EHR) that meet standards for meaningful use (MU). MU, which will be achieved in three stages, seeks to promote delivery of high-quality health care and includes distinct pathways to incentives for eligible hospitals (EH) and eligible professionals (EP). For example, to achieve stage 1 of MU, EPs must satisfy 20 EHR usage requirements and report 6 clinical quality measures (Centers for Medicare and Medicaid Services, 2012).

Satisfying these requirements is challenging, even for providers who have prior experience using an EHR. (Note: In this article, the term “provider” refers to a single healthcare professional, not a group or provider organization, such as a hospital.) One particular challenge is that providers must use an EHR system that has been certified for MU (Office of the National Coordinator for Health Information Technology, 2012). This typically requires either a newly installed EHR or an updated, certified version of an existing EHR. In either case, providers must adapt their workflows to new EHR features, at a minimum, and perhaps to an entirely different EHR design.

While this adaptation can be difficult for an individual provider, coordinating MU achievement across multiple providers within a large institution adds even greater complexity. For example, integrated health care systems include not only large numbers of individual providers, but also multiple clinical service areas (e.g., primary care and specialty outpatient clinics) that have different services provided, patient needs, personnel, resources, policies, and procedures. Health care systems pursuing MU, therefore, must develop the IT infrastructure and other support (e.g., policies and training) necessary for providers to achieve MU requirements across these multiple heterogeneous clinical service areas.

Developing this infrastructure and support first requires understanding the variation across the service areas, which can be daunting because there is little guidance in the literature for doing so. We believe one way to capture this variation is in terms of organizational capacity for MU achievement, which includes the foundational resources (e.g., people, technology) and processes (e.g., workflows) relevant to MU. Documenting baseline organizational capacity can facilitate a richer understanding of each service area, comparisons of resources and processes across service areas, and identification of barriers and needs. Without such an understanding, the institution risks trying to force a one-size-fits-all solution across clinical areas with substantially different needs and structures.

This article describes the approach undertaken by UNC Health Care to document organizational capacity for achieving MU for EPs across its outpatient clinical service areas. Specifically, the aims of this article are to (1) describe the data collection method and tool used to assess organizational capacity; (2) provide summary capacity results from the

assessment; and (3) report barriers to MU identified by representatives of the clinical service areas. Our goal is to provide a framework and interpretation that other organizations can draw upon when planning for MU-related changes, either for Stage 1 or for subsequent MU stages.

## CONCEPTUAL FRAMEWORK

Organizational capacity for change has not been developed thoroughly in the health services research literature either as a construct or a measure. However, it "implies not only a focus on the implementation phases but ongoing support for the new practice." Also, it typically is "expressed in structural terms and includes factors such as a delivery system's financial, material, human, and informational resources necessary to support the introduction, routinization, and sustainability of a new practice" (Alexander & Hearld, 2012). In the context of MU implementation, the new practice is the combination of EHR usage requirements. Organizational capacity for a change is distinct from readiness for change, which refers to "the extent to which organizational members are psychologically and behaviorally prepared to implement organizational change" (B. J. Weiner, Amick, & Lee, 2008). Thus, readiness is psychological and capacity is structural.

We are not aware of any literature applying organizational capacity to MU. However, Korst et al. (Korst, Aydin, Signer, & Fink, 2011) explored organizational capacity related to hospital readiness to participate in a health information exchange, which has implications for subsequent stages of MU. They found that hospital leadership fostering a quality improvement culture was a key to participation in the data sharing collaborative. This finding exemplifies the human resource factor (e.g., leadership) of capacity that Alexander and Hearld (2012) identify. It also illustrates that successful health information initiatives are embedded within broader organizational structures and goals (e.g., quality improvement). Consistent with this finding, Alexander and Hearld's (2012) description of organizational capacity, and a socio-technical perspective on health IT implementation (Aarts, Callen, Coiera, & Westbrook, 2010; Sittig & Ash, 2011; Yusof, Kuljis, Papazafeiropoulou, & Stergioulas, 2008), we believe that MU within a health care organization requires adequate fit between the EHR technology, work tasks and processes, and the social system (e.g., the employees, values, and reward system). We therefore defined organizational capacity as having three dimensions – people, processes, and technology resources – and identified elements of the dimensions (Table 1). These dimensions are commonly found in the information technology literature, including such fields as software engineering and knowledge management, which aim for a "fit" between people, processes, and technology.

In the context of organizational change, the people, processes, and technology dimensions of organizational capacity relate to the three stages of Lewin's model: unfreeze, change, and refreezing (Borkowski, 2005). Organizations need the capacity to communicate the need for change (unfreeze); acquire needed technology and implement new processes (change); and monitor progress, modifying practices as necessary to achieve MU requirements over time (refreeze). Operationally, the people domain involves having MU champions to promote the effort, change leaders to facilitate the change process, EHR super-users to provide technical support to colleagues, and quality improvement teams to modify clinical processes. The process domain involves having standard processes in place for performing the MU requirements within the EHR. Documenting these processes is a necessary first step toward modifying them for MU. Finally, the technology domain requires sufficient access to computers and printers for providers to incorporate the new MU processes into their workflows. Deficiencies in any of the three dimensions represent barriers to implementing an effective MU change process.

# METHODS

## The Study Site

The UNC Health Care System (UNC-HCS) is an academic, not-for-profit integrated health care system. Based at the University of North Carolina at Chapel Hill, it is owned by the State of North Carolina. Approximately 800,000 patients are served in UNC-HCS outpatient clinics and physician practices each year (UNC Health Care, 2012). UNC-HCS uses a homegrown EHR system which consists of a suite of complimentary products to provide a comprehensive medical record in both its inpatient and outpatient settings.

## Data Collection

Using an iterative process, we developed a structured interview tool by identifying broad MU-related dimensions of organizational capacity (i.e., people, process, and technology) and specific elements of each dimension (See Appendix). Most interview questions were designed to yield first a categorical response (e.g., yes/no) and then open-ended explanation of the answer. Therefore, this structured tool enabled us to collect (1) standardized responses that could be quickly summarized into information about MU-related human resources, work processes, and IT resources; and (2) contextual information about these domains that could be analyzed for a richer understanding of the capacity of each clinic. We piloted the tool with five individuals from two clinical service areas and made minor modifications as appropriate.

Once the tool was finalized, recruitment for interviews began. We interviewed multiple respondents from each clinical service area because most clinical service areas do not have one person who knows all of its resources and processes relevant to MU. For example, a medical director may be familiar with the workflows of physicians, but not of nursing staff. Similarly, a nurse manager may know the workflows for nurses but not for physicians. And neither the medical nor nursing director may know the administrative details related to staffing levels and computer hardware. Therefore, a “snapshot” of the resources and processes for a given clinical service area obtained from one individual would be incomplete and biased. To standardize the process, we interviewed individuals serving in three roles for each service area: medical director, nurse manager, and clinic manager. However, we left open the possibility of interviewing fewer or more individuals as needed due to variation in the structure of some clinical areas (e.g., individuals performing multiple roles or other individuals having important insights into the organizational capacity dimensions of their service area).

Teams of two (interviewer and scribe) met with each respondent. The interviewer began by asking the structured interview questions. Verbal responses were immediately coded into a web-based data collection instrument that mirrored the structured interview. The scribe took detailed, often verbatim, notes to capture context and full responses to open-ended questions. This data collection protocol allowed for immediate summary feedback (i.e., the coded responses) for the UNC-HCS MU team to use, as well as free-text data that was summarized shortly thereafter to provide contextual information not captured by the coded responses.

## Data Analysis

For the categorical responses, the data analysis process involved reconciling sometimes discordant answers from multiple representatives within a single service area to determine the “correct” answer for each capacity element. The first step toward reconciliation was to verify each individual’s categorical response and the rationale provided. This allowed the research team to identify instances where the categorical response provided by the

interviewee did not reflect the intended meaning of the question or was based on an assumption rather than direct knowledge. After verifying categorical responses, we used a "majority rules" method for determining the final answer for each capacity element for the clinical service area. Summary tables were developed for each clinical service area, and aggregated results were compiled to identify the percentage of clinical service areas with a particular capacity element in place, as well as to compare primary care clinical areas (i.e., family medicine, internal medicine, pediatrics, geriatrics, and OB-GYN primary care) with specialty clinical areas.

Although most interview questions had categorical responses, we asked an open-ended question about barriers to MU. Two members of the research team (CS and NN) independently coded the responses using a set of pre-identified codes that were modified based on emergent themes. After they coded all responses once, they discussed emergent codes and any coding discrepancies and recoded responses until reaching consensus on any previous discrepancies.

## FINDINGS

We interviewed 109 individuals representing 46 outpatient clinics at UNC-HCS. It is important to note that the study was not powered to test for statistically significant differences between clinic types (i.e., primary care vs. specialty). Instead, the sample consisted of all clinics within the main UNC-HCS campus participating in a coordinated MU effort. This approach was consistent with the purpose of developing a practical method and tool for health care leaders to implement within their own system. We do, however, report in the tables below which findings are statistically significant using methods appropriate for small sample sizes.

Most UNC clinics reported having the capacity elements in the human resources domain (see Table 2). Ninety-three percent reported that a majority of physicians were proficient EHR users, 85 percent reported that a majority of nurses were proficient EHR users, and 74 percent reported having a quality improvement team. Most UNC clinics also reported having a physician champion (100%), a nurse champion (85%), a person who drives change (98%), and an EHR super-user (76%). However, some differences in MU human resources capacity were observed between primary care clinics and specialty clinics. A lower percentage of primary care clinics have a quality improvement team than specialty clinics (67% versus 75%, respectively), but a higher percentage of primary care clinics have a nurse champion (100% versus 83%) and an EHR super-user (100% versus 73%). Also, even within the same clinic, respondents identified different individuals who could fulfill these leadership roles. Respondents working in any given clinic identified the same person as the physician champion only 33% of the time. Similarly, respondents agreed on the same individuals for nurse champion, person who drives change, and EHR super-user only 15%, 9%, and 26% of the time, respectively.

Many clinics reported not having some of the capacity elements in the process domain (see Table 3). While 93% of clinics captured allergies as structured data in the EHR, the percentage doing so was lower for medications (80%) and problem lists (46%). Most clinics reported having standard processes for updating patients' vitals (96%), medications (96%), and allergies (93%); however, only 46% had standard processes for updating problem lists. Between clinic types, a higher percentage of primary care clinics reported entering problem lists as structured data (83%) and having standard processes updating problem lists (83%), as compared to specialty clinics (40% and 38%, respectively). Less than half of all clinics (48%) reported having methods in place to track compliance with existing processes and the

vast majority (85%) maintained clinical information in multiple data systems, not just the EHR.

The technology domain includes measures of preferences and capabilities (see Table 4). Nearly all (98%) clinics reported that having a computer in every exam room is necessary for MU, while having printers in each room was only perceived as necessary in 35% of clinics. Approximately ¾ of all clinics (74%) indicated having a sufficient supply of computers, but there was a noticeable difference between clinic types. All primary care clinics had a sufficient supply of computers, but only 70% of specialty clinics reported having this capacity element.

In addition to the structured data on the capacity domains, unstructured feedback about perceived barriers to achieving MU in the clinics was collected and coded into eight barriers (Table 5). The most commonly cited concern (38%), particularly among medical directors (49%), was a deficiency in the current functionality of the EHR system, including the ability to capture data in an appropriate format (e.g., structured vs. free-text) and the integration of system components (e.g., how easily users can navigate the system to accomplish a range of tasks). Another common concern was the need to redesign workflows (34%), particularly in primary care settings (50%) as compared to specialty settings (31%). Concerns about provider resistance to change and the inability to track compliance with MU processes (21%) were more commonly expressed by nurse managers (33%) and clinic managers (25%) than by medical directors (11%). Approximately 1/5 of all respondents (21%) cited concerns about increased workloads due to MU; however, this concern was not noticeably different across practice settings or roles.

## PRACTICE AND RESEARCH IMPLICATIONS

Preparing eligible professionals within health care systems for MU requires changes to existing organizational structures, even among systems that currently have EHRs. To prepare for Stage 1 MU, we assessed organizational capacity across the domains of people, processes, and technology. The results were intended to guide those leading MU implementation efforts. In addition, the conceptualization of organizational capacity and the structured interview guide we used provide a foundation for future research on organizational capacity in the context of MU implementation or, more broadly, health IT implementation.

Regarding the human resources (i.e., people) domain, we believe identifying the key individuals within the clinic who can promote the change effort is most important. This endeavor includes, but is not limited to, identifying EHR super-users and potential champions. Also important is identifying the key person driving change and whether the clinical area has an established quality improvement team. Perhaps each clinic does not have each of these people in place, and perhaps it is not necessary to have each. However, our experience suggests that some combination of these key individuals is necessary.

Within the process domain, we found that the problem list, which identifies diagnoses and other important issues for a patient (Holmes, 2011), is problematic with respect to structured data and standard processes; this is particularly true in specialty clinics where providers may believe maintaining the problem list is not a priority or is outside of their scope of work. This finding is consistent with previous literature (Wright, Maloney, & Feblowitz, 2011) and highlights the problem list as a major obstacle for institutional MU change efforts. Furthermore, nearly half of all clinics lacked a method for tracking compliance with existing processes. Such tracking is critical to identify breakdowns in care processes that may impede providers' achievement of MU. Therefore, while all clinics would be able to track the success rate of providers achieving MU requirements, many would find it difficult to

track the deviations from standard processes that negatively affect their success rate. Finally, in contrast to the MU gold standard, where the EHR serves as the single hub for storing all clinical information, 85% of clinics reported using multiple data systems. Eliminating all other clinical information systems may not be feasible; however, the presence of parallel systems (e.g., paper-based charts) or systems providing functions that could be performed by the EHR (e.g., standalone registries), implies deficiencies (either actual or perceived) in the EHR. At a minimum, it increases workload and possibility of error.

Prominent perceived barriers to MU were concerns about EHR functionality, changes to workflows, resistance to change, and increases in workload. These are distinct, albeit related, concerns. Modifications to EHR capabilities should achieve MU requirements within the resource and patient flow constraints of the clinic. Concerns about workload increases relating to physicians' documentation of patient information in the EHR are supported by evidence, but efficiencies can be gained in other activities, such as retrieving patient information (Poissant, Pereira, Tamblyn, & Kawasumi, 2005). System components need to be integrated smoothly to realize efficiencies and promote effective use of the system (DesRoches, Agarwal, Angst, & Fischer, 2010). Furthermore, work processes should be optimized so that physicians document only what a physician must document and other care providers document other items. Otherwise, the EHR may be perceived as obtrusive.

## Recommendations for Practice when Assessing Organizational Capacity

The primary contribution of our study is a practical method and tool for assessing organizational capacity that can be adapted to the environments of other institutions. We have three recommendations for institutions planning to adopt this method and tool. First, and perhaps most important, is to solicit input from multiple representatives within each clinical unit. This approach increased our confidence in the data and is less subject to being biased by the perspective of one "all-knowing" respondent per clinic. Another benefit is the additional insight into the dynamics of a given clinic gained from discrepancies in responses from within the clinic. These benefits far outweigh the additional time involved in analyzing the data.

Second, we recommend collecting a combination of quantitative and qualitative data during the assessments. The quantitative data allows for quick, descriptive analyses useful to begin the planning process at both the institution and clinic levels. These data are critical for optimizing existing resources (both technological and support services) and predicting future resource needs within the institution. For example, decision makers can identify which clinical units are deficient in their supply of computers or will likely need more support with redesigning workflows. Qualitative data provide complementary information regarding the context for assessing the validity of the quantitative data; this is particularly useful when there is a discrepancy in the responses from interviewees within the same clinic. The qualitative data also capture unforeseen issues and the nuances related to capacity within a given clinic, which can lead to prioritization of implementation barriers and inform development of strategies tailored to the needs of each unit. Finally, qualitative data can provide insight (or at least a starting point) for understanding how capacity problems relate to each other, sometimes across capacity domains (i.e., people, process, and technology). This understanding is important for minimizing the negative unintended consequences of solutions designed for a given capacity problem.

Third, we recommend capturing the data at the lowest level of MU implementation possible. For example, at UNC-HCS, some departments have many clinics with substantial variation in structures and resources. Assessing capacity at the department level, therefore, would be unreliable because respondents could only provide a response that generally (i.e., imprecisely) represents the group of clinics, but does not specifically represent each clinic.

Capturing the data at the lowest level of implementation enables analysis at the clinic level and aggregation to other levels (e.g., department and institution).

## Recommendations for Future Research

This study offers a framework for conceptualizing organizational capacity around three domains relevant to health IT implementation: people, processes, and technology. Future research is needed to validate our method and tool to assessing capacity and establish reliable metrics that would enable researchers and managers to analyze variation in capacity across organizations and trends in capacity development. Also, it would be important to study the relationship between capacity and other factors influencing implementation effectiveness (B. J. Weiner, Lewis, & Linnan, 2009). For example, organizational capacity logically could influence the change efficacy dimension (i.e., perceived ability to change) of the readiness-to-change concept (B. Weiner, 2009); that is, one's perception of his or her own change efficacy could be influenced by the capacity of his or her organization.

Regarding specific areas of capacity, the human resources and processes domains proved most interesting from a research perspective. For example, the best measure of the key roles within the human resources domain (i.e., champion, super-user, and person who drives change) could be debated. However, we believe the stricter measure, that is, consensus identification of the same person for a given role, is more useful than clinic leaders identifying any person at all for a given role. It is not enough to simply know that there is a person who could fulfill a given role (e.g., person who drives change); rather, individuals in the clinic should agree upon who that person is. Likely a person who is viewed as such across all key roles within the clinic is well-suited to drive a clinic-wide change such as MU achievement. Therefore, the substantial variation in percentage of clinics with these capacity elements across the two metrics suggest that only a small number of clinics have clear champions, super-users, and change leaders and others have potential individuals who could fill these roles. Furthermore, clinics without consensus on these individuals may have underlying differences in opinions and gaps in communication across clinical and administrative teams (e.g., physicians, nurses, administration), which could pose barriers for changing expectations and workflows as required to achieve MU. A future area for research is assessing the impact of clinic leader consensus on the readiness for change within the clinic and, ultimately, the success of the change.

With respect to the process domain, we suspect that there was variation in how respondents defined "process" and determined its presence. Future research could focus on measuring the presence of a standard process, including specifying criteria, such as whether the process is written and whether formal training on the process is provided. In addition, future research focusing on how clinical units track compliance, and who does the tracking, would be useful. Compliance tracking is not only important for accountability, but also for identifying instances in which the workflow is not aligned properly with the EHR and or not efficient given resource and/or patient flow constraints.

## Limitations

This study had some limitations. First, findings may not be generalizable to other integrated health systems if issues around capacity and barriers are institution-specific. However, the method and tool we used to assess organizational capacity was designed for adaptation to other institutional environments and to subsequent stages of MU requirements. Second, although we piloted the interview guide, there may be some variation in how respondents interpreted the meaning of certain capacity elements. For example, the physician and nurse EHR proficiency questions were challenging because respondents had to make judgments about (1) what constitutes "proficiency" in their clinic environment and (2) the percentage of

their physicians and nurses, respectively, who meet the proficiency threshold. In the future, we could define proficiency with specific examples of tasks performed in the EHR. Third, for some capacity elements, respondents within the same clinic did not provide the same answer about the presence of the element in the clinic. Therefore, to arrive at a single response, we used a "majority rules" approach. This approach may not account for the possibility that items may be present for select work groups within a clinic and not others. However, the qualitative data gave us a basis on which to judge the interviewees' level of confidence in a given response, and the extent to which different answers may have reflected lack of knowledge rather than actual conditions. Finally, our study was designed to assess organizational capacity among clinics within a single integrated health system, but not powered to detect statistically significant differences across clinics by specialty. However, even in the absence of statistical significance, differences are meaningful to health system leaders charged with allocating limited resources across clinics.

### Conclusion

The MU program for eligible professionals has outlined clear requirements and incentives for EHR use. However, in order to realize improvements in care quality, not simply incentive payments, health care systems must view MU as an opportunity to improve the alignment between their human resources, processes, and clinical information systems. This perspective requires a comprehensive, not technology-centric, approach to the MU change effort. Implementing a comprehensive change effort is complex, however. Therefore, health care system leaders need guidance and tools to develop strategies tailored to the specific environments of their clinical settings. The organizational capacity assessment approach provided in this study is one such tool. Data provided from such assessments can lead to information useful for developing implementation strategies and can serve as baseline data for evaluations designed to measure organizational change and assess the effectiveness of MU change management strategies.

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## APPENDIX Clinic Capacity Checklist Questions

| | |
|---|---|
| **Dept./Division:** | **Date of Interview:** |
| **Job Role of Participant:** | **Start Time:** |
| **Study ID#** | **End Time:** |

**PEOPLE**

| | |
|---|---|
| **1** | Can you identify a physician champion for MU in your Dept/Division's practice site? If so, who? |
| **2** | Can you identify a nurse champion for MU in your Dept/Division's practice site? If so, who? |
| **3** | Is there an EHR "superuser" MD and/or Clinical Staff (someone who uses the EHR to fullest capacity) in your Dept/Division's practice site? (NOTE: Answers may include MD and nurse.) |
| **4** | If you wanted to drive change or change the structure of operations in your Dept/Division's practice site, who would you go to? What is their role? |
| **5** | Are physicians in your Dept/Division's practice site competent or skilled in entering data into the EHR? Approximately what % are competent (25, 50, 75, 100)? |
| **6** | Are nurses/clinical staff in your Dept/Division's practice site competent or skilled at entering data into the EHR? Approximately what % are competent (25, 50, 75, 100)? |
| **7** | Assuming no increase in support staff, what can be done to improve the capability of the current staff in your practice site? (Note: If needed, offer training as an example.) |
| **8** | How can the Healthcare System help with improving staff capabilities? |

| | |
|---|---|
| **9** | Is there an active quality improvement (QI) or clinical care team within your Dept/Division's practice site? |
| **10** | If you have a QI Team, how are the meeting outcomes (decisions) implemented? |

**PROCESS**

| | |
|---|---|
| **1** | Does your Dept/Division have standards for obtaining vitals at each patient encounter? (Vitals = Height, Weight, Blood Pressure, BMI, Plot of BMI for children ages 2–20) |
| **2** | Does your Dept/Division have standards for updating allergies at each patient encounter? |
| **3** | Does your Dept/Division have standards for updating the medication list at each patient encounter? |
| **4** | Does your Dept/Division have standards for updating the problems list at each patient encounter? |
| **5** | Does your Dept/Division track compliance of these standards? If so, how? |
| **6** | Are problems currently entered into the EHR as a coded problem in the 'General Problems List'? If yes, by which job role (physician, nurse, CMA)? |
| **7** | Are medications currently entered into the EHR as coded medications in the 'Outpatient Medications List'? If yes, by which job role (physician, nurse, CMA)? |
| **8** | Are allergies currently entered into the EHR? If yes, by which job role (physician, nurse, CMA)? |
| **9** | What types of information are maintained elsewhere? Where is it maintained (paper, registries, other systems?) |
| **10** | Can you ID known deficiencies or bottlenecks that may be a barrier to achieving MU in your Dept/ Division? |

**TECHNOLOGY**

| | |
|---|---|
| **1** | To achieve MU, is it necessary to have a computer in every exam room? |
| **2** | To achieve MU, is it necessary to have a printer in every exam room? |
| **3** | Would a centrally located printer be sufficient for your Dept/Division's clinical needs? |
| **4** | Do you currently have a sufficient supply of working computers? |
| **5** | What method of training (e.g., online tutorial, in-person session) is best for your division's EHR needs? (MD and clinical staff) |
| **6** | What other types of training would be helpful? |

**Table 1**

Organizational Capacity Domains

| People | Process | Technology |
|---|---|---|
| Proficiency of physicians and nurses in using the EHR | Use of structured data (instead of free text) in the EHR | Sufficient supply of working computers and printers |
| Physician and nurse champions | Standard processes for updating patient data | Appropriate location of computers and printers |
| EHR super-user | Method for tracking compliance with existing processes | |
| Individual who drives change | Use of other information systems, besides the EHR, to maintain clinical data | |
| Quality improvement team | | |

## Table 2

"People" Capacity Elements -- Results from Fisher's Exact Test

| Capacity Element | All Clinics (%) | Clinic Type | | p (primary care vs. specialty) |
|---|---|---|---|---|
| | | Primary Care Clinics (%) | Specialty Clinics (%) | |
| Majority of MDs proficient with EHR | 43 (93) | 6 (100) | 37 (93) | 1.0000 |
| Majority of nurses proficient with EHR | 39 (85) | 5 (83) | 34 (85) | .3780 |
| Presence of Quality improvement team | 34 (74) | 4 (67) | 30 (75) | .6435 |
| Presence of physician champion | 46 (100) | 6 (100) | 40 (100) | N/A |
| Consensus on who is physician champion | 15 (33) | 4 (67) | 11 (28) | .0782 |
| Presence of nurse champion | 39 (85) | 6 (100) | 33 (83) | 1.0000 |
| Consensus on who is nurse champion | 7 (15) | 1 (17) | 6 (15) | 1.0000 |
| Presence of person who drives change | 45 (98) | 6 (100) | 39 (98) | 1.0000 |
| Consensus on who is person who drives change | 4 (9) | 1 (17) | 3 (8) | 1.0000 |
| Presence of EHR superuser | 35 (76) | 6 (100) | 29 (73) | .3113 |
| Consensus on who is EHR superuser | 13 (26) | 2 (33) | 11 (28) | .4400 |

## Table 3

"Process" Capacity Elements -- Results from Fisher's Exact Test

| Capacity Element | All Clinics (%) | Clinic Type | | p (primary care vs. specialty) |
|---|---|---|---|---|
| | | Primary Care Clinics (%) | Specialty Clinics (%) | |
| Allergies entered as structured data | 43 (93) | 6 (100) | 37 (93) | 1.0000 |
| Medications entered as structured data | 37 (80) | 6 (100) | 31 (78) | .3273 |
| Problems entered as structured data | 21 (46) | 5 (83) | 16 (40) | .0831 |
| Process for updating allergies | 43 (93) | 6 (100) | 37 (93) | 1.0000 |
| Process for updating medications | 44 (96) | 6 (100) | 38 (95) | 1.0000 |
| Process for updating problem list | 20 (43) | 5 (83) | 15 (38) | .0773 |
| Process for updating vitals | 44 (96) | 6 (100) | 38 (95) | 1.0000 |
| Compliance tracking of existing processes | 22 (48) | 3 (50) | 19 (48) | 1.0000 |
| Information maintained outside of EHR | 39 (85) | 5 (83) | 34 (85) | 1.0000 |

## Table 4

"Technology" Capacity Elements -- Results from Fisher's Exact Test

| Capacity Element | All Clinics (%) | Clinic Type | | p (primary care vs. specialty |
|---|---|---|---|---|
| | | Primary Care Clinics (%) | Specialty Clinics (%) | |
| Necessary to have computer in each exam room | 45 (98) | 6 (100) | 39 (98) | 1.0000 |
| Necessary to have printer in each exam room | 16 (35) | 3 (50) | 13 (33) | .4055 |
| Clinic has sufficient supply of working computers | 34 (74) | 6 (100) | 28 (70) | .3167 |

**Table 5**

Barriers to Meaningful Use Achievement -- Results from Fisher's Exact Test

| Barriers | # citing the barrier n = 109 (%) | Clinic Type | | | Role | | | |
|---|---|---|---|---|---|---|---|---|
| | | Primary care (%) | Specialty (%) | p (primary care vs. specialty) | Medical Director (%) | Nurse Manager (%) | Clinic Manager (%) | p (med dir, nurse mgr, clinic mgr) |
| Functionality of the EHR | 41 (38%) | 7 (44) | 34 (37) | .5834 | 23 (49) | 6 (20) | 12 (38) | .0381 |
| Changes to workflows | 37 (34%) | 8 (50) | 29 (31) | .1420 | 19 (4) | 9 (30) | 9 (28) | .4557 |
| Resistance to change/inability to enforce compliance | 23 (21%) | 4 (25) | 19 (20) | .7416 | 5 (11) | 10 (33) | 8 (25) | .0479 |
| Increased workload | 23 (21%) | 5 (31) | 18 (19) | .3222 | 12 (25) | 6 (20) | 5 (16) | .5620 |
| Physicians' lack of computer skills | 12 (11%) | 0 (0) | 12 (13) | .2074 | 6 (13) | 4 (13) | 2 (6) | .6833 |
| Computer access and reliability | 9 (8%) | 1 (6) | 8 (9) | 1.000 | 3 (6) | 2 (7) | 4 (13) | .6713 |
| Disagreement with MU goals | 7 (6%) | 0 (0) | 7 (8) | .5907 | 3 (6) | 3 (10) | 1 (3) | .4779 |
| Disruption to patient flow and satisfaction | 5 (5%) | 0 (0) | 5 (5) | 1.000 | 5 (11) | 0 (0) | 0 (0) | .0438 |

Note: Some respondents identified multiple barriers.