Information and Communication Technologies in Patient-Centered Healthcare Redesign: Qualitative Studies of Provider Experience

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Abstract

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Promoting widespread availability and provider adoption of electronic medical records is a core component of current efforts to reform healthcare in the United States. Initiatives to redesign healthcare to achieve quality improvement, patient access, economic sustainability, and other reforms often seek to leverage the potential of electronic medical records and other information and communication technologies. However, the evidence pertaining to the effectiveness of these technologies in supporting and promoting these objectives is limited, and their adoption among healthcare providers remains low – particularly in primary care and other ambulatory care settings. Given both the questionable sustainability of primary care and its central role in current healthcare reform initiatives, there is a critical need to inform these endeavors with empirically-derived knowledge of how information and communication technologies affect healthcare providers and their efforts to redesign care to better meet the needs of their patients and communities. This dissertation explores provider perspectives on the roles, importance, and effects (both positive and negative) of healthcare information and communication technologies in the context of patient-centered healthcare redesign. Three qualitative observational studies were conducted at Group Health Cooperative, a large integrated healthcare delivery system serving patients throughout the Pacific Northwest. These studies were informed by Donabedian's framework for evaluating healthcare quality, Rogers' Diffusion of Innovations Theory, and the Tavistock Institute's Sociotechnical Systems Theory. Findings revealed provider and organizational perspectives on their experiences with implementing and using a commercial clinical information system (EpicCare Ambulatory EMR) with an integrated patient Web portal, patient-provider email, internal clinical messaging, an internally-developed online health risk assessment application, and other information and communication technologies. Participants expressed sharply contrasting perspectives on the same technologies viewed as components of two unique practice redesign initiatives – an organization-wide redesign of operations to implement Patient-Centered Access, and a single clinic redesign to implement the Patient-Centered Medical Home model. These findings suggested that contextual factors such as the care redesign methods and the care models used to guide care redesign are key determinants of the effects associated with the implementation and use of these technologies. This dissertation contributes to the literature on sociotechnical approaches to technology-enabled healthcare redesign and evaluation by describing how instances of these different care redesign models incorporated the various technologies, and by evaluating providers' perspectives on their roles, importance, and effects.

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Chapter 1: Introduction and Dissertation Overview

This dissertation is about understanding healthcare provider perspectives on the roles, importance, and effects of information and communication technologies in their efforts to implement healthcare quality reforms through practice redesign. I argue that their relevant perspectives are largely dependent on specific dimensions of context that can be understood by conceptualizing healthcare as occurring in "sociotechnical" [1] systems of activity defined in part by these technologies and their uses. This argument emerged from three original studies of provider and organizational experience that were informed by and that extended relevant theories and models of healthcare quality, healthcare delivery, and technology adoption. This work has significant implications for the design, implementation, and evaluation of healthcare of information and communication technologies.

1.1 Background and Motivation

A critical review of the evidence highlights the opportunity and urgent need for healthcare quality reform in the United States. Several landmark studies reveal care quality deficiencies, and also call for quality reforms to be achieved through comprehensive healthcare redesign, support of effective and accessible primary care, and widespread adoption of electronic medical records systems with computerized provider decision support applications and other healthcare information and communication technologies (ICT). [2] [3] [4] [5]

However, the United States is currently facing a shortage of primary care providers, who are challenged to "do more with less" while simultaneously managing pressures associated with information overload.[6] Fewer medical students are choosing primary care as their profession, and the average age of our current primary care workforce is increasing just as demands for primary care services are increasing partly as a result of the prevalence and rising incidence of chronic disease in our population.[7 8 9] As the generation of Baby Boomers ages, it is likely that the stresses on primary care will only increase.

Also, despite the promises of healthcare information and communication technologies (ICT), evidence of their effectiveness in promoting and supporting healthcare quality reform is weak and often conflicting. Several rigorous systematic reviews of the published scientific literature conducted over the past four years have all reached the same conclusions – that we need more and better evidence about the effectiveness of these technologies.[10 11 12] Also, provider adoption of these technologies remains low, particularly in primary care, and factors that affect providers' adoption of these technologies are poorly understood.[13]

The systematic reviews of the scientific literature cited in the preceding paragraph point to several prevalent weaknesses in healthcare ICT evaluation studies and reveal four significant weaknesses in the current evidence base pertaining to ICT in U.S. healthcare quality reform. First, ICT and ICT-enabled interventions and effects are inadequately described in the vast majority of studies, a deficit that significantly limits the generalizability of their findings. Second, most published accounts of ICT evaluation studies lack relevant contextual information about the conditions of intervention implementation and assessment, which also limits generalizability. Third, studies of mature internally-developed ICT deployed at a small number of academic medical institutions are over-represented in the subset of published studies that exhibit significant findings. The fourth significant weakness revealed by systematic review of the literature is that, given the scope and priority of the relevant healthcare reform challenges and policies, there is a relative paucity of evidence in general about ICT effectiveness in promoting healthcare quality, and additional studies are warranted – particularly studies of the role of emerging healthcare ICT designed specifically for use in primary care and other ambulatory care contexts.

There is an unmet need for studies that account for these deficiencies by providing greater transparency into the specific characteristics and traits of the ICT interventions and the contexts of their implementation and use – particularly studies of ICT implementation and use in primary care redesign contexts. Studies of the effects of electronic medical records with clinical decision support and other healthcare ICT (e.g., patient Websites and portals, secure patient/provider email messaging) on all dimensions of healthcare quality across the full continuum of acute, preventive, and chronic care are also warranted.

Furthermore, a review of the literature on ICT adoption reveals a need for studies aimed at understanding the effects of ICT implementation and use on care providers and their relationships with patients. The few studies that have aimed to elicit and describe patient and provider perspectives on the usefulness of ICT, while offering compelling insights and conclusions, are typically framed in limited scope (e.g., disease-specific or ICT-specific) contexts. As such, this area of inquiry presents fertile ground for more comprehensive studies of ICT use and adoption in the context of primary care redesign. Eliciting and describing providers' perspectives on the challenges associated with both quality reform and routine ICT use will be fundamental to understanding barriers to, facilitators of, and outcomes associated with widespread healthcare ICT adoption.

In summary, the aggressive promotion and adoption of healthcare ICT currently outpaces our understanding of the effects of these technologies on care delivery, patient-provider relationships, intramural care team relationships, healthcare quality, and health outcomes. There is a critical need for contextualized studies of primary care providers' experiences with ICT implementation through practice redesign, their routine use of these technologies, and the effects of these changes and technology uses on healthcare quality.

This dissertation discusses three studies intended to address this critical need and the identified evidentiary gaps.

1.2 Research Questions & Objectives

This program of research was motivated by the following two research questions:

> *How are primary care providers integrating information and communication technologies (ICT) into their practices, and how is their use of ICT affecting their relationships with patients, staff, and other providers; care quality; and their quality of work life?*
>
> *What can elicitation and description of provider perspectives teach us about their adoption of healthcare ICT?*

Answers to these questions and variants of them were pursued through three original qualitative studies that sought to elicit, describe, and characterize provider perspectives on the roles, importance, and effects of information and communication technologies (ICT) in their efforts to implement care quality reforms through practice redesign.

The constellation of ICT studied includes:

- Electronic medical records with integrated clinical decision support applications
- Provider-provider email
- Patient Web portals that enable shared access to patients' medical records
- Online health risk appraisals
- Patient-oriented care encounter documentation
- Patient-provider email

1.3 Methods and Theory

Qualitative observational study designs and methods were used to support the overarching objectives to produce highly-descriptive accounts of providers' assessments of the roles, importance, and effects of ICT use and the contexts of ICT implementation through healthcare redesign. Specifically, these studies utilized semi-structured participant interviewing and document archive review as the primary methods of data methods, and qualitative text document content analysis techniques to derive findings. Studies used variants of Crabtree and Miller's template and editing organizational approaches, and phenomenological and hermeneutic approaches to interpretation.[14]

The studies were informed by several theories and concepts pertaining to the nature of healthcare quality, systems of care, and changes to these systems of care that impact quality, including Donabedian's framework for evaluating healthcare quality, [15] the Tavistock Institute's Sociotechnical Systems Theory, [16] [17] and Rogers' Diffusion of Innovations Theory. [18] These theories and models informed the organizing frameworks, interview guide instruments, and indexing codebooks used in each of the three original studies presented in Chapters 5, 6 and 7.

1.4 Original Studies

This dissertation includes three original studies conducted at Group Health Cooperative (Group Health), a large integrated health insurer and healthcare delivery system headquartered in Seattle, Washington that employs over 850 physicians and serves over 560,000 patients throughout the Pacific Northwest. These studies involved two healthcare redesign initiatives pursued in Group Health-owned ambulatory care clinics located in the Puget Sound region.

Chapter 5 presents a study of provider experience with ICT and the Patient-Centered Access care model as implemented through a multi-year organization-wide care redesign initiative referred to as the Access Initiative.

Chapter 6 presents a study of organizational experience with designing and planning a single-clinic implementation of the Patient-Centered Medical Home care model. Chapter 7 presents a study of provider experience with ICT and the Patient-Centered Medical Home care model as implemented through a comprehensive clinic-level care redesign initiative.

1.5 Significance and Contributions

This program of dissertation research offers significant original contributions to the discipline of Biomedical & Health Informatics (BHI) that manifest primarily in two forms – contributions to the evidence base on the roles, effects, and importance of healthcare ICT in healthcare redesign and quality improvement, and generation of empirically-grounded research questions, hypotheses, and conceptual frameworks well-suited to further exploration and development by the BHI research community.

Chapter 2: Information & Communication Technologies and Healthcare Quality

The healthcare system in the United States is plagued with problems of patient safety, variable quality, and limited effectiveness in addressing the care needs of our population. Widespread provider adoption and use of healthcare information and communication technologies (ICT) continues to receive support as a critical component of solutions to these problems. However, despite the promise offered by ICT, evidence of their effectiveness is limited and their adoption remains low in primary care and other outpatient settings where most healthcare services are provided.

This chapter opens with a discussion of the healthcare quality challenges that serve as the impetus for a wide variety of current medical practice redesign initiatives and healthcare ICT investments in the United States. Section 2.1 also presents an overview of what constitutes healthcare quality, with particular emphasis on the three dimensions of quality that are most directly relevant to this dissertation. Section 2.2 presents conceptual models which served to guide efforts to achieve quality reform through care system redesign in the settings of the original studies included in this dissertation. Proposed roles for ICT and information management innovations in these redesign endeavors are discussed in section 2.3, which also presents a critical review of the evidence pertaining to ICT effectiveness and physicians' use and adoption of these technologies in ambulatory care settings. The chapter closes with section 2.4, a summary of the most significant evidentiary gaps and unanswered questions raised by this review of the scientific literature, and which provide the motivation for this dissertation.

2.1 The Need for Healthcare Quality Reform in the United States

The Institute of Medicine's 2001 report *Crossing the Quality Chasm: A New Health System for the 21st Century*[19] continues to have a profound impact on healthcare quality reform and the widespread adoption of ICT in support of it. This report concludes that fundamental, radical, and comprehensive redesign of the U.S. healthcare system is required to realize much-needed improvements in healthcare quality. It approaches the topic of health care quality from a comprehensive and holistic perspective, calling for quality improvement efforts to yield healthcare that is safe, effective, patient-centered, timely, efficient, and equitable. This expansive conceptualization of what constitutes healthcare quality – and the report's specificity in calling for reforms across the six proposed dimensions of it – represented a departure from conventional conceptualizations and treatments of the care quality construct.

This report has also been tremendously influential in bridging the health services research and health informatics research communities. Like its predecessor Institute of Medicine (IOM) report *To Err is Human: Building a Safer Health System*[20], *Crossing the Quality Chasm* explicitly calls for the effective use and widespread adoption of ICT and improved information management practices in supporting the care redesign endeavors it proposes as means to achieving quality reform. The issues of iatrogenic injury due to medical error revealed in *To Err is Human* continue to drive the patient safety movement within the larger healthcare quality reform effort and related efforts to promote widespread healthcare ICT adoption. The opportunities and evidence about ICT in efforts to reform the safety dimension of care quality are discussed in Appendix A.

The care quality dimensions of efficiency and equity are likely to gain increasing attention in healthcare quality reform efforts given the emerging national and global economic crisis. Projections based on estimates that at least 45 million Americans were uninsured as of 2003 are likely to increase sharply as unemployment rises in this nation that relies on employer-sponsored health insurance as the primary mechanism of ensuring access to healthcare services.[21] [22]

However, the original work presented in this dissertation focuses primarily on the roles of ICT in enabling, supporting, and promoting the other three dimensions of care quality defined in *Crossing the Quality Chasm* – effectiveness, patient-centeredness, and timeliness. These constructs are defined and discussed in the following subsections.

2.1.1 Dimensions of Care Quality: Effectiveness

Effectiveness is defined in *Crossing the Quality Chasm* as:

> *"providing services based on scientific knowledge to all who could benefit, and refraining from providing services to those not likely to benefit."*[23]

A similar interpretation of the care effectiveness construct manifesting as care processes is evident in the work of Wennberg, Fisher, and others associated with the Dartmouth Atlas of Health Care Project,[24] who differentiate unwarranted variations in care effectiveness from unwarranted variations in preference-sensitive and supply-sensitive care. Each of these classes of variation in clinical practice is classified as "unwarranted" because it represents variation that can not be attributed to patient preference or illness severity. Variations in care effectiveness involve care that has demonstrated efficacy in clinical trials or rigorous cohort studies and that doesn't involve significant tradeoffs that depend on patient preferences, and therefore should be provided to all patients who are eligible for it. Failure to provide this care represents under use, and the Dartmouth Atlas studies continue to find systematic under use of effective care – with the extent of under use varying widely by geographic location and by type of care.[25]

McGlynn et al provided additional insight into the quality issues plaguing U.S. healthcare in their RAND study and seminal 2003 paper published in the New England Journal of Medicine.[26] This report provided what many consider to be the first comprehensive and systematic assessment of the extent to which standard healthcare processes are delivered in the United States. Whereas the Wennberg and other Dartmouth Atlas studies have focused on Medicare enrollees as the primary study populations and Medicare claims as the usual primary data source, McGlynn's study was based on data associated with a nationally-representative sample of American adults with a wide variety of insurance coverage types. Based on primary self-reported patient experience data triangulated against data extracted from these participants' medical records, care was evaluated across 439 dimensions of quality for 30 acute and chronic conditions and various dimensions of preventive care. The findings were consistent with the Dartmouth Atlas studies in that the investigators found that on average participants received only about half of the recommended acute (53.5 percent), chronic (56.1 percent), and preventive (54.9 percent) care. They also found significant variation in provision of recommended care by condition, ranging from only 10.5 percent for alcohol abuse and dependence to 78.7 percent for senile cataract. This study also found more significant quality problems associated with under use (46.3 percent of participants did not receive recommended care) than with overuse (11.3 percent of participants received care that was not recommended and potentially harmful). In their discussion of findings, the authors offered several examples to emphasize their primary conclusion that these care quality deficits represent significant threats to the U.S population, and explicitly tied these examples to the preventable death construct. For example, in their discussion of findings pertaining to under treatment of hypertension, they estimated that poor blood pressure control results in approximately 68,000 annual preventable deaths; failure to vaccinate elderly adults for pneumonia contributes to approximately 10,000 annual preventable deaths; and failure to provide fecal occult blood tests results in an estimated 9,600 annual preventable deaths from colorectal cancer.[27]

Woolf took a similar approach to building his case for a greater emphasis on effectiveness in healthcare quality improvement and reform endeavors. Citing the work of McGlynn and others, his 2004 paper in Annals of Internal Medicine offers several condition-specific examples as well as aggregate estimates to illustrate the scope and magnitude of effectiveness issues with U.S. healthcare that dwarf the 98,000 annual accidental deaths estimate claimed by leaders of the patient safety movement.[28] For example, like McGlynn, cites under use of β-blockers as follow-up treatment to myocardial infarction as a care effectiveness issue, and estimates that this specific form of under-treatment results in approximately 4,300 to 17,000 preventable deaths annually. He goes on to cite the NCQA's aggregate estimate of 57,000 preventable annual deaths due to under-providing recommended care, and cites some of his own work with evidence aggregation and modeling that suggests that as many as 700,000 annual preventable deaths occur due to quality deficits in effective screening, immunizations, and risk factor reduction.[29]

Clearly there exists an opportunity and a challenge to improve our health care system's effectiveness in meeting the comprehensive (preventive, chronic, and acute) healthcare needs of our population. An examination of health outcomes provides compelling evidence of our need for quality improvement and healthcare system reform. Advances in science and medicine in conjunction with societal trends have yielded an aging population of citizens suffering primarily from chronic disease. As of 2000, an estimated 45% of U.S. residents had at least one chronic medical condition, approximately half of which (60 million people) had multiple chronic conditions.[30] The incidence of chronic disease is also rising. This same RAND study projects that by 2015, the number of Americans living with chronic illness will rise to 150 million.[31]

This challenge was also highlighted in *Crossing the Quality Chasm*, which called for the Agency for Healthcare Research and Quality (AHRQ) to identify at least 15 priority health conditions to serve as the foundation for developing condition-focused 5-year quality improvement strategies, goals and action plans.[32] The outcome of this charge to AHRQ was the IOM's 2003 report *Priority Areas for National Action: Transforming Healthcare Quality*, which identified 21 specific priority areas for quality improvement – the majority of which are chronic conditions, chronic care processes and characteristics (e.g., coordination, support of patient self-management efforts), and disease prevention practices.[33]

The opportunities and evidence pertaining promoting effectiveness across the full continuum through care redesign and applications of ICT are discussed in subsequent sections 2.3 and 2.4. Original study findings related to effectiveness are also included in Chapters 5, 6 and 7.

2.1.2 Dimensions of Care Quality: Patient-Centeredness

The term "patient-centered medicine" was introduced into the medical literature in 1969 by Balint, who coined this term to differentiate medical practices that incorporate individual patient preferences from usual "illness-oriented" approaches to medical care aimed primarily at combating disease.[34] Since then the concept has evolved, and interpretations of "patient-centeredness" range from its use in characterizing dimensions of patient-provider communication[35] [36] to differentiating styles of practice based on the locus of control in clinical decision-making.[37]

The definition of patient-centered care in *Crossing the Quality Chasm* is:

> *"Patient-centered: providing care that is respectful of and responsive to individual patient preferences, needs, and values, and ensuring that patient values guide all clinical decisions."*[38]

Meeting the challenges of patient-centered healthcare reform requires significant changes in the planning, evaluation, and delivery of health services, which have traditionally been organized around providing episodic care for patients with acute conditions of limited duration.[39] [40] As both healthy people and those with chronic conditions use the Web and other information resources to become more informed about their health, healthcare providers and healthcare delivery organizations are challenged to become more collaborative and patient-centered to meet patient expectations and needs.[41] [42] Unfortunately, evidence suggests that these more informed patients are becoming increasingly dissatisfied with their healthcare services.[43] [44] [45]

The concept of patient-centeredness as it pertains to practice redesign is discussed further in section 2.2. The concept is also referenced throughout Chapters 4 through 7, which present background and findings generated by original studies of ICT-enabled patient-centered care redesign initiatives.

2.1.3 Dimensions of Care Quality: Timeliness

Crossing the Quality Chasm also stresses the requirement for high-quality care to be timely, according to the following definition:

> *"Timely: reducing waits and sometimes harmful delays for both those who receive and those who provide care."*[46]

Efforts to provide timely care and reduce patient wait times may be viewed as manifestations of patient-centered care reform. For example, some conceptualizations of patient access incorporate timeliness as a key dimension of care quality that is closely associated with the patient-centeredness construct (e.g., Advanced Access[47], Patient-Centered Access[48]). Other interpretations of access acknowledge but de-emphasize its relation to timeliness and patient-centeredness, and place greater emphases on equity and clinical need defined from a population-based perspective (e.g., the Aday-Andersen Access Framework[49]). Alternative interpretations of access, timeliness and patient-centeredness are discussed further in subsection 2.2.2. These concepts are also integral to the original studies chapters.

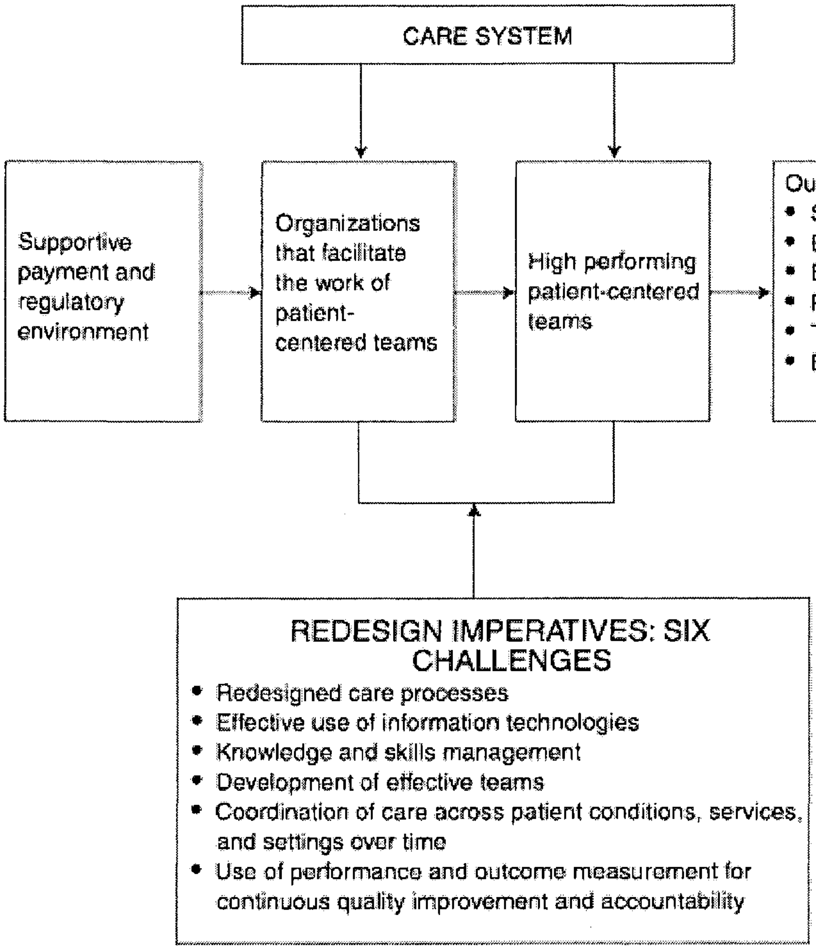
2.2 Achieving Quality Reform Through Care Redesign

The previous section highlighted the need for fundamental quality reform in the U.S. healthcare system, and provided an overview of what constitutes quality. This section presents perspectives on requirements for achieving quality reform through care redesign. Five models of care redesign are discussed, each of which has direct relevance to the redesign initiatives pursued by the organization that served as the setting for the original studies presented in this dissertation. Each of these models also serves to motivate and/or inform healthcare reform policy and care redesign initiatives pursued by a wide variety of provider practices and healthcare delivery organizations.

2.2.1 The Institute of Medicine Reports: The Redesign Imperative

The three IOM reports discussed previously – *To Err is Human, Crossing the Quality Chasm,* and *Priority Areas for National Action* – call for fundamental and expansive redesign of the entire healthcare system. *Chasm* in particular stresses the inadequacy of incremental improvements to current systems of care as a means of realizing the quality reforms it proposes. Its ten year strategy and recommended action plan for achieving quality reform across all six dimensions of care quality is illustrated in the conceptual model presented as Figure 2.1. It is within this context of comprehensive care system redesign that the report's authors propose a central supporting role for ICT in the transformation of U.S. healthcare.

Figure 2.1: Redesign Model Proposed in *Crossing the Quality Chasm*

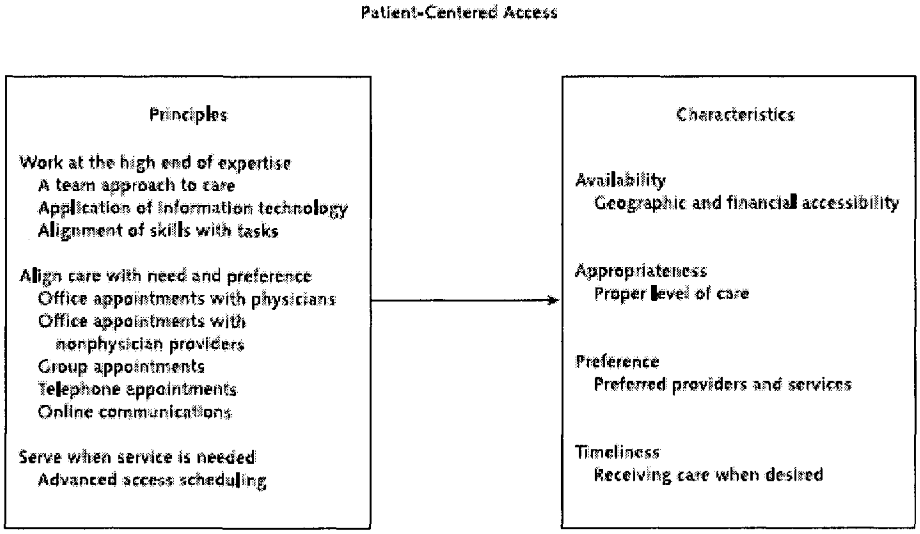


Crossing the quality chasm: a new health system for the 21^{st} *century.* Washington, DC: National Academy Press, 2001.

2.2.2 Patient-Centered Access

Implementation of advanced access (or "open access") is a patient-centered approach to care delivery and practice redesign that has received considerable attention over the past decade. It involves applications of queuing theory and just-in-time production principles to provider staffing and patient visit scheduling practices primarily in primary care and other ambulatory care settings.[50] As defined by Murray and colleagues, access is *"the ability of a patient to seek and receive primary care with the provider of choice and the time the patient chooses."* [51] This conceptualization of patient access represented a significant departure from previous interpretations that conceptualized access as relative to patients' needs rather than their expressed demands, emphasized equity in the availability of needed health services to segments of a population, and emphasized providers' assessments of clinical need and urgency as determinants of service availability and visit scheduling priority. [52] The Advanced Access model explicitly calls for redesign of in-person patient visit scheduling methods and practices, and implies (but does not specify) more comprehensive practice redesign changes necessary to ensure that provider capacity and patient demand are consistently aligned to support redesigned scheduling practices.

Figure 2.2: The Patient-Centered Access Model



From Berry LL, Seiders K, Wilder SS. Innovations in access to care: a patient-centered approach. Ann Intern Med. 2003;139:568-574.

Berry, Seiders and Wilder extend and expand upon the concept of Advanced Access in their conceptualization of Patient-Centered Access, which they define as "*...an integrated concept and philosophy to provide context for evaluating specific access initiatives*" that assesses patient access across four dimensions – availability, appropriateness, preference, and timeliness (see Figure 2.2).[53]

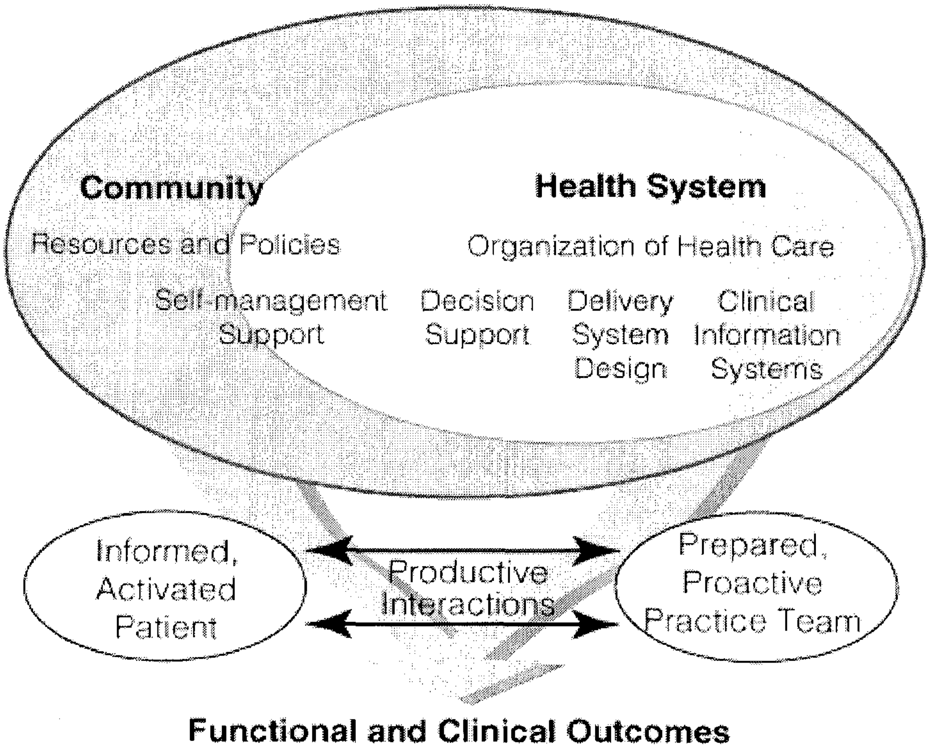
It is primarily in their inclusion of the third and fourth dimensions of Patient-Centered Access – preference and timeliness – that their model both extends the Advanced Access model and aligns most directly with the evidence-based dimensions of care quality specified in *Crossing the Chasm.* However, its inclusion of the appropriateness dimension of access (i.e., providers' assessments of medically-indicated need as a determinant of access and availability of effective services) represents a fundamental departure from the Advanced Access model. Like *Crossing the Chasm*, Berry et al explicitly call for fundamental and comprehensive care delivery system redesign, and offer three core principles for guiding redesign efforts – one of which proposes that online (i.e., email) and telephone access should be offered as alternatives to in-person visits as channels of patient access. These non-traditional channels of patient access served as key components of the care redesign initiatives undertaken in the settings and contexts of the original studies presented in this dissertation.

2.2.3 Wagner's Chronic Care Model

The Chronic Care Model also posits that fundamental and comprehensive care redesign is required to achieve quality reform and better outcomes for people living with chronic conditions and ongoing healthcare needs. Wagner and colleagues assert that effective chronic illness care requires productive interactions between prepared and proactive teams of providers and "activated", prepared, and informed patients, and that practice redesigns aimed at supporting these interactions must explicitly strive to incorporate effective decision support and clinical information systems.[54]

Wagner and colleagues assert that the Chronic Care Model promotes both evidence-based and patient-centered care practices at the individual provider and care system levels.[55] The model promotes and reflects patient-centeredness with its emphasis on the provision of effective self-management support and the associated requisite efforts to increase patient participation in care and collaborative goal-setting and treatment planning. In promoting the incorporation of both evidence-based need and patient preference in care decisions this model appears to share a common characteristic with Berry et al's conceptualization of Patient-Centered Access and the IOM's *Crossing the Chasm* vision for redesigning care systems to produce personalized care.

Figure 2.3: Wagner's Chronic Care Model



From "Chronic Disease Management: What Will It Take To Improve Care for Chronic Illness?" *Effective Clinical Practice,* August/September 1998. 1:2-4.

This model was initially developed via a literature review and synthesis that aimed to identify and summarize the features of effective programmatic efforts to improve chronic illness care.[56] The refined Chronic Care Model developed through additional literature synthesis and extensive expert review (see Figure 2.3) has since served to guide a wide variety of care redesign and evaluation efforts.[57] Empirical evidence generated by evaluation studies of many of these redesign endeavors and systematic literature reviews are typically cited as further validation of it.[58] [59] While not explicitly defined in the Chronic Care Model, Wagner and colleagues suggest that the majority of health system changes it implies are directed at primary care settings and practices. [60] [61]

2.2.4 Theories and Models of Primary Care

There is abundant evidence of the effectiveness of primary care and ever-increasing recognition of its potential for playing a central role in U.S. healthcare quality reform efforts. Starfield at al's 1994 study of the quality of care provided to Medicaid enrollees found that care delivered in medium-cost community primary care clinics demonstrated equivalent or higher quality than higher-cost medical services provided in other settings.[62] Similar findings and conclusions were offered in the 1996 IOM report *Primary Care: America's Health in a New Era*, which recommended "development of primary care delivery systems that will make the services of a primary care clinician available to all Americans". [63] Starfield, Shi and Macinko's 2005 review paper offered similar conclusions – that a greater emphasis on primary care in the U.S. healthcare system offers the potential to improve the health of the population while simultaneously lowering costs and addressing current inequities.[64]

The Dartmouth Atlas project also continues to generate evidence that illustrates the effectiveness of primary care. In their 2008 report commissioned by the Robert Wood Johnson Foundation, Fisher et al stated:

> *"Primary care physicians play a key role in providing and coordinating high quality healthcare. For conditions such as diabetes and hypertension, primary care physicians have been shown to provide care that is similar to specialty care in quality and lower in cost. Adequate access to primary care can improve care coordination and reduce the frequency of avoidable hospitalizations. The Dartmouth Atlas Project and other studies have found that regions with a greater proportion of care provided by primary care physicians have both lower costs and higher quality."* [65]

The definition of primary health care that emerged from the World Health Organization's 1978 conference at Alma-Ata is one that reflects a population health focus. The Alma Ata Declaration that emerged from this conference defines 'primary health care' as:

> *"Essential health care based on practical, scientifically sound, and socially acceptable methods and technology made universally accessible to individuals and families in the community by means acceptable to them and at a cost that the community and country can afford to maintain at every stage of their development in a spirit of self-reliance and self-determination. It forms an integral part of both the country's health system of which it is the central function and the main focus of the overall social and economic development of the community. It is the first level of contact of individuals, the family and the community with the national health system, bringing health care as close as possible to where people live and work and constitutes the first element of a continuing health care process."*[66]

The 1984 IOM report *Community-Oriented Primary Care: A Practical Assessment* provided an operational definition of community-oriented primary care (COPC) that differentiates it from the WHO definition in its focus on the role of clinicians in primary health care. This report defines 'community-oriented primary care' as:

> *"...the provision of primary care services to a defined community, coupled with systematic efforts to identify and address the major health problems of that community through effective modifications in both the primary care services and other appropriate community health programs."*[67]

This definition as used throughout the report implies that COPC clinicians should strive to deliver effective and appropriate care not only to their active patients, but also to other "non-user" members of the defined community for which they are accountable. Thus, outreach activities are implied in this definition. However, the studies included in this report found no fully-developed examples of COPC.[68]

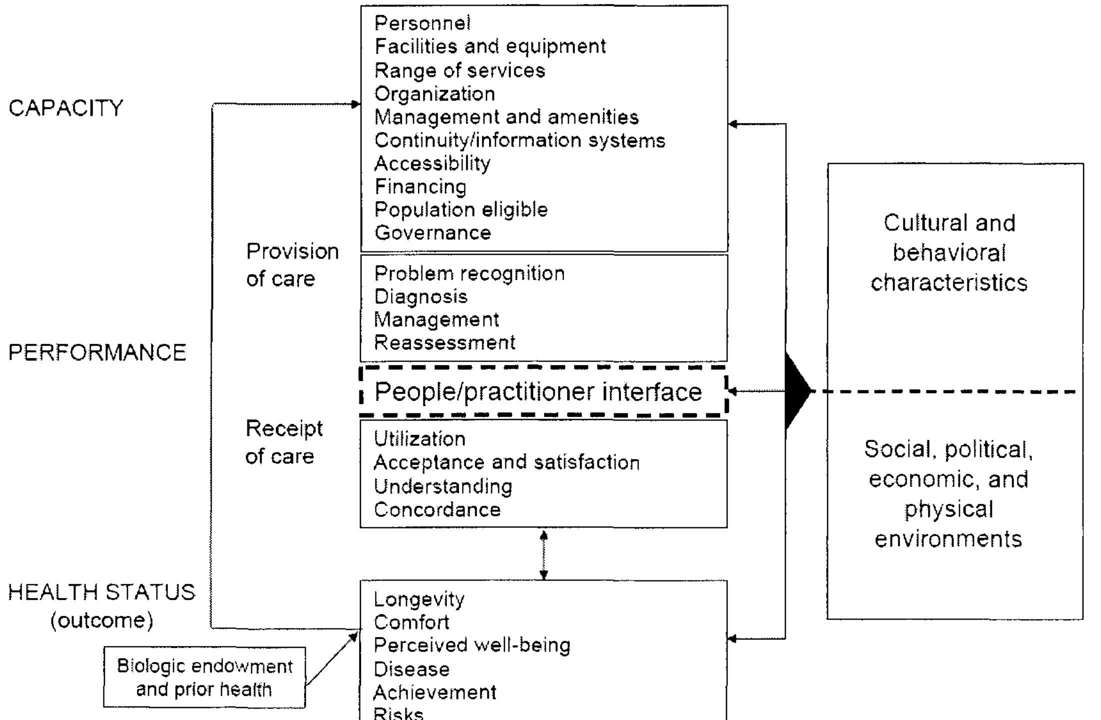
An IOM report published in 1996 offers another definition of 'primary care', and includes as its first recommendation that this definition should be universally-adopted *"by all parties involved in the delivery and financing of primary care and by institutions responsible for the education and training of primary care clinicians."*[69] The definition proposed in this report *Primary Care: America's Health in a New Era* is:

> *"Primary care is the provision of integrated, accessible health care services by clinicians who are accountable for addressing a large majority of personal health care needs, developing a sustained partnership with patients, and practicing in the context of family and community."*[70]

Starfield provides an evidence-based operational definition of primary care. Her Capacity-Performance Model of Health Services Systems defines primary care based on both its potential for and attainment of defining performance outcomes, and reflects the overall structure-process-outcome care quality evaluation framework introduced in 1966 by Donabedian.[71] Starfield posits that primary care is defined by four essential structural features and two essential process features that are required to translate potential (or capacity) into the performance of activities to attain the four defining outcomes of primary care.

These elements of primary care structure, process, and outcome represent a subset of components that define any health services system (see Figure 2.4). The essential structural elements that define primary care are accessibility, range of services, eligible population, and continuity, and the process elements are utilization of services by the population and problem (or needs) recognition by healthcare providers. The four defining performance outcomes of primary care are first-contact care, longitudinality, comprehensiveness, and coordination.

Figure 2.4: Starfield's Capacity-Performance Model



Source: Starfield. Primary Care: Balancing Health Needs, Services, and Technology. Oxford U. Press, 1998.

Starfield 1997
HS 1064 n

This overall conceptualization of primary care, its defining components and traits, and extensive reviews of evidence cited as empirical validation for these theories and constructs are presented in *Primary Care: Balancing Health Needs, Services, and Technology.*[72] In this book Starfield also cites the central roles of information and information transfer in coordination, continuity, and problem/needs recognition, and discusses the role of medical records in primary care.

Continuity, problem/needs recognition, and the overall systems orientation and context in which the concepts and constructs are presented in Starfield's interpretations of primary care are of particular relevance to studies of ICT in healthcare quality reform. Theories of care continuity that differentiate relational continuity and informational continuity are also helpful in conceptualizing dimensions of ICT usefulness in the context of team-based care. According to Reid et al:

> *"Informational continuity is the use of information on prior events and circumstances to make current care appropriate for the individual and his or her condition. Information is the common thread that links care from one provider to another and one health event to another. Relational continuity refers to an ongoing therapeutic relationship between a patient and one or more providers. It not only bridges past and current care, it also provides a link to future care."* [73]

Improving care continuity is one of the objectives of the Patient-Centered Medical Home model discussed in the next subsection, which also proposes the use of electronic medical records and other healthcare ICT as means of achieving these improvements.

2.2.5 The Patient-Centered Medical Home Model

More than a decade after the release of the IOM's *Primary Care*, several of its key contributors along with Starfield[74] [75] and others continue to call for U.S. healthcare reform policies that place a strong if not central emphasis on primary care medicine. However, productivity, access, economic, and other pressures are leading to significant primary care provider job dissatisfaction.[76] [77] This is most troubling given the current and projected shortages of primary care physicians in the U.S.[78] These trends have led some to question the long-term viability and sustainability of the profession of primary care medicine.[79] [80]

This growing recognition that primary care may not be sustainable has led to increasing levels of advocacy for healthcare reform based in large part on alternative team-based and ICT-enabled models of primary care that aim to support and sustain the practice of primary care. Representative models include the Society of General Internal Medicine's Coordinated Care Model[81] and the Patient-Centered Medical Home model jointly proposed by the American College of Physicians, the American Academy of Family Physicians, the American Academy of Pediatrics, and the American Osteopathic Association.[82]

The Patient-Centered Medical Home (aka, Medical Home Model, Advanced Medical Home) is a proposed model for structuring the organization and delivery of primary care. This model was originally proposed as a means of reforming pediatric care, and is now receiving increased attention as a means of global reform of our healthcare system.[83] [84] [85] [86] Interpretations of this concept vary, [87] [88] [89] [90] but all emphasize that fostering and supporting strong primary care and strong longitudinal relationships between patients and their care providers is essential. Also, many interpretations of the Patient-Centered Medical Home (PCMH) view EMRs and other healthcare ICT as core components of this model, and healthcare ICT infrastructure as "necessary prerequisite conditions" for its implementation. [91] [92] [93] [94] Some interpretations of this concept posit that a personal health record (i.e., the patient chart) if adequately structured and maintained in an EMR system that is broadly accessible to providers, could constitute a medical home.

However, there is little direct evidence currently available in the scientific literatures about the comparative effectiveness of the PCMH as a comprehensive practice model or its effectiveness as a delivery system redesign intervention. Like Wagner's Chronic Care Model (which is cited as a foundational concept in the American College of Physicians' conceptualization of the Advanced Medical Home, and is referenced heavily in other medical home models), the PCMH is based on design principles that emphasize both evidence-based and patient-centered practices. It also emphasizes improved information exchange, improved and expanded channels of ICT-enabled patient access, and strives to specifically address a wide range of quality reform imperatives primarily through redesign of primary care. But if viewed as a comprehensive and integrated model for a system of care rather than a constellation of evidence-based components, it remains a theory in need of empirical validation. The National Committee for Quality Assurance (NCQA), the Centers for Medicare and Medicaid Services (CMS), and a variety of research foundations are currently supporting PCMH practice certification and PCMH model demonstration programs.[95] [96] At the time of this writing (December 2008) no evaluation studies of implementation experience with this model or the effects generated by it as a practice redesign intervention could be found in the published medical, health services, and informatics research literatures.

The PCMH model is referenced heavily in Chapters 6 and 7, as it served to inform one of the two redesign initiatives pursued by the organization that served as the setting for the original studies presented in this dissertation.

2.3 Information & Communication Technologies in Care Redesign

The models and theories of healthcare quality reform described in the preceding section share two common characteristics: each calls for comprehensive and fundamental care system redesign, and also specifies key contributing roles for ICT and/or information management innovation in these redesign endeavors. This section presents a more detailed discussion of the opportunities for applications of ICT in care redesign contexts, and offers a critical review of the relevant evidence on ICT effectiveness and trends in their use and adoption by providers.

2.3.1 Opportunities for Applications of ICT in Care Redesign

The scientific literature reviewed in previous sections and in Appendix A support the assertion that more effective communication, information exchange, and information management are necessary components of the fundamental care delivery redesigns required to achieve quality reform. For example, of the ten rules (or guiding principles) for care redesign presented in *Crossing the Quality Chasm* to advance its six priority aims for quality improvement, three explicitly call for changes in information management and communication:

> *"4. Knowledge is shared and information flows freely. Patients should have unfettered access to their own medical information and to clinical knowledge. Clinicians and patients should communicate effectively and share information.*
>
> *7. Transparency is necessary. The system should make available to patients and their families information that enables them to make informed decisions...*
>
> *10. Cooperation among clinicians is a priority. Clinicians and institutions should actively collaborate and communicate to ensure an appropriate exchange of information and coordination of care."* [97]

Furthermore, this review of the literature also revealed that widespread adoption of ICT is viewed as a widely-advocated (and in some interpretations, necessary) means of achieving these improvements. For example, *Crossing the Chasm* calls for four required changes to the structure and processes of the environments in which health care professionals and organizations function. One of these four specified changes is:

> *"Using information technology. Information technology, including the Internet, holds enormous potential for transforming the health care delivery system, which today remains relatively untouched by the revolution that has swept nearly every other aspect of society. Central to many information technology applications is the automation of patient-specific clinical information. Such information typically is dispersed in a collection of paper records, which often are poorly organized, illegible, and not easy to retrieve, making it nearly impossible to manage various illnesses, especially chronic conditions, that require frequent monitoring and ongoing patient support. Many patients could also have their needs met more quickly and at a lower cost if they could communicate with health professionals through email. In addition, the use of automated systems for ordering medications can reduce errors in prescribing and dosing drugs, and computerized reminders can help both patients and clinicians identify needed services."* [98]

Wennberg also advocates for improved information management practices and widespread adoption of some healthcare ICT as necessary conditions for improvements in care effectiveness:

> *"Delivery of effective care requires a practice based infrastructure with reminder systems to ensure, for example, that patients with diabetes get immunisations and eye tests. Successful programmes along these lines depend on interdisciplinary research, the development and maintenance of clinically relevant disease registries for long term monitoring of clinical care and relevant clinical outcomes, and rigorous scientific methods to test theories on the causes and remedies of performance variation."* [99]

> "*Steps could include requiring the adoption of either a single shared electronic health record or communication standards that ensure complete and reliable sharing of information among physicians and institutional providers within the defined network; the implementation of care management systems such as disease registries and disease management protocols; and…*" [100]

McGlynn offered similar remarks in the concluding statements of her seminal paper on the quality of U.S. healthcare:

> "*A key component of any solution, however, is the routine availability of information on performance at all levels. Making such information available will require a major overhaul of our current health information systems, with a focus on automating the entry and retrieval of key data for clinical decision making and for the measurement and reporting of quality.*" [101]

Woolf suggests a somewhat different but compatible perspective on the role of ICT in quality improvement endeavors based largely on the construct of effectiveness and a more holistic view of care quality:

> "*If poor control of blood pressure or serum lipid levels accounts for more deaths than do illegible drug prescriptions, a quality improvement program that is preoccupied with computerized prescription entry but ignores the large proportion of patients with uncontrolled hypertension or hyperlipidemia costs more lives than a program with reverse priorities. This contention relies to some extent on a false dichotomy, because common etiologies often cause lapses in both safety and quality and similar solutions apply. The same reminder system that corrects drug errors can also recognize overdue mammography.*" [102]

These and similar positions advanced by other proponents of comprehensive healthcare quality improvement propose a central role for informatics and ICT in care quality reform. For example, Bergeson and Dean[103] propose four evidence-based requirements for implementing patient-centered care reforms in provider organizations, and cite specific examples of how healthcare ICT can and should be leveraged to satisfy them. Their proposed care system redesign requirements include:

> "*1) improving access to and continuity with clinicians, 2) increasing patients' participation in care by making it easier for patients to express their concerns and involving them more actively in the design of their care, 3) supporting patient self-management through systems that facilitate goal setting and that increase patient and family confidence in self-care, and 4) establishing more efficient and reliable mechanisms for coordinating care among settings.*"[104]

E-mail and telephone patient-provider communication are specifically cited as proposed means of satisfying requirement #1 for improved access to and relational continuity with providers. The authors also cited online patient access to providers' EMR systems as potentially contributing to improved continuity (requirement #1), increased patient involvement (requirement #2), and improved care coordination (requirement #4). The authors also advocate for the use of post-visit summaries[105] and other patient- and family-oriented information artifacts (as paper or electronic tools/embedded features of EMRs) "*that list both patient and clinician issues and that documents agreed-upon priorities for a given consult*" and that "*specifies how and when other issues will be addressed, including by other members of the care team or in a non-visit format*".[106]

Although health risk assessment and health risk appraisal (HRA) instruments are not cited explicitly, in discussing requirements #3 and #4 the Bergeson and Dean also call for *"an approach in which self-assessment of health status is used [to identify] specific gaps between their current and ideal health"*, *"Web-based assessment tools that have been* *developed for this purpose"*, and ICT that *"can help with the previsit work of identifying 'What's the matter?' – that is, specific conditions or symptoms – and 'What matters?' – that is, patients' interests, concerns, and fears about specific conditions or symptoms"*[107].

These perspectives are supported and expanded upon in a 2006 special topics issue of the Journal of Ambulatory Care Management that focuses on the roles that ICT and provider-mediated tailored informational interventions can play in enabling patient-centered collaborative care practices.[108] In addition to describing how the use of EMRs, patient portals, patient-provider email and telephone contact, and other ICT-enabled care processes can improve care quality, authors Moore and Wasson also highlighted the time-constrained and throughput-pressured contexts of the primary care practices in which these technologies and processes are deployed. One particularly compelling example was the citation of a modeling study that estimated 22.2 hours of physician time per day would be required to provide indicated evidence-based chronic care in addition to usual acute and follow-up care under a typical primary care practice model.[109] These and other studies of time constraints typical of primary care practices[110] [111] were cited as supporting evidence for the authors' arguments that ICT must be leveraged in practice redesigns to achieve alternative models of sustainable, effective, and patient-centered primary care.

This critical review of relevant peer-reviewed literature reveals multiple opportunities for leveraging the conceptual potential of various ICT in primary care-oriented healthcare redesign and quality improvement contexts. The following section offers a critical review of the scientific literature pertaining to the realization of this potential and the observed effects of provider ICT use and adoption.

2.3.2 Critical Appraisal of the Scientific Evidence on ICT

The AHRQ commissioned a systematic review of the evidence about the effects of healthcare ICT on the quality, efficiency, and costs of care that was published in Annals of Internal Medicine in 2006. Chaudhry et al found that of the 257 studies that met their inclusion criteria, the vast majority were about EMRs and/or clinical decision support applications including CPOE, and roughly 25% were studies of "home grown" systems developed and deployed at 4 academic institutions – the Regenstrief Institute, Brigham and Women's Hospital/Partners Health Care, the Department of Veterans Affairs, and LDS Hospital/Intermountain Health Care. Studies of other organizations also involved mostly internally-developed systems, as only 9 of the 257 qualifying studies pertained to evaluations of multi-functional commercial technologies. Quality was determined to have shown improvements manifesting as enhanced surveillance and monitoring, decreased medication errors, and increased adherence to guideline-based care (i.e., effectiveness), with preventive health as the primary domain of improvement. [112]

However, the authors also concluded that the generalizability of these findings is limited primarily to the 4 benchmark organizations, and that "*Published evidence of the information needed to make informed decisions about acquiring and implementing health information technology in community settings is nearly nonexistent*".[113] They cite the absence of contextual implementation information from the majority of reviewed studies as one of the primary challenges to generalizability of the evidence, along with inadequate descriptions and heterogeneity of the ICT interventions. The authors conclude with four recommendations to enhance the evidence base for healthcare ICT, including 1) additional studies of commercially-developed systems deployed in community practice settings, and 2) studies of contextual factors associated with ICT implementation and use, including organizational change, workflow redesign, human factors, and project management issues.[114]

Similar conclusions and recommendations also emerged from another systematic review of the evidence on healthcare ICT published as an AHRQ evidence report in 2006, to which Chaudhry and some of the other Annals review paper co-authors contributed. This report stated that:

> *"...widespread implementation of HIT has been limited by a lack of generalizable knowledge about what types of HIT and implementation methods will improve care and manage costs for specific health organizations. The reporting of HIT development and implementation requires fuller descriptions of both the intervention and the organizational/economic environment in which it is implemented."*[115]

A more recent systematic review by Häyrinen et al also concluded that published studies of healthcare ICT continue to exhibit insufficient description of the interventions, and also concluded few studies have examined the role of nursing documentation or patient self-documentation.[116]

Specific to the role of ICT in improving the quality of chronic care, Rundall et al reported significant variation in the extent to which effective care processes and ICT were leveraged to address patients' chronic care needs in nine of the leading integrated healthcare systems in the U.S. – including Group Health Cooperative. They also concluded that the use of ICT in chronic care could be significantly expanded, and that the agenda for quality reform should include promotion of adoption and diffusion of clinical ICT.[117] Similar conclusions were offered in a systematic review published in 2007, in which the authors also recommended additional rigorous evaluation studies of in-context use of ICT in organizational care quality improvement endeavors.[118]

Another 2007 systematic review of the published evidence on the use of ICT in chronic care[119] concluded that use of several specific ICT components demonstrated positive impacts on the quality of chronic illness care. Of the 50 reviewed studies based on experimental designs that demonstrated positive outcomes (67 percent), the uses of specific ICT that were most strongly correlated with positive results were EMRs, computerized prompts, reports and feedback functions pertaining to population health management, specialized decision support, electronic scheduling, and personal health records. The authors also concluded that the current evidence base should be supplemented with additional studies of barriers to ICT use and adoption, and also suggest that studies of patient Web portals are warranted.

Patient Web portals are receiving increased attention from the health informatics, healthcare quality, and consumer health advocacy communities. In addition to providing patients with read-only online access to their records in provider-maintained EMR systems via secure connections through the Internet, they are often coupled with secure patient-provider email messaging capabilities.[120] [121] This new form of online health services access and asynchronous patient-provider communication appears to offer the potential to improve both the quality of preventive and chronic care[122, 123, 124, 125] and the efficiency of care provision.[126, 127] However, relatively few studies have explored the actual impact of online health services on the content, effectiveness, or structure of communications between patients and teams of care providers.[128] It is also unclear whether secure patient-provider messaging offers the efficiency gains and in-person encounter substitution potential that its proponents often claim.[129]

Evidence about patient Web portals with secure patient/provider email messaging and other ICT designed for interactive use by both chronically ill patients was reviewed in an AHRQ evidence report published in late 2008.[130] This report primarily focused on a review of the evidence pertaining to patients' use of interactive ICT in managing their health, which while relevant and also one of the Candidate's areas of research interest,[131] [132] is not within the overall scope of this dissertation. However, this evidence report also concluded that clinician participation in collaborative use of some interactive ICT is a significant determinant of both effectiveness and patient adoption.

Only very recently have provider organizations that offer patient Web portals begun to explore the use of online health risk appraisals (HRAs) as general-purpose patient information elicitation and care planning tools. These survey instruments have traditionally been administered by employers to their employee populations as a means of gathering information to inform their health benefits planning and workplace health promotion activities,[133] or by the designers of disease-specific tailored informational behavioral health interventions.[134] [135] While online HRAs appear to offer potential to contribute to care quality improvement, their use as general-purpose provider-administered preventive and chronic care planning tools has not yet been systematically studied.

This conclusion is indicative of the overall findings emerging from this examination of the peer-reviewed ICT evaluation literature. Although multiple opportunities exist for leveraging the conceptual potential of various ICT in primary care-oriented healthcare redesign and quality improvement contexts, there is only limited empirical evidence currently available to support these claims. This conclusion might help to explain some of the findings presented in the next section's review of the literature pertaining to provider use and adoption of healthcare ICT.

2.3.3 Physician Use and Adoption of Healthcare ICT

Healthcare reform policies such as the National Health Information Infrastructure (NHII) in the U.S., the U.K.'s National Program for Information Technology (NPfIT), and Canada Health InfoWay call for aggressive promotion of widespread healthcare ICT adoption. And as previously described, *Crossing the Quality Chasm* also explicitly calls for the use of ICT by providers and provider organizations as one of the four changes required to create practice environments amenable to quality reform.

However, provider adoption of healthcare ICT remains low in the U.S. despite these policy initiatives and the fact that demonstration projects and production deployments of clinical information systems comprising EMRs coupled with provider decision support applications have been ongoing for over 25 years.[136] [137] Bodenheimer and Grumbach estimated that as of 2002 only 17% of primary care providers in the U.S. were using EMRs.[138] Another study based on national survey data for the same time period estimated only slightly higher levels of adoption (20-25%) of EMRs among primary care medical groups with at least 20 physician members.[139]

Most recently, results of another national survey study published in the New England Journal of Medicine estimated that as of early 2008 only 6% of primary care physicians in the U.S. were using "extensive, fully-functional" EMRs and 15% were using "basic" EMRs.[140] While this distinction is atypical in comparison to most studies, and the authors also called for other studies to include more explicit definitions and descriptions of the ICT interventions under study, it is representative in that the overall body of current evidence on primary care provider adoption of ICT is limited almost exclusively to studies of their adoption of EMRs. However, early experience with provider-sponsored Web portals and secure patient-provider messaging also indicates that implementation of these advanced ICT will represent "natural next steps" for providers who ultimately adopt EMR systems, and their adoption of these ICT is largely predicated on their adoption of EMRs to first provide the requisite information infrastructure.

Studies of the determinants of providers' satisfaction with their use of healthcare ICT cite several variables that might help to explain these continuing trends of low provider adoption. Substantial work redesign requirements, concerns about disruption of the doctor-patient relationship, poor ICT usability, and resistance to change are typically cited as the primary barriers to provider adoption and the key determinants of failed enterprise ICT implementations.[141] [142] [143] [144] [145] [146] Other studies reveal that successful use of these technologies requires their integration into providers' routine systems of work,[147] [148] further highlighting the care redesign implications of ICT implementation and adoption. Qualitative studies of the role of ICT in facilitating medical error are particularly illuminating in this regard.[149] [150] In aggregate, the current evidence suggests that sustained use and adoption of EMRs and other healthcare ICT requires successful care redesign.

However, the redesign requirements of quality reform are significant. The preceding review of healthcare quality redesign models reveals that all of them reject incremental approaches and call for comprehensive and often radical care redesign. The *Crossing the Quality Chasm* authors acknowledge the significant challenges inherent in physicians' attempts to integrate ICT into their practice redesign efforts:

> *"The challenges of applying information technology should not be underestimated, however. Health care is undoubtedly one of the most, if not the most, complex sectors of the economy. Sizable capital investments and multiyear commitments to building systems will be needed. Widespread adoption of many information technology applications also will require behavioral adaptations on the part of large numbers of clinicians, organizations, and patients."* [151]

These challenges may help to explain why provider adoption of healthcare ICT remains low. The previous section's literature review also revealed that the relative paucity of evidence pertaining to the effectiveness of ICT might also represent a relevant contributing factor. Additional studies of providers' attitudes towards and experiences with ICT use could reveal the extent to which these and other factors influence their adoption of healthcare ICT.

2.4 Summary

This chapter opened with a discussion of the healthcare quality challenges that currently drive a wide variety of current medical practice redesign and healthcare ICT initiatives, and an overview of key healthcare quality constructs. This critical review of the evidence highlights the opportunity and urgent need for healthcare quality reform in the United States.

Subsequent sections presented theories and models of healthcare that offer promise to guide successful care delivery redesign efforts that aim to realize these quality reforms. They vary in the level of detail with which they specify their constructs and the extent to which they are directly or indirectly grounded in empirical evidence, but these models and theories share two common traits in that 1) they call for the profession of primary care medicine to play a central role in care system redesign, and 2) they explicitly call for the integration of information management innovations and ICT into care system redesign endeavors.

Some specific proposed applications of ICT to redesign endeavors striving to realize healthcare quality reform appear to offer promise and are supported by limited but encouraging evidence. However, a critical review of the peer-reviewed published literature pertaining to the effectiveness of ICT in creating or supporting improved care quality reveals significant evidentiary weaknesses and unanswered questions. The bulk of the existing evidence is based on evaluations of the effects of internally-developed EMRs with CPOE and other decision support functions on the safety of acute (predominantly inpatient) care at a limited number of large academic medical centers. Also, the generalizability of existing evidence on ICT is limited due to inadequate descriptions and suspected heterogeneity of the evaluated ICT interventions and a lack of consideration for including relevant contextual variables in most study designs.

There is an unmet need for studies that account for these deficiencies by providing greater transparency into the specific characteristics and traits of the ICT interventions and the contexts of their implementation and use, particularly primary care redesign contexts aimed at realizing comprehensive quality reforms. Studies of the roles (intended and emergent) and effects of both EMRs with clinical decision support and other healthcare ICT (e.g., patient Websites and EMR portals, secure patient/provider messaging, online HRA's) on all dimensions of healthcare quality across the full continuum of acute, preventive, and chronic care are also warranted.

Furthermore, a review of the literature on ICT adoption reveals a need for studies aimed at understanding the effects of ICT implementation and use on care providers and their relationships with patients. The few studies that have aimed to elicit and describe patient and provider perspectives on the usefulness of ICT, while offering compelling insights and conclusions, are typically framed in limited scope (e.g., disease-specific[152] or ICT-specific[153]) contexts. As such, this area of inquiry presents fertile ground for more comprehensive studies of ICT use and adoption in the context of comprehensive primary care redesign. Eliciting and describing providers' perspectives on the care redesign challenges associated with both quality reform and routine ICT use will be fundamental to understanding barriers to, facilitators of, and outcomes associated with widespread ICT use and adoption.

In summary, the aggressive promotion and adoption of healthcare ICT currently outpaces our understanding of the effects of these technologies on care delivery, patient-provider relationships, intramural care team relationships, healthcare quality, and ultimately on health outcomes. This chapter has highlighted the critical need for contextually-rich studies of primary care providers' experiences with ICT implementation through practice redesign, their routine use of these technologies, and the effects of these changes on healthcare quality. The remainder of this dissertation discusses three studies intended to address this critical need and the identified evidentiary gaps.

Chapter 3 provides an overview of research methods and theories relevant to studying the intended and emergent roles and effects of various healthcare ICT in primary care redesign contexts. The methods and theories in Chapter 3 informed the original studies presented in Chapters 5, 6 and 7 of this dissertation. The three studies were designed to address the variants of the following two questions that provide the overall motivation for this body of work and the importance of which were discussed in this chapter:

How are primary care providers integrating information and communication technologies (ICT) into their practices, and how is their use of ICT affecting their relationships with patients, staff, and other providers; care quality; and their quality of work life?

What can elicitation and description of provider perspectives teach us about their adoption of healthcare ICT?

Chapter 3: Methods and Theory

The reviews of relevant scientific literature presented in the preceding chapter and in Appendix A revealed four significant weaknesses in the current evidence base pertaining to ICT in U.S. healthcare quality reform. First, that ICT and ICT-enabled interventions and effects are inadequately described in the vast majority of studies, a deficit that significantly limits the generalizability of their findings. Second, that most published accounts of ICT evaluation studies lack relevant contextual information about the conditions of intervention implementation and assessment, which also limits generalizability. Third, that studies of mature internally-developed ICT deployed at a small number of academic medical institutions are over-represented in the subset of published studies that exhibit significant findings. The fourth significant weakness revealed by this examination of the literatures is that, given the scope and priority of the relevant healthcare reform challenges and policies, there is a relative paucity of evidence in general about ICT effectiveness in promoting healthcare quality, and that additional studies are warranted – particularly studies of the role of emerging healthcare ICT designed specifically for use in primary care and other ambulatory care contexts. Ammenwerth and others who have recently reviewed the evidence on the ICT effectiveness in healthcare quality have recognized these weaknesses and concluded that there exist both timely opportunities and urgent needs for qualitative observational studies of healthcare ICT implementation, use, and adoption.

The original studies described in subsequent Chapters 5, 6 and 7 aimed to address these four areas of weakness. Specifically, these are studies of provider and organizational experiences with implementation and use of commercially-developed healthcare ICT. These studies were conducted in a large community-oriented (i.e., non-academic) integrated healthcare insurer and delivery system (described further in Chapter 4). The study designs and methods were selected to support the overarching objectives to produce highly-descriptive accounts of the primary care redesign contexts of ICT implementation, providers' experiences with their use, and providers' assessments of the roles, importance, and effects of ICT use.

This chapter describes the research methodologies and theoretical underpinnings of the original studies presented in subsequent Chapters 5, 6 and 7. Section 3.1 presents a brief review of the theories and models that most heavily influenced the individual study designs and their approaches to data organization and interpretation. Section 3.2 presents a description of qualitative observational research as a class of research paradigms and methodologies. This section also includes a discussion of specific investigators and selections from the relevant literatures that exemplify the use of these methods in studies of healthcare delivery and health informatics. The chapter concludes with section 3.3, which specifies several research questions that motivated the original studies presented in this dissertation – the Chapter 5 study of provider experience with ICT in an enterprise-wide organizational redesign to implement Patient-Centered Access; the Chapter 6 study of organizational experience with and development history, composition, and intended effects of a single clinic redesign pilot implementation of a Patient-Centered Medical Home; and the Chapter 7 study of provider experience with ICT use in this PCMH pilot.

3.1 Review of Theory and Conceptual Frameworks

The original studies presented in this dissertation were informed and guided by several theories and concepts pertaining to the nature of healthcare quality, systems of care, and changes to these systems of care that impact quality. The influences of Donabedian's model for evaluating healthcare quality, [154] the Tavistock Institute's Sociotechnical Systems Theory, [155] [156] and Rogers' Diffusion of Innovations Theory [157] are evident in the individual analytical frameworks and indexing codebooks (Appendices C, F and G) used to organize text data and initiate document content analyses in each of the three studies presented in Chapters 5, 6 and 7, and in the emergent conceptual model presented in Chapter 8. Each is briefly reviewed in the following subsections.

The theories and models of effective primary care described in section 2.2.4 also influenced my perspectives on the studies presented in Chapters 6 and 7,and deliberately served as "sensitizing concepts and constructs"[158] to aid in analysis and interpretation. Other theories, concepts, and constructs that may have inadvertently biased my conceptualizations and interpretations throughout this program of research (e.g., Yro Engstrom's interpretations of Activity Theory, Bonnie Nardi's constructs and theories of shared situational awareness) were documented as such in my reflexivity journal.

3.1.1 Donabedian's Framework for Healthcare Quality Evaluation

Avedis Donabedian's seminal paper published in 1966 presented his critical review and synthesis of the prevailing approaches to evaluating healthcare quality. He characterized the majority of care quality evaluation studies as belonging to one of three linearly-linked classes – evaluations primarily focused on the structures that enable healthcare delivery, or the processes of care delivery, or the outcomes of care. [159] In calling for evaluation approaches to incorporate assessments of all three of these dimensions of healthcare, this paper set the stage for what many would consider to be the current paradigm of health services research. Modified versions of Donabedian's framework served as the organizing templates from which I derived the interview guide instruments and indexing codebooks used in my original studies (see Figures 5.1, 6.2 and 7.1).

3.1.2 Sociotechnical Systems Theory

Sociotechnical Systems Theory offers a means by which the systems of work that include and are enabled by ICT may be conceptualized in terms of people, processes, tools/technologies, and efforts to achieve "joint optimization" of the technical and social subsystems by which work is accomplished in a "production system" of activity that is embedded in a larger environment with which this production system interacts.[160] This theory emphasizes conceptualizing the production system (in this case, the healthcare production system) as a whole rather than in terms of isolated processes or structures, and stresses the interrelatedness of social and technological facets of the system. Herbst characterizes the sociotechnical perspective as follows:

> *"Although for certain purposes it may be helpful to look at the social and technological structures as separate components of a production system, from the present point of view it will be more useful to consider them as two alternative frames of reference in the study of the complex interrelated process within a production system... The concept of a pure social system without technological components or of a technological system without behavioral and social components is, therefore, somewhat of a fiction... The basic concept employed is that of an activity which may be analysed both with respect to its behavioural and with respect to its technological components. In other words, activities are treated as the point of bifurcation between behavioural events on the one hand and physical or technological events on the other. An activity may be altered by changing either its behavioural or its material and technological components, and it is by no means self-evident that these can be separated as neatly as it is generally assumed. The behavioural world and the physical world are not in practice two distinct worlds, but two alternative conceptual analytical schemes with respect to which an event can be evaluated."*[161]

Sociotechnical Systems Theory was introduced by Trist, Bamforth, Emery, Rice, Herbst and their colleagues affiliated with the Tavistock Institute of Human Relations, an interdisciplinary research organization founded in London in 1946 with the explicit purpose of actively relating the psychological and social sciences to the needs and concerns of society. The first of the Tavistock studies to describe the sociotechnical concept was published in 1951, and was the first of several studies of the effects of technological change on coal mining practices. This theory was developed and empirically validated over a period spanning more than 30 years through applied research endeavors in the Action Research tradition as exemplified by the work of Kurt Lewin, and maintains worker participation and emancipation through the democratization of work as a central premise and core value.[162] Initial development of this theory was largely influenced by von Bertanfly's Open Systems Theory, and in its view of organizations as open sociotechnical systems interacting with their environments it has been recognized as one of the first applications of open-systems concepts to social science.[163] Also, because Sociotechnical Systems Theory takes the view that work occurs in a production system context, the sociotechnical perspective appears to be compatible with the Lean/Toyota Production System methodology of work redesign and quality improvement that has rapidly emerged as the leading methodology practiced within the healthcare quality improvement research and practice communities in the United States.

As discussed later in this chapter's section 3.2, Marc Berg has often been credited with introducing the sociotechnical perspective (if not formal Sociotechnical Systems Theory per the Tavistock interpretation) to the medical informatics research community.[164] His and the work of others affiliated with the American Medical Informatics Association's People and Organizational Issues special interest group continues to draw increasing attention to the social and organizational dynamics of ICT use and adoption. One prominent example of the increasing acceptance of the sociotechnical perspective in biomedical and health informatics can be found in published reactions[165] to Greenhalgh et al's recently-published commissioned qualitative evaluation of the implementation of the Summary Care Record,[166] a central component of the NHS' National Programme for Information Technology (NPfIT) initiative.

This perspective informed enhancements to the conceptual models that served as organizing templates for my second and third original studies (see Chapters 6 and 7). The emergent findings from all three studies suggest that for purposes of evaluating the effects of healthcare ICT as per the research questions posed in Chapter 2, these "ICT interventions" must be conceptualized as changes introduced into dynamic sociotechnical systems of care, and that these interventions comprise interrelated and inseparable structural technology components (e.g., the software applications) and the processes and contexts of their use (e.g., the emergent use cases).

3.1.3 Diffusion of Innovations and Other Theories of Technology Adoption

Healthcare ICT and care redesign models can be viewed as innovations. As such, Rogers' Diffusion of Innovations Theory[167] provides several concepts and constructs that may be applied to studies of the use and sustained adoption of ICT. Facets of this theory differentiate the determinants of individuals' use and adoption of innovations from determinants and dynamics of diffusion of these innovations within and among larger social systems (e.g., organizations, societies). Specifically, Rogers' conceptualization of "consequences associated with innovation use" and their roles in individual adoption decision and behaviors were particularly relevant. He classifies consequences according to their intent (unintended versus intended), causal proximity to innovation use (direct versus indirect), and desirability (desirable versus undesirable).

Diffusion of Innovations Theory suggests that deliberately designed care system structure and process changes introduced through care redesign and/or ICT implementation initiatives can be viewed as "innovations". This theory posits that individual adoption decisions are based in large part on the extent to which innovation use is perceived to be useful and provide net comparative advantage compared to users' status quo behaviors. This concept is also central to the Technology Acceptance Models (TAM/TAM2)[168] and the more recent Unified Theory of Acceptance and Use of Technology (UTAUT).[169] Specifically, all of these theories share a common trait in that each posits comparative advantage derived from use of the innovation as a key determinant of individuals' adoption decisions and behaviors. The desirable consequences of comparative advantage and net utility gain derived from innovation use (Diffusion Theory), perceived usefulness (TAM/TAM2), and performance expectancy (UTAUT) were key sensitizing concepts leveraged in these studies, and are reflected in iterations of my conceptual framework that served as the organizing templates for these studies.

3.2 Methods of Qualitative Observational Research

Qualitative observational studies of providers' experiences with use of ICT offer means by which ICT-enabled healthcare system redesign endeavors and their effects can be better understood, richly described, and communicated to diverse audiences. Qualitative research methods, like the social science and humanities disciplines from which they emerged, are numerous and diverse. However, they share the following common traits as derived from a synthesis of the literature for this dissertation (see the following paragraph for specific citations):

1) They are systematic methods of inquiry that employ measures to ensure the trustworthiness of the findings they generate;
2) The primary objectives of the research endeavors in which they are leveraged involve description, explanation, and classification of social phenomena. These methods are used in studies that aim to answer research questions of the type *"What is X, how does X vary in different circumstances, and why?"*;
3) Qualitative methods are well-suited for studies that pertain to understanding and describing social *action* and/or *meaning*, in contrast to quantitative methods which are better suited to studies that pertain to delineating social *structure* (e.g., topology of social networks);
4) People and artifacts are studied in their natural settings rather than manipulated or controlled by the investigator as in experimental studies;
5) Sampling of study participants, settings, and artifacts that are subjected to analysis tends to be purposive rather than randomized or probability-based;

6) Data analysis is iterative and involves both inductive and deductive reasoning; and
7) Findings typically take the form of thick narrative descriptions and/or descriptive models, theories, or hypotheses – which may serve as the basis for subsequent naturalistic, quasi-experimental, or experimental studies.

Most qualitative observational study designs and analytic approaches can be attributed to a relatively small number of research paradigms and methodologies originating in the academic disciplines of sociology, psychology, and anthropology. Glaser, Strauss and Corbin,[170] [171] Patton,[172] Lincoln and Guba,[173] Erlandson,[174] and Miles and Huberman[175] are typically cited as providing the methodological foundations for studies on topics that range from generation of novel theories of sociology to evaluation of educational curricula. Crabtree and Miller[176] and Mays and Pope[177] have made significant contributions to extending and applying these qualitative research paradigms and methods in healthcare contexts, and are among the more prolific authors of qualitative studies appearing in the medical and health services research literatures.

Joan Ash, Paul Gorman, Bonnie Kaplan, and Marc Berg are among the more influential and prolific members of the health informatics research community who are known for their qualitative and mixed-methods naturalistic studies. They are among the founding members of the American Medical Informatics Association's People and Organizational Issues special interest group, and each has published seminal empirical studies of in-context use and adoption of various healthcare ICT. Kaplan,[178] [179] Ash[180] and Berg[181] have also made significant contributions to the health informatics evaluation research methods literature. Many also credit Berg with introducing the sociotechnical paradigm to the international health informatics research community.[182] Gorman is also recognized within the general information science research community as an influential contributor of studies of human information behavior from the healthcare domain.[183]

Significant contributions of qualitative health informatics research to patient safety and quality research are probably most evident in several studies of physician order entry and the unintended consequences of CPOE implementation. Gorman, Lavelle and Ash used qualitative observational methods in their study of the processes and contexts of physician order creation and communication published in 2003.[184] That same year, Kuzel and colleagues published the body of their AHRQ-funded research proposal for a qualitative study of patient and provider perspectives on medical error in the journal *Qualitative Health Research*, and included additional reflections on the reviewers' critiques of this proposal in an effort to improve the odds of funding for similar qualitative studies.[185] This was followed in 2004 by Ash, Berg and Coiera's publication of their multi-national qualitative study of unintended consequences of healthcare ICT use, which catalyzed much interest and debate about the role of CPOE and other ICT in facilitating medical errors.[186] Ash, Sittig, Campbell and others have continued to collaborate in an active program of mostly qualitative research on the unintended consequences of CPOE use and ICT-induced medical error.[187] [188] [189] Their studies are frequently cited in quantitative studies and reviews of the general evidence pertaining to medical error and the relationships between ICT and medical error.[190] [191]

Qualitative observational research methods continue to gain increasing attention and use in both health services and health informatics research. Recognition of their strengths and potential for complementing the more traditional quantitative and experimental paradigms and methods used to generate the majority of healthcare quality evidence is illustrated in the following quotes from publications authored by thought leaders in the health informatics and healthcare quality research communities:

> *"To improve care, evaluation should retain and share information on both mechanisms (i.e., the ways in which specific social programs actually produce social changes) and contexts (i.e., local conditions that could have influenced the outcomes of interest). Evaluators and medical journals will have to recognize that, by itself, the*

> *usual OXO experimental paradigm is not up to this task. It is possible to rely on other methods without sacrificing rigor. Many assessment techniques developed in engineering and used in quality improvement – statistical process control, time series analysis, simulations, and factorial experiments – have more power to inform about mechanisms and contexts that do RCTs, as do ethnography, anthropology, and other qualitative methods. For these specific applications, these methods are not compromises in learning how to improve; they are superior."* -D. Berwick [192]

> *"Indeed, there are many actors playing many roles in any real-world setting where an information resource is introduced. Each actor, as an individual and a member of multiple groups, brings a unique viewpoint to questions about fuzzy constructs such as need, quality, and benefit... Although subjectivist studies may run counter to most readers' notions of how one conducts empirical investigations, these methods and their conceptual underpinnings are not at all foreign to the worlds of information and computer science. The pluralistic, nonlinear thinking that underlies subjectivist investigation shares many features with modern conceptualizations of the information resource design process... Verbal description can be highly illuminating. Qualitative data are valuable in and of themselves and can lead to conclusions as convincing as those drawn from quantitative data. Therefore, the value of qualitative data goes far beyond that of identifying issues for later "precise" exploration using quantitative methods... Overall, subjectivist study of deployed information resources remains a relatively unexploited opportunity in biomedical informatics."* –C.P. Friedman and J.C. Wyatt [193]

The original studies described in Chapters 5, 6 and 7 were generated using methods of qualitative observational research based on semi-structured interviews and content analysis of verbatim interview transcripts and pre-existing project document archives. These qualitative observational studies yielded detailed descriptions of providers' perspectives on the roles, importance, and effects of ICT use. The fieldwork, data collection and analytic approaches were informed by the social sciences research traditions and methods of phenomenology, grounded theory, and hermeneutics. The specific applications of these methods to study design and analysis are described in each of these subsequent chapters. However, general descriptions of these qualitative research methods and their underlying epistemological foundations are provided in the following chapter subsections 3.2.1 – 3.2.4.

3.2.1 Epistemological Foundations

Paradigms and theory play an important role in qualitative research. Thomas Kuhn's *The Structure of Scientific Revolutions* popularized the use of the term "paradigm" in the context of discussing and characterizing scientific inquiry.[194] Guba defines a paradigm as "*a patterned set of assumptions concerning reality (ontology) knowledge of that reality (epistemology), and the particular ways of knowing about that reality (methodology)*".[195] Crabtree and Miller reference this definition of paradigm in their assertion that "*each investigator must decide what assumptions are acceptable and appropriate for the topic of interest and then use the methods consistent with the selected paradigm*".[196]

One of the primary objectives of this program of research was to explore the dynamics of and factors associated with provider adoption of healthcare ICT. According to Diffusion of Innovations Theory and other theories of technology adoption discussed in section 3.1, adoption of ICT and other innovations involves a component of individual experiential assessment of the perceived usefulness or "net comparative advantage" associated with their use. As such, scientific inquiry focused on the dynamics of provider adoption of ICT requires selection of an appropriate research paradigm and methodologies suited to eliciting and representing study participants' perspectives from their points of view.

Constructivist (also referred to as naturalistic or interpretivist) inquiry was the paradigm chosen as the basis for the majority of the work presented in this dissertation. The constructivist inquiry paradigm implies that the objective of research is to represent a given perspective on reality rather than to attain "the truth". As defined by Crabtree and Miller, this paradigm assumes a pluralistic treatment of knowledge by recognizing the importance of the subjective human creation of meaning while also acknowledging some notion of an objective reality.[197] Hammersley, Mays and Pope characterize the underlying epistemology implied by this paradigm as one of subtle realism. They contrast this perspective to both the epistemology of positivism (or realism), which assumes a single social reality that is completely independent of the researcher and the research process, and the epistemology of postmodernism (or relativism) which asserts that there are no "universal truths" and that multiple social realities are created and constructed during the research process. Subtle realism assumes an underlying social reality which can be studied, but also acknowledges that all research involves subjective perception and different methods produce different perspectives on knowledge of this social reality.[198]

Qualitative observational research methods are both appropriate and often preferred for studies that strive to inform constructivist knowledge. The qualitative observational methods selected as the basis for the original studies in this dissertation are described in the subsections that follow.

3.2.2 Methods of Sampling and Data Collection

The original studies presented in Chapters 5, 6 and 7 all utilized a field research style that generated data through audio recorded and transcribed in-depth semi-structured interviews with purposively-sampled participants working in purposively-selected settings and contexts. Interview data were also supplemented with a review of pre-existing project document archives for the study presented in Chapter 6, and with informal observational field notes and analytic memos generated during a one-year participant-observer field engagement for the study presented in Chapter 7. As such, the data sources for all original studies were text documents. The specific purposive sampling criteria, participant recruiting methods, and interview objectives and discussion guides used in each study are detailed in their respective chapters. However, it should be noted here that the experience gained through the initial study presented in Chapter 5 directly informed the purposive selection of the research settings, contexts, and participants for the study presented in Chapter 7, and that experiences gained via the participant-observer engagement initiated as a component of the fieldwork supporting the Chapter 7 study both inspired and informed the case study presented in Chapter 6.

The semi-structured qualitative interviewing method used in all cases is accurately characterized by Patton's general interview guide approach, which he defines as an interview that "*involves outlining a set of issues that are to be explored with each respondent before interviewing begins. The guide serves as a basic checklist during the interview to make sure that all relevant topics are covered.*"[199] The primary intent of using this interview type that relies exclusively on open-ended questions is to offer the participants the opportunity to respond using their own terms to express their unique personal perspectives on the questions and topics.

Content analyses of the verbatim interview transcripts leverage these unique perspectives to generate findings. The objectives of content analyses and the nature of the findings they generate from these expressions of participants' personal perspectives are dependent on the chosen analytic perspectives and methods. Similarly, the nature of findings generated by content analyses of secondary text document artifacts (e.g., project document archives) vary based on the chosen analytic perspectives and methods.

Several commonly-accepted research trustworthiness strategies were employed in the interview activities to mitigate risks of potential bias in data collection. First, all participant recruiting and consent materials used to support the fieldwork clearly specified that the purpose of the interviews was to support public-domain, grant-funded academic research and not business or other operational priorities of Group Health, and that these research findings would serve as the basis for a graduate student dissertation and also possibly as the basis for peer-reviewed research journal publications. Second, during the recruiting and consent processes and prior to initiating all interviews, I introduced myself as a graduate student from the University of Washington, and clarified that my role as a part-time employee at the Center for Health Studies was one of a student research associate. These strategies were intended to convey to all participants my status as an "outside neutral party", and mitigate risks that they might direct their comments and responses to my questions to people responsible for making operational, technical, strategic, or leadership decisions at Group Health. Third, I also used an indirect an open-ended questioning approach in the interviews to maintain and to project a neutral stance on the questions I asked – particularly those pertaining to ICT. As my intent was to elicit participants' candid perspectives and opinions about the roles, importance, effects – and "goodness" or "badness" – of the ICT and other components of the care models, redesign initiatives, implementation processes, etc., I refrained from offering any of my own opinions, even when questioned directly in this regard by the participants. All of these strategies aimed to reduce the risk of Hawthorne effect in that by projecting as neutral a stance as possible on all of the questions and topics covered in the interviews, I offered minimal opportunity for participants to "tell me what they thought I wanted to hear" and/or "what Administration needs to hear", "what those people in IT need to hear", etc. Also, to avoid observer and other biases in participants' responses, the written consent forms stated and I also verbally assured participants that all records of their comments and responses would be thoroughly de-identified, and that I would be the only person to ever know their identity as study participant.

3.2.3 Methods of Data Analysis and Interpretation

The term content analysis comprises numerous approaches to qualitative data interpretation that share a common objective of attempting to identify meanings and core consistencies, patterns, or themes within the data. However, the specific data analysis procedures and the nature and extent to which they rely on inductive and deductive reasoning are determined by the interpretive perspective selected by the analyst. This section describes the three interpretive perspectives that informed the document content analyses conducted in support of the original studies presented in this dissertation – phenomenology, grounded theory, and hermeneutics.

Phenomenology seeks to understand the lived experiences of individuals, their intentions, and the meanings that they attribute to events and phenomena. Initially introduced as a modern research methodology by Husserl,[200] [201] phenomenology strives to address the question *"What has been the participant's lived experience in this context?"* The analyses conducted in the study of provider experience with the Access Initiative presented in Chapter 5 assumed a phenomenological interpretive stance, as did the initial analysis in the Chapter 7 study of provider experience with the Group Health PCMH.

Grounded theory as introduced by Glaser and Strauss in 1967[202] and as currently described and practiced[203] utilizes a "constant comparative method" of iterative sampling, data collection, and inductive/deductive reasoning cycles to develop classifications and theory "grounded" in the specific social setting under investigation. The goal of grounded theory is to address the question *"What are the relevant concepts, their dimensions, and their interrelationships?"* The Chapter 6 study of the development history, composition, and intended effects of the Group Health PCMH utilized a grounded theory approach to interpretation in that the object of study was a conceptual care system model.

Hermeneutics involves deriving meaning through analysis of text. Heidegger[204] is often credited with developing hermeneutics as a methodology for social science research, which Crabtree and Miller describe as "*a movement beyond phenomenology in that the goal of hermeneutic research is to use the interpretation of lived experience to better* *understand the political, historical, and sociocultural context in which it occurs.*"[205] The second analysis conducted in the study presented in Chapter 7 was conducted in the hermeneutic tradition in that the documented thematic findings generated by the initial phenomenological analysis of provider experience served as the basis for development of grounded hypotheses and theories about the roles and contributing effects of ICT use in these experiences.

3.2.4 Document Content Analysis Procedures Used in Original Studies

In each of the original studies in this dissertation, document analyses were preceded by an index (or template) coding approach to enable efficient retrieval and multiple views of the text data. Verbatim interview transcript texts were loaded into either the AnSWR (Chapter 5 study) or Atlas.ti (Chapter 6 and 7 studies) software applications, and marked up or "coded" using index codes that represented dimensions of the a-priori conceptual frameworks that were derived in large part from the theories and concepts presented in section 3.1 (see Figures 5.1, 6.2 and 7.1). Text segment reports for each index code were generated from each corpus of primary interview transcript or project archive documents. These text segment reports were then subjected to analysis procedures typically employed in grounded theory endeavors.[206] Iterative open coding of the text segment reports was performed in concert with memo development to establish preliminary emergent concepts and themes. Codes were developed to represent each of these emergent concepts and themes, and each code included specific definitions and application rules (e.g., text segment markup inclusion and exclusion criteria). These emergent theme and concept codes were then applied to the primary source documents (i.e., the complete interview transcripts) and refined, clustered, and connected using an iterative selective coding and memo development procedure. The two phenomenological analyses of provider experience (see Chapters 5 and 7) incorporated multiple-coder triangulation as a research trustworthiness strategy to mitigate risks of interpretive bias, as did the supplementary hermeneutic analysis conducted in the Chapter 7 study.

After saturation was achieved through multiple iterations of document coding, the authenticity and fidelity of preliminary findings (i.e., emergent themes and concepts) were verified via member checking with subsets of the study participant populations to ensure trustworthiness – the rough analog to validity in (typically quantitative) positivist research methodologies. Two other methods used to ensure the trustworthiness of both data collection and interpretation in this research included peer review and maintenance of a longitudinal reflexivity journal.

This method of qualitative content analysis, which combines the use of an initial basic indexing procedure to organize raw text data prior to initiating inductive/deductive cycles of constant comparison using grounded theory document coding procedures, might be accurately classified as a Framework Analysis approach. The Framework Analysis method of qualitative content analysis was initially developed in 1985 at the UK's National Centre for Social Research.[207][208] It has been widely applied to studies in nursing, medicine, and public health.[209][210][211] Although it has not been widely used nor explicitly cited in naturalistic medical informatics studies, many of the "hybrid inductive/deductive"[212] "grounded approaches"[213] and "constant comparison"[214] qualitative interview and focus group analysis methods employed in these studies may be classified as variants of Framework Analysis. Themes are developed both from the a priori research questions and theoretical frameworks, and from the narratives generated by research participants. Framework Analysis entails both within-case analyses and thematic comparisons between cases or among groups of cases.

The approach to qualitative document content analysis used in these original studies could also be classified as a hybrid of Crabtree and Miller's editing and template organizing styles:

> *"The template organizing style makes use of a template or organizing codebook that is applied to the text being analyzed. The template can be detailed or more open ended and usually undergoes revision after encountering the text. The template derives from theory, research tradition, preexisting knowledge, and/or a summary reading of the text. ...Templates can be codebooks developed prior to data collection, such as in the approach of Miles and Huberman (1994), or after data collection has begun, as in ethnographic content analysis... Whatever the template, is applied to the text with the intent of identifying the meaningful units or parts... If the text reveals inadequacies in the template, modifications and revisions are made and the text is reexamined. The interaction of text and template may involve several iterations and include the collection of more data until no new revisions are identified. The analysis then proceeds to the connecting phase, where the units are connected into an explanatory framework consistent with the text.*
>
> *The editing organizing style is termed "editing" because the interpreter enters the text much like an editor searching for meaningful segments, cutting, pasting, and rearranging until the reduced summary reveals a helpful interpretation. The interpreter engages the text naively, without a template. The researcher attempts to identify and separate from preconceptions prior to reading the data. The interpreter searches for meaningful units or segments of text that both stand on their own and relate to the purpose of the study. Once identified, these units are sorted and organized into categories or codes. It is these categories that are explored for patterns and themes in the connecting phase of analysis."*[215]

3.3 Summary

Qualitative observational studies of providers' experiences with use of ICT offer means by which ICT-enabled healthcare system redesign endeavors and their effects can be better understood, richly described, and communicated to diverse audiences.

Theories of healthcare quality evaluation, innovation diffusion, and sociotechnical systems also offer potential to inform qualitative observational studies of providers' experiences with use and adoption of ICT. This chapter presented an original conceptual model and analytical meta-framework that represents a synthesis of several constructs drawn from these theories that are helpful in conceptualizing study designs and organizing text data prior to engaging in content analysis.

The preceding Chapter 2 concluded that the aggressive promotion and adoption of healthcare ICT in the name of quality reform currently outpaces our understanding of the effects of these technologies on providers, care delivery processes, patient-provider and intramural care team relationships, care quality, and ultimately on health outcomes. That chapter revealed four specific evidentiary gaps and raised two broad questions that motivated this program of research, specifically:

> *How are primary care providers integrating information and communication technologies (ICT) into their practices, and how is their use of ICT affecting their relationships with patients, staff, and other providers; care quality; and their quality of work life?*
>
> *What can elicitation and description of provider perspectives teach us about their adoption of healthcare ICT?*

This Chapter 3 has highlighted the potential for leveraging qualitative observational research methods and various theories in studies of providers' use of ICT in quality reform and primary care practice redesign contexts to answer these questions. Subsequent chapters will describe original qualitative observational studies of organizational and provider experience with ICT in two sequentially-implemented patient-centered care redesign initiatives pursued by a large integrated healthcare delivery system – an organization-wide implementation of Patient-Centered Access, and a clinic-level implementation of the Patient-Centered Medical Home. Each of these studies aimed to address variants of all of the following research questions that provide greater specificity to the two overarching research questions raised in Chapter 2 that, if answered, offer the potential to address the evidentiary gaps revealed in that chapter:

> *What are providers' perceptions, beliefs, and expectations about the intended purposes and intended uses of healthcare ICT?*
>
> *What are providers' perceptions and beliefs about their actual uses of healthcare ICT, and the use of these technologies by their colleagues and patients?*
>
> *How are these ICT useful (or burdensome or harmful) to providers who strive to provide safe and effective patient-centered care? How and to what extent do physicians and other care team providers derive utility from their use?*
>
> *What challenges do providers face when trying to use these ICT and incorporate them into their practices, and to what extent does this impact their adoption?*
>
> *What other factors are impacting individual providers' use and adoption of these ICT (e.g., social influences, individual user traits, etc)?*
>
> *What are the unintended consequences – both positive and negative – associated with the use of healthcare ICT?*

These questions served as the basis for a program of qualitative observational research I conducted over a three year period at Group Health Cooperative, a large integrated health insurance and delivery system based in Seattle, Washington. Initially founded in 1947 and evolving into what would come to be known as a health maintenance organization

(HMO) model, today this organization is recognized nationally as an innovator and early adopter of healthcare ICT and as a leader in primary care-oriented healthcare quality reform. Chapter 4 provides a description of this study setting and the contexts in which the Candidate engaged in field research there. The subsequent Chapters 5, 6 and 7 provide detailed accounts of each of these original studies and their findings, including additional study setting and contextual information specific to each. Chapter 8 provides additional insight into the significance and limitations of this program of dissertation research.

Chapter 4: Study Settings and Contexts of Fieldwork Engagement

This chapter provides a description of the organizational setting and contexts of the original studies presented in Chapters 5, 6 and 7. A description of the context of my field engagements is also provided.

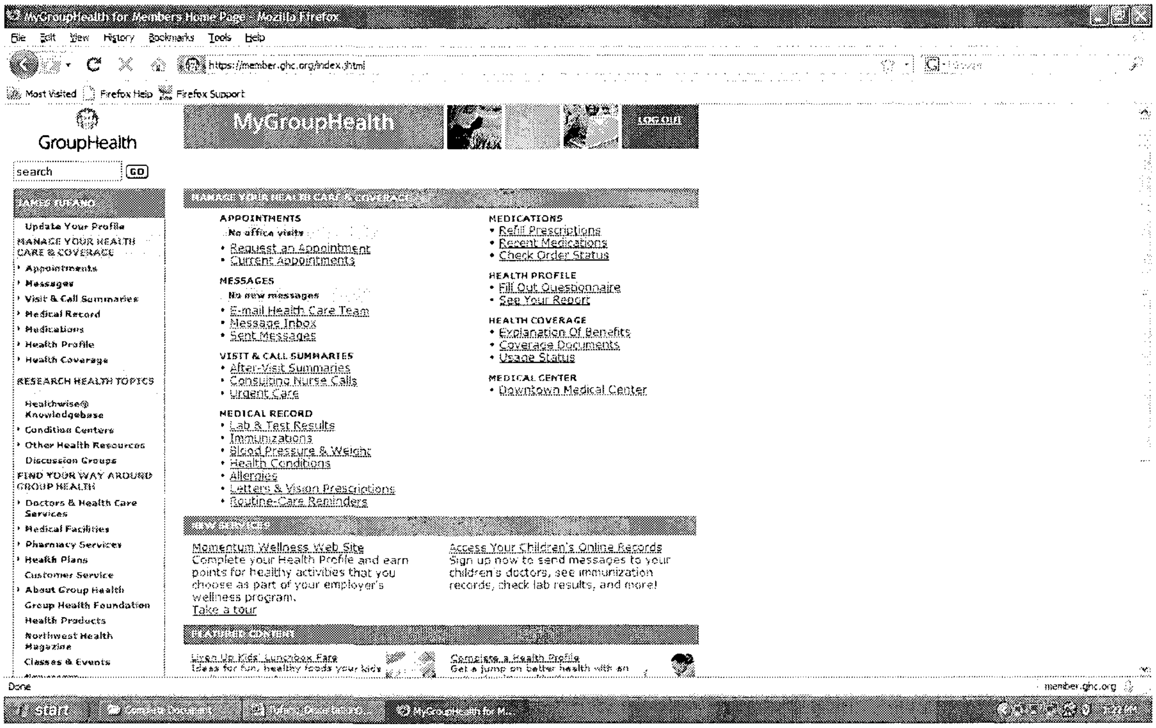
4.1 Group Health's Organizational Structure and History

Group Health Cooperative (Group Health) is a primary care-based, member-governed, not-for-profit, integrated health insurance and delivery system headquartered in Seattle, Washington. Group Health currently employs over 9,700 people who support or directly provide comprehensive healthcare services to approximately 540,000 enrolled patients, generating annual revenues in excess of $2.1 billion. The medical group practice division, Group Health Permanente, employs 850 staff physicians who practice in 26 owned and operated community-based ambulatory care medical centers, 7 hospitals, and three specialty care clinics located the Puget Sound region of Washington State. The network division contracts with an additional 9,000 practitioners and 39 hospitals to provide services to members in other areas of Washington State and northern Idaho. Enrolled adult patients choose a family physician or general internist as their primary care physician, each of whom is typically responsible for providing care to approximately 2,300 paneled patients.

4.1.1 Healthcare Information and Communication Technology Infrastructure

Group Health is also nationally recognized as an innovator in the design and successful use of healthcare ICT.[216] Group Health's ICT infrastructure includes the EpicCare Ambulatory EMR,[217] a commercial ambulatory electronic medical record and clinical information system (CIS). The 2005, 2006 and 2007 versions of this product were in production use during the study period. Activated functions and modules that were in general use included clinical decision support alerts ("health maintenance alerts" and "best practice reminders") and integrated email that enables secure internal communications among clinicians while they concurrently or asynchronously access patient records ("staff messaging").

Figure 4.1: Screenshot of MyGroupHealth Homepage



Complete your Health Profile and earn points for healthy activities that you choose as part of your employer's wellness program.

Sign up now to send messages to your children's doctors, see immunization records, check lab results, and more!

The CIS was integrated with a patient Website (MyGroupHealth[218]) which provided patients with read-only access to portions of their medical records including their active problem lists, medication lists, and provider-authored patient-oriented visit summary documents ("after visit summaries"). The Website also provided patients with the capability to engage in secure email communication with their providers ("secure messaging"). Website integration with the organizations' other legacy systems also enabled patients to view and trend lab results, re-order medications, request and cancel appointments, and access consumer-oriented health information from a commercially-available knowledgebase.[219] A custom-developed interactive patient health history and risk assessment application ("the Health Profile") was also integrated with both the patient Website and CIS during the study period (after completion of the study presented in Chapter 5 and prior to the studies presented in Chapters 6 and 7). A detailed description of the patient Website is available elsewhere.[220]

Provider perspectives on the roles, importance, and effects associated with this constellation of ICT were explored in the Chapter 5 and Chapter 7 studies. The study presented in Chapter 6 explored the roles and intended effects of this constellation of ICT in the design of a unique instance of the Patient-Centered Medical Home care model.

4.2 Group Health's Organizational Strategies 1990s Through 2008

[Note: This section 4.2 and subsection 4.2.1 include large passages of paraphrased text from an original manuscript authored by James Ralston et al that is currently under review. This material is included and cited here with his permission.]

The prospect of national healthcare reform in the early 1990's had a significant impact on Group Health's organizational strategy. In anticipation of national healthcare reform, the Health Services Act enacted by the state of Washington in 1993 aimed to ensure universal access to care by 1999 and control costs through a variety of "managed competition" mechanisms including healthcare insurance premium limits.[221] One of the requirements for provider groups attempting to compete in what would be the emergent business environment "was the importance of broad geographic coverage with a presence in almost every community."[222] In attempting to meet this requirement, Group Health expanded its delivery system into many communities in Washington where it previously had no geographic presence. From 1995 to 1997, the organization also expanded its membership from 557,852 enrollees to 708,965 enrollees.[223] By the mid-1990's Group Health appeared to be well-positioned to successfully compete in the reformed healthcare market envisioned in the national and state healthcare reform legislation endeavors spawned earlier in the decade.

However, by 1997 the federal healthcare reform legislative efforts had failed, and Washington State's healthcare reform legislation had been mostly repealed.[224] Group Health found itself overextended, and the regional marketplace became increasingly resistant to the constraints typical of the organization's traditional managed care model. Patients and employers were demanding increased choice in accessing health care services. For example, the organization's primary care gate-keeping model of accessing specialty services was no longer viable. During the 1995 to 1998 period, Group Health suffered financial losses exceeding $89 million, and by 2000 enrollment had fallen to 592,629.[225]

4.2.1 Enterprise Redesign of Operations: The Access Initiative

[Note: This section 4.2 and subsection 4.2.1 include large passages of paraphrased text from an original manuscript authored by James Ralston et al that is currently under review. This material is included and cited here with his permission.]

As described in the previous section, the national and regional healthcare business environment of the late 1990's presented significant challenges for Group Health and other HMOs to capture and retain market share while maintaining financial viability. In response to these challenges, Group Health's Board of Trustees actively engaged with the organization's administrative leaders in a comprehensive strategic planning effort to redesign the organization to better meet the needs and preferences of patients and the demands of the marketplace. This endeavor included substantial components of consumer-oriented research including focus groups and surveys of the organization's members, which revealed strong preferences for improved access to their personal physicians and more timely access to healthcare services in general. Members also expressed desires for new modes of access, including secure email messaging with physicians and other online health care services.

In response, Group Health implemented an ensemble of organization-wide redesign strategies referred to collectively as the Access Initiative in the 2000-2006 timeframe. Through the Access Initiative, Group Health sought to provide improved and more patient-centered access to services by expanding their options for exercising personal choice in their access decisions. This strategy also called for simultaneous streamlining of operations, increasing provider productivity, and implementing the EpicCare Ambulatory EMR, a commercial electronic medical record and clinical information system (CIS).

A key assumption of this patient-centered access strategy was that patients would make appropriate choices in their use of services. Some of the organization's leaders feared that removing the traditional managed care access controls would result in inappropriate utilization and significant operating cost increases. Although published studies of similar organizations' experiences with implementing advanced access in primary care[226] [227] and direct access to specialty care[228] [229] revealed no significant changes in cost or utilization, the impact of simultaneously implementing these practice changes along with secure email and Web access was unknown.[230] Some leaders also expressed concern that efforts to improve individual patient access could adversely impact care by drawing attention away from population-oriented care activities. Others predicted that the Access Initiative would generate utilization efficiencies in that improved primary and specialty care access would reduce unnecessary utilization of emergency room and urgent care services. Some predicted that the implementation of the CIS would yield operational efficiencies by reducing the prevalence of redundant service delivery and rework that result from inadequate access to patient information. [231]

Chapter 5 presents an original study of provider experiences with the Access Initiative, and their views on the role of ICT in these experiences. These study findings have also been published as an original research manuscript in the Journal of General Internal Medicine.[232]

4.2.2 Clinic-Level Redesign: The Patient-Centered Medical Home

Management operations data and quantitative summative evaluation studies revealed that the Access Initiative succeeded in improving patient access to care and patient satisfaction, but also resulted in increased costs associated with utilization of some consulting specialty, emergency room, urgent care, and hospital services.[233] [234] Some measures of clinical quality also appear to have declined during this period.[235] The organization's leaders also suspected declining trends of primary care provider job satisfaction. It was in this context during the spring of 2006 that members of Group Health's leadership began to conceptualize and develop an alternative organizational redesign strategy based on principles of the Advanced Medical Home model (now generally referred to as the Patient-Centered Medical Home, described in Chapter 3).[236] These efforts culminated in an organizational commitment to a comprehensive clinic-level practice redesign pilot. This pilot was initiated at the Group Health Factoria Medical Center in January 2007.

A fact sheet describing the Group Health Medical Home pilot and its objectives was developed and distributed internally throughout the organization, segments of which are included below:

> *"The model is expected to help us deliver more patient-centered care and better health outcomes... The key to the model is providing patients with more access to their personal care physician and clinical teams... Patients will receive even better care and services... They will be able to establish a collaborative care plan that reflects their personal values and goals... Staff and physicians will work together as teams to provide coordinated, patient-centered, high quality care and services...*

> *Primary care physicians at the medical center will lead the teams that provide care to their patients. With smaller panel sizes, they will be able to establish continuous, healing relationships with their patients and serve as their guides and partners. Personal physicians will also coordinate care across a variety of settings, ensuring that all other clinicians who interact with the patient use and update the collaborative care plan, and stay focused on delivering quality outcomes and patient satisfaction... Clinical and business systems within the medical center are being modified to enhance patients' relationships with their personal physician and care team, as well as the overall patient experience. The medical center changed the processes that affect how patients are appointed, triaged, and treated by the physician and care team, and how phone calls and secure messages [patient emails] are handled within the medical center."*[237]

The original study presented in Chapter 6 provides a descriptive case study of the Group Health Patient-Centered Medical Home practice redesign pilot, its development history, and its defining care system model components – including an inventory of specific ICT and their intended roles and effects. Chapter 7 presents an original study of the experiences of providers who practice in this model, including their perspectives on the actual uses of the ICT and the effects generated by the use of these technologies.

4.3 Context of My Field Engagements

> *"The creative mind generates new possibilities; the critical mind analyzes those possibilities looking for inadequacies and imperfections... Qualitative inquiry draws on both critical and creative thinking... The perspective that the researcher brings to a qualitative inquiry is part of the context for the findings... In qualitative inquiry, the researcher is the instrument... Judgments about the significance of findings are thus connected to the researcher's credibility... No definitive list of questions must be addressed to establish investigator credibility. The principle is to report any*

> *personal and professional information that may have affected data collection, analysis, and interpretation – either negatively or positively – in the minds of users of the findings."* –MQ Patton [238]

It is important in any research endeavor for the researcher to actively strive to maintain self-awareness and to employ techniques to account for if not manage personal bias. As evidenced in the preceding quotes, this is particularly important in qualitative research, in which the researcher serves as the instrument of both data collection and data analysis and interpretation. It is for this reason that recognized research trustworthiness assurance techniques were employed in this dissertation research (e.g., triangulation of data sources, peer review during transcript coding, maintenance of reflexivity journals, member checking of findings).

The contexts of my prior work and research experiences with Group Health and the specific field engagements that supported the original research in this dissertation are also potentially relevant, and therefore reported here. My first personal experience working directly with Group Health began in 1995 while working as a postgraduate fellow in healthcare administration at Virginia Mason Medical Center, and lasted for approximately one year. During this time I worked directly with the senior executive leadership teams and various mid-level managers and directors from both Virginia Mason and Group Health. The majority of original work performed in this role involved provision of analytical support for Virginia Mason's Director of Strategic Planning, who was charged primarily with developing strategy and policy recommendations related to the Group Health-Virginia Mason Alliance, and secondarily with developing analyses and project and program plans related to provider workforce planning, service demand, labor capacity, and performance measurement. As the Pennington Fellow I also reported directly to Virginia Mason's Executive Administrator, and routinely participated in joint Group Health-Virginia Mason Alliance and internal Virginia Mason executive leadership meetings (e.g., Executive Committee, Operations Committee, Alliance Planning Team).

I also worked as a contracted information technology consultant with several investigators and staff from the Group Health Center for Health Studies (including committee member R.J. Reid) during 2003-2004. This work involved outsourced development and technical support for a limited trial deployment of a prototype tablet-PC software application used in point-of-care breast cancer risk surveillance.[239] This work also involved collaboration with Dr. Reid and CHS Research Associate Erin Aiello-Bowles on a related Small Business Innovation Research grant proposal that was not funded.

My third and most recent direct engagement with Group Health is directly related to and resulted in field engagements that produced the three original studies in this dissertation. In late 2005 I was offered and accepted a limited-scope part-time opportunity to develop and execute a qualitative arm of the larger Access Initiative Evaluation Study funded by the Robert Wood Johnson Foundation (Prinicpal Investigator David Grembowski, PhD, University of Washington). The grant proposal specified a high-level plan and general aims for an interview-based qualitative study of Group Health physicians' experience with the Access Initiative, with project co-investigators James Ralson, MD, MPH (GH-CHS) and Diane Martin, MA, PhD (UW) responsible for sponsoring and guiding this arm of the study. Under their guidance, I modified and provided greater specificity to the study design and aims, secured IRB approval for this qualitative sub-study, and then performed and led all phases of fieldwork and analysis that resulted in the study findings presented in Chapter 5.

This experience led to further involvement in several of Dr. Ralston's other grant-funded projects as a compensated Research Assistant at the University of Washington (e.g., Project Health Design, RWJF) and at the Group Health Center for Health Studies (e.g., eDiabetes, AHRQ). Also, the experience gained through the Access Initiative provider experience study inspired me to conceptualize, design, and pursue the second study and field engagement described in Chapter 7. This endeavor was initially unfunded, but after the I specified the initial study design and secured approvals from both my PhD advisory committee and the CHS Institutional Review Board (IRB), Dr. Reid offered me an opportunity to join the Group Health Medical Home Evaluation Team as a part-time compensated Research Associate, and to incorporate this study into the Team's overall scope of work. Minor modifications to the interview guide were made to accommodate some shared objectives to explore more general provider experiences not specific to ICT. I sought and secured IRB approval for these modifications, and initiatied the fieldwork in late January of 2008.

As an active member of the Medical Home Evaluation Team throughout 2008, I also participated in conversations pertaining to the (primary) quantitative quasi-experimental components of the Team's evaluation research on the Medical Home pilot. One outcome of this experience was my (and others') recognition that a thorough and detailed description of the pilot "intervention" would provide a valuable and necessary contribution to both research efforts. I developed and proposed an appropriate case study in July 2008. IRB approval was granted, supplemental internal CHS funding was secured, and the fieldword was initiated in early August. The study was completed in October 2008, and is presented as Chapter 6 in this dissertation.

Other potentially relevant information about the extent to which my previous experiences might have influenced my perspectives are provided in Appendix B.

4.4 Strengths and Limitations of the Research Setting

Three primary rationale are offered for selection of Group Health as the setting for the original research in this dissertation – 1) the size and diversity of settings within the organization, which provide opportunities for studying a wide range of "natural experiments" relevant to provider use and adoption of ICT in quality reform contexts; 2) the organization's history as an innovator and early adopter of healthcare ICT that often becomes more widely adopted by other provider organizations[240]; and 3) timely opportunities for access to relevant study sites and populations.

Limitations imposed by this setting that are typically cited in quantitative experimental and quasi-experimental studies include challenges to generalizability of results due to Group Health's relatively unique organizational structure and prepaid financing model, and its relatively homogenous membership/patient demographic profile. However, as generalizability (in the positivist sense) of statistically-established correlations or causal relationships is not an objective of this qualitative research endeavor, these organizational traits do not impose significant limitations given the research questions and aims. Strategies of purposive sampling were employed in all studies to optimize the balance of accounting for unique and diverse participant perspectives and the potential for transferability of findings. Also, as Group Health has migrated to physician compensation models that incorporate encounter code-based productivity metrics and more physicians in the U.S. are organizing into medical group practices that incorporate fixed or partially-fixed salary compensation models, the prepaid versus fee-for-service distinctions as they manifest to front-line physicians – while perhaps significant in some regards – appear to be losing relevance in studies of provider experiences and behaviors.

4.5 Summary

As a recognized early adopter and innovator of healthcare ICT, Group Health provides a robust setting for qualitative observational studies of provider and organizational experiences with implementation, use, and adoption of healthcare ICT. At the initiation of the study period (i.e., late 2005 for the Chapter 5 study) all of the ICT described earlier in this chapter except for the Health Profile had been in general "production" use for several years. The fact that Group Health is a community-based (i.e., non-academic and primarily outpatient-oriented) delivery system pursuing primary-care oriented healthcare quality reform endeavors that leverage primarily commercial ICT also qualify it as a setting for empirical studies that address several of the evidentiary gaps revealed in Chapter 2 (e.g., that most studies involve ICT developed internally at one of four academic medical centers). The nature and timing of my engagement with this organization yielded unique opportunities to pursue studies of phenomena and "natural experiments" directly relevant to the research questions posed in preceding Chapters 2 and 3.

The next chapter presents the first of these three original studies, and pertains to provider experiences with ICT use in the context of the Access Initiative. This study identified adverse and unintended consequences associated with this ICT-enabled organizational redesign endeavor. Its findings inspired the conceptualization and pursuit of the original studies of organizational and provider experience with Group Health's pilot implementation of the Patient-Centered Medical Home described in Chapters 6 and 7.

Chapter 5: Provider Experience With Patient-Centered Access

This chapter presents an original study of physicians' perspectives on the Group Health Access Initiative, and their experiences working with ICT in the context of this organizational redesign strategy. As described in Chapter 4, from the organizational perspective the primary intended roles and effects of the ICT in the Initiative were to improve patient access to their providers and healthcare services, expand their choice options for how and when to secure access, and to simultaneously generate the service utilization, production, and cost efficiencies required so sustain the organization's viability. This study primarily aimed to elicit providers' perspectives on the extent to which these desirable effects were being realized, the intended and unintended consequences associated with implementation of the various Access Initiative components, and the direct and indirect roles played by ICT in creating or mediating these effects that may influence their individual adoption decisions as suggested by Diffusion of Innovations Theory.

The study described in this chapter served as the basis for an original peer reviewed journal article that was published prior to submission of this dissertation to the University of Washington Graduate School. The abstract of this published manuscript is included as Appendix E - *Tufano JT, Ralston JD, Martin DP. Providers' experiences with an organizational redesign initiative to promote patient-centered access: a qualitative study. Journal of General Internal Medicine. 2008;23(11):1778-83.* Verbatim segments of it are used throughout this chapter and are enclosed in quotations and referenced accordingly.

Supplemental material pertaining to the study findings, methods, and analytical procedures not found in the published manuscript is also included here. Appendices C and D also contain additional detailed information and documentation pertaining to this study, and may be particularly helpful in addressing questions about study design, data collection/fieldwork, and analysis.

5.1 Study Introduction and Background

"Patient-centered access is a philosophy and a method that supports efforts to redesign health care delivery systems to deliver higher quality care and to better meet the needs and preferences of patients. Providing patients with access to the health services, information, and resources they desire when they desire them honors patient choice and may yield higher-quality care and better health outcomes.[241]

Successful implementation of patient-centered access requires care providers to adopt three organizing principles in pursuing their reform efforts – providers should work at the high end of their expertise; care should be aligned with both patient need and preference; and providers should serve when service is needed.[242] Information and communication technologies (ICT) may enable each of these organizing principles. Advocates of patient-centered access specifically call for the use of electronic medical records and computerized clinical decision support, examination room terminals, and online patient-provider communication (e.g., e-mail) in promoting patient-centered access reforms. [243]

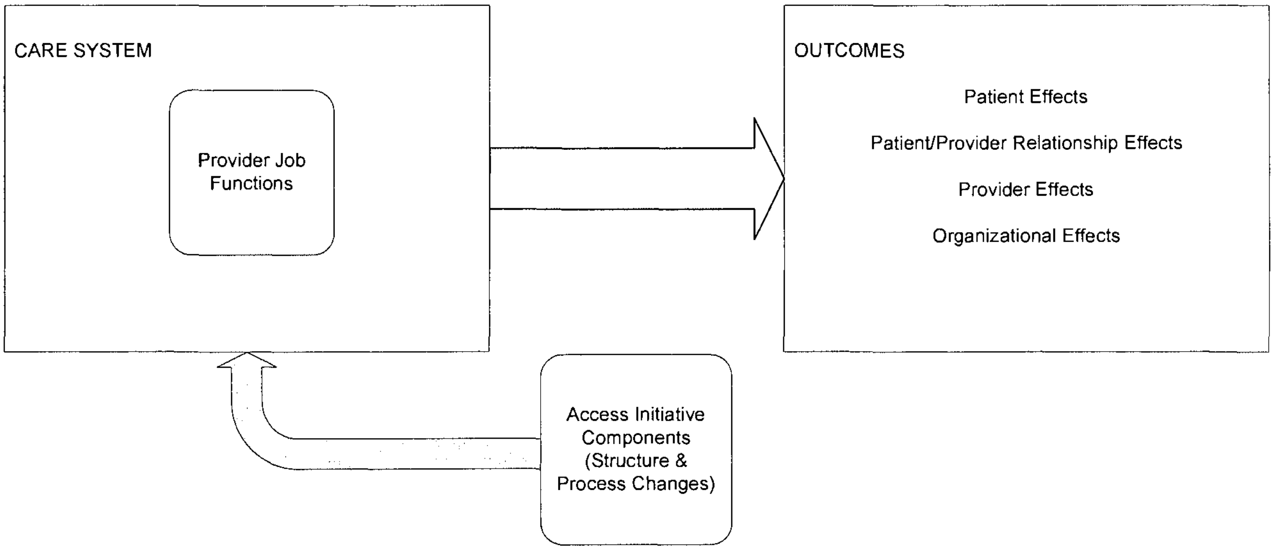
Successful implementation of these technologies requires substantial organizational redesign in order to support their integration into providers' routine systems of work.[244] [245] [246] The challenges associated with catalyzing and sustaining providers' willingness to engage in these changes are often cited as the key determinants of success or failure of ICT implementations.[247] [248] Understanding the impact on care providers and their relationships with patients will be fundamental to achieving the goals of widespread health care ICT adoption, patient-centered access, and other pressing health care quality and safety reforms.

The overall objective of this research is to elicit, describe, and characterize the effects of a six-year ICT-enabled patient-centered access improvement strategy from the care providers' perspective."[249]

5.2 Study Design & Methods

This qualitative study of provider experience involved semi-structured interviewing and qualitative content analysis of verbatim interview transcripts using a phenomenological approach to analysis. The organizing template for the study that informed the approaches to both data collection and data interpretation is presented as Figure 5.1. The interview discussion guide and intial interview transcript indexing codes were derived from this framework, which is based heavily on Donabedian's framework described earlier in Chapter 3.

Figure 5.1: Study organizing framework.



5.2.1 Setting and Context

During the 2000 to 2006 time period Group Health pursued an ensemble of strategic initiatives aimed at promoting patient-centered system reform and improved patient access. This organizational redesign strategy, referred to as the Access Initiative, comprised five components implemented in phases between 2000 and 2005 (see Chapter 4). The organization also concurrently pursued implementation of the EpicCare Ambulatory EMR, a commercial clinical information system (CIS) that was integrated with their MyGroupHealth patient Website[250] via the product's MyChart module.

5.2.2 Participant Sampling

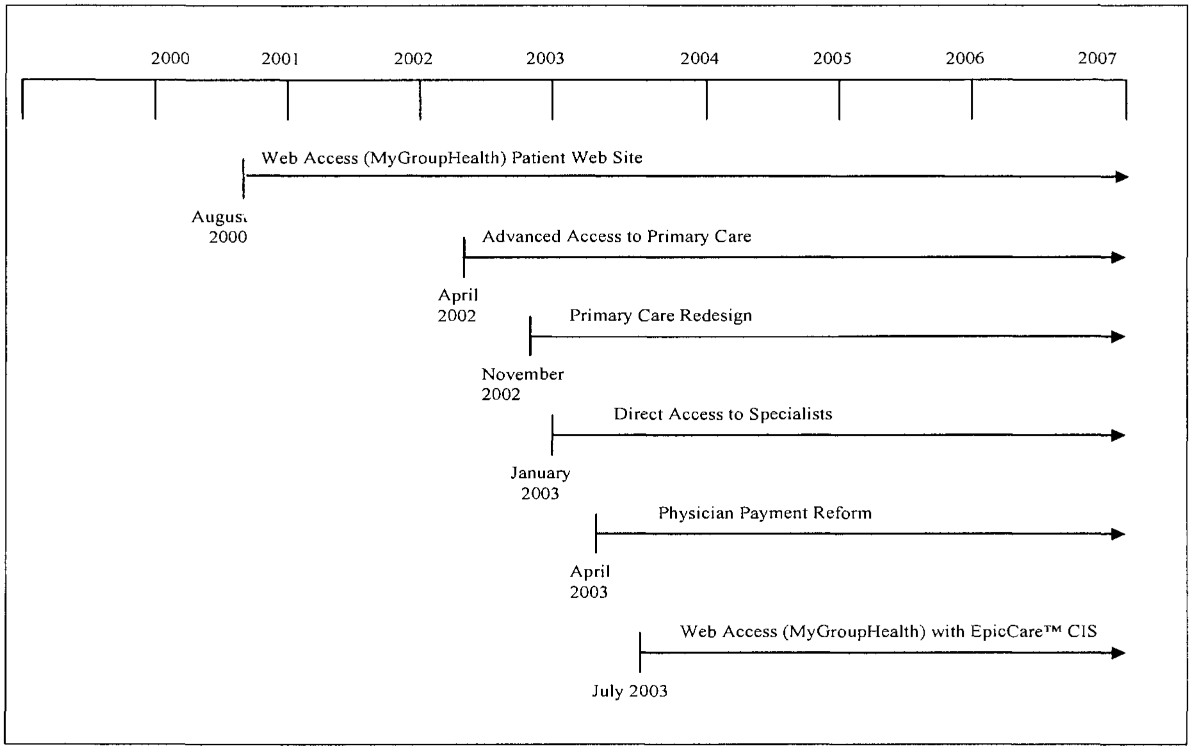
"Twenty-two care providers representing fourteen medical specialties were recruited from seven purposively-selected Group Health practice sites, representing a 23% rate of participation among eligible providers solicited via interoffice mail. Participants worked at least 50% time performing direct patient care activities. Participants had at least five years of tenure with Group Health to ensure they had direct experience with the Access Initiative. The practice sites were purposively selected to maximize diversity of clinic and patient characteristics. Parameters used for purposive sampling of practice sites included urban versus suburban location and the presence or absence of specialty and primary care provider co-location within the given clinic facilities. Sites were also purposively sampled to ensure diversity of patient socioeconomic and demographic traits. Participants included eleven primary care physicians, five medical specialists, five surgeons, and one physical therapist."[251]

5.2.3 Data Collection

I conducted in-depth, semi-structured interviews in participants' offices or homes between November 2005 and March 2006. A diagram illustrating the components of the

Access Initiative and the CIS implementation and their respective timelines was used to facilitate discussion (see Figure 5.2) along with a standardized interview guide consisting of ten open-ended questions designed to elicit participants' perspectives on the Access Initiative (see Text Box 5.1).

Figure 5.2: Access Initiative Diagram Used During Interviews



Interview duration averaged 45-60 minutes. All interviews were tape recorded, transcribed verbatim, and de-identified prior to initiating analysis. The 22 interviews yielded a corpus of 295 pages of Microsoft Word transcript documents (113,939 words) that were converted to .rtf files and loaded into the AnSWR software application[252] to facilitate content analyses.

Text Box 5.1: Access Initiative Participant Interview Guide

1. How does this diagram agree with your views of what Group Health had done to promote patient access in the past five years? What parts would you delete or add?
2. In your view, what are the goals of the Access Initiatives?
3. Will the Access Initiatives achieve these goals? If yes, then how? If no, then why not?
4. What is your opinion about the Access Initiatives? What parts of it have worked well, what parts have not worked well?
5. What are the elements of these initiatives that are reducing patient access to care? Improving access to care?
1. What elements of these initiatives have affected you as a provider?
    a. Of those elements of work that have become harder, which are worth the extra effort?
    b. What is the net effect of all of these changes on your work life?
    c. Would it be better to go back to doing things the old way?
2. How do you think the initiatives have affected your patients?
    a. How do you think the initiative affected the clinical quality of care?
3. What changes would you recommend to improve the Initiatives?
4. What are your thoughts on the challenges associated with delivering both population-based care and visit-based care?
10. Are these initiatives in line with your philosophy of care?

5.2.4 Analysis

Verbatim interview transcripts were subjected to qualitative content analysis using a hybrid template/editing organizing approach.[253] [254] Transcripts were organized and their contents were initially indexed using a codebook developed from a preliminary organizing framework (see Figure 5.1 and Appendix C). Text segment reports were generated for each index code, and then subjected to open coding. Open coding yielded thirty-two unique emergent concepts, which were clustered to form eleven concept classes or "emergent themes (see Appendix D). Each theme was assigned a unique code definition and explicit rules for application to the transcripts (i.e., text segment inclusion and exclusion criteria).

Multiple coder triangulation was used as a research trustworthiness strategy to mitigate risks of interpretive bias during data analyses. The emergent theme codes were independently applied to each of the transcripts by me and by my committee member

James Ralston, who met with me repeatedly to compare results, discuss discrepancies, and refine code definitions and application rules. A third co-investigator coded a subset of the transcripts and also served as the designated arbiter if cases of inter-coder discordance could not be resolved by discussion. No such instances arose during analyses. The themes were also subjected to a member checking procedure in which a document describing each of the nine emergent themes was presented to and discussed with six of the study participants who were randomly selected from three purposively-selected practice specialty categories – two primary care providers, two medical specialists, and two surgeons. All findings were deemed representative by these participants, and no revisions were required.

5.3 Findings: Provider Experience Themes

The provider experience themes that emerged from the analysis are reported on a theme-by-theme basis with illustrative verbatim participant interview quotes. These findings apply across all study clinic locations and provider types (i.e., surgeons, medical specialists, and primary care providers), and represent the participants' perspectives on the effects of the Access Initiative in aggregate. Cases in which themes are more strongly attributed to specific components of the Access Initiative are noted.

5.3.1 Improved Quality of Care

"Providers believe that the Access Initiative improved the clinical quality of patient care. Specifically, providers reported that their use of the CIS enables them to better coordinate care and to provide more effective care during patient encounters.

> *"...the way in which [the CIS] can help me organize care for my patients is a major leap in primary care. It is significant as far as my ability to give a lot better care to folks." -PCP"*[255]

> *"...all good care has an error rate and some of our computer systems, our pharmacy with its interaction profiles, really, really, really tries to manage that. It's awesome. And praiseworthy." –Surgeon*

> *"I think it is affecting clinical quality, I think clinical quality is going up." –Medical Specialist*

> *"In a lot of ways it's better because you organize the information better, other people know what your thoughts are better." –Medical Specialist*

Even among providers who were particularly critical of the CIS (which included surgeons, medical specialists, and primary care physicians), none advocated for abandoning the system or "going back" to paper-based systems when explicitly questioned in this regard."[256]

> *"The nice thing about the system is that the output and coordination of care is fantastic. So I don't think any of us want to go back. But we need to figure out how to utilize it a little more effectively." –PCP*

Providers expressed enhanced abilities to provide better care largely as a result of improvements to information transfer and enhanced shared situational awareness of patient care trajectories enabled by their own and others' uses of the CIS. However, analyses revealed somewhat contradictory perspectives on care quality effects.

5.3.2 Compromised Population Health Focus

"Providers from all specialties expressed concern that pursuit of the Access Initiative compromised their ability to provide effective population-based preventive and chronic care."[257]

> *"Who has time for it? Population based care is like the big picture. But we're overwhelmed with the day to day requirements of the patients we're sitting next to... population based care generally gets lost I think... I think the support and incentives aren't there to do really good population based care. It takes time. Time that we - time that's being allocated to just keeping up with - yeah, it's very hard. It almost has to be a hobby, your hobby to do it. But it's something after a full day of seeing patients in the office to start thinking about what would you do for the population of breast cancer patients? That's just very hard to do." –Medical Specialist*

> *"We just are busy seeing patients one at a time, and we don't see the big picture... ...there's less of an emphasis on it. ... we don't have anybody focusing on it systematically." –PCP*

> *"You know, the population based care, we kind of fit into the corners as best we can... I happen to have a superb nurse who can understand priorities and she goes independently with it and sends things back to me. But sometimes months go by before she'll have a chance to review what's up with my noncompliant diabetics or whatever. The other piece that I think is really missing in our system is providing some personal support for people dealing with chronic diseases. So my model, because I'm 30 years into this work, is sort of establishing a relationship with a primary physician and coming in when you have questions. And that simply doesn't work anymore. We haven't really come up with what's going to fill the gap." –PCP*

Because population health management has traditionally been a strength of Group Health and a fundamental facet of its organizational culture, for many of the study participants this was a particularly troubling and personally dissatisfying consequence of pursuing the Access Initiative."[258] This finding also suggested that not all dimensions of care quality were positively affected, and that participants were concerned that patients' preventive and chronic care needs were being neglected as an unintended (although arguably not unanticipated) consequence of the Access Initiative.

5.3.3 Improved Patient Satisfaction

"Providers reported that the Access Initiative improved patient satisfaction. Advanced Access and Patient Web Access were cited as particularly effective in achieving this outcome.

> *"I think patients are really happy with the access. I hear that a lot. They're surprised that they could get in when they wanted to. ...And then the patients that use the Web system have in general really been pleased with it, very happy with it." –PCP"* [259]

> *"I think that direct access improves the satisfaction of the people I see."*
> *–Medical Specialist*

> *"Patients adore being able to look up stuff on the computer, like their labs and stuff. The patients adore secure messaging." – Surgeon*

"Many participants suggested that fundamental changes in the patient-provider relationship resulting from the Access Initiative contributed to the improvements in patient satisfaction.

> *"Advanced access to primary care and access to specialists I think has made them feel empowered." –Surgeon*

Furthermore, participants commented on the strategic impact on the organization associated with these improvements in patient satisfaction.

> *"I know patients are happier, they're more satisfied. And we are more competitive in the marketplace." –Surgeon"* [260]

Patient satisfaction increases represented desirable anticipated consequences associated with implementation of the Access Initiative, and participants attributed these effects at least in part to patient's use of the MyGroupHealth Website and their collaborative uses of secure messaging with their patients as an alternative and/or complement to access via in-person office visits.

5.3.4 Increased Provider Workload and Inhibited Pace of Work

"The Advanced Access and Primary Care Redesign components of the Access Initiative explicitly called for increases in primary care provider productivity in terms of daily patient encounters. However, participants commented that the Access Initiative also increased their workload in other ways. Providers reported that their use of the CIS and secure messaging created significant volumes of new work for them (e.g., data entry, documentation, managing the message inbox), slowed them down during patient encounters and ultimately extended their work days.

> *"There's nothing I do now that wasn't faster with paper." –PCP*

> *"[The CIS] slows me down." –Surgeon*

> *"[Secure messaging] is just more work you didn't have to do before. ...I mean some of it saves visits or saves phone calls because the people may have called otherwise. But there certainly is a proportion of it that people do because it's so convenient. They wouldn't have otherwise picked up the phone or otherwise made an appointment." –PCP"* [261]

> *"Today it's the computer, just the messages from either various practitioners, many, many messages from patients, and what it's done is compacted the office day and it's lengthened both ends of it." – Medical Specialist*

> *"I think in some ways it's made me more efficient, in other ways it's taking me a lot longer to do the same things I used to do." –Surgeon*

> *"Epic hands down does decrease access just from the sheer fact that it takes longer to do everything – from the medical assistant or LPN putting patients in the room to the physician going in there and doing the documentation as you go along... I think if you really surveyed the docs what you'd get is the majority would say it adds time to your day hands down. We wouldn't go back, but it adds time. I can't see as many [patients] as I used to." –PCP*

"Some participants also commented that this was not a transitional phenomenon attributable to a technology use learning curve and that a certain degree of ICT-associated provider productivity burden might be unavoidable.

> *"I had our CIS guy come and follow me around one day. I said 'There's gotta be something that I can do better because this is ridiculous. A year into this now I should know what I'm doing.' And he said 'Well, you're using a lot more tricks than most people, you've got good preference lists'. So that for like a hypertension visit for the first time I've got a whole list of things that I can go click, click, click, and so I can sort of do those quickly. ...So that's part of what I can't figure out is, there are things that clearly save steps, where clearly it's so much faster. So why am I working two hours extra a day, literally? ...I'm probably doing 13-15 hours more per week at home on the computer."– PCP"*[262]

"Epic's increased the work. More of the work shifts to the physician. More of the work has the potential to shift to the physician." –PCP

"Whether we want to admit it or not, you can't work as fast in a computer system as you could in a paper system where you check boxes and draw a line and do that." –PCP

"And the only way I see - and of course that's the impossible way - is we need more money to hire some extra staff... more bodies, yeah. Because it's not just the people-to-people work, the face-to-face work. For some reason that is not obviously clear to me, there's more work with Epic and it takes more time. " –PCP

"I have mixed feelings about Secure Messaging... I've actually stopped in the last few months encouraging new people to sign up because I'm being overwhelmed by emails... if you have 15 emails a day - and I've tracked how long it takes me, an average of 3 minutes, some longer, some less - that's 45 minutes extra a day! That doesn't come from anywhere but my hide." – Medical Specialist

"We kept thinking all along that there was a way to do Epic, and that if someone just showed us that way and we worked hard enough, then it would be the way we were told, that it was really efficient and it was wonderful and it was going to save us time or at least not make more time and everything was going to be great about it, and it's just that we didn't get it (laughs) you know? But we could 'get it', you know? And it turns out that's not true at all. There is no 'way'! There is no one way, there is no one person - we're it, we're doing it, and that just seems odd... I guess you think because it's computers and technology that there's some truth out there, but it turns out it's just as mysterious as the rest of medicine... there are wonderful things about Epic, the after visit summaries are wonderful, pharmacy doesn't have to read people's writing and things go right to where they're supposed to be going. But there is

> *nothing that I do in that system that wasn't quicker before…It's not clear to me why it's worse to be honest, but it is. It takes longer than it used to be when it was on paper and I'm not sure why." –PCP*

The "new work" for providers that resulted from their own and others' uses of the ICT (e.g., responding to incoming patient Secure Messages) combined with the indirect effects of ICT facilitating the redistribution of tasks formerly performed by others to the physicians while simultaneously inhibiting their pace of work had the net undesirable effect of extending physicians' daily working hours as more of their time was required to complete work that did not entail direct patient contact.

5.3.5 Patient-Provider Relationships Were Affected

Participants expressed that the Access Initiative and the use of ICT affected patient-provider relationships. It was suggested that Secure Messaging and exam room use of the CIS in particular changed the ways in which physicians interact with their patients. However, participants' comments varied widely regarding the nature of these changes and their desirability. Relevant comments included affective descriptions of the effects on relationships as well as more factual descriptions of perceived changes in communication practices, and carried both positive and negative connotations which varied by participant.

> *"It does impact on how you interact with patients." –Surgeon*

> *"When you order it's hard to really order and look at the patient. It's distracting because I'm still doing my thing, but I think it does take something away actually… Yeah, I don't think communication is quite as focused. You get distracted by putting in orders and finding diagnoses to link with the orders, link with the medications or whatever you order." –PCP*

"I think it's given a sense they feel that they have more power." –Surgeon

"It is making the patient feel like they have a stronger connection and ultimately I think that's a good thing." –PCP

"And it certainly makes the patient's experience better when they come on their first visit from someplace else because we know what they're here for. We now start right in on 'The doctor said that you were taking out your garbage', and they say 'Oh, did they write that down?'... So every time we go in the door we know what's going on and that wasn't the case before Epic. It was 'Now tell me – what happened?' But people really love that you know why they're here." –Medical Specialist

"Well, and the other theme I think that I've tried to thread through this is the notion of the relationship between the patient and the primary care doc. Which I think has really gotten diluted with a lot of these initiatives and if we are an evidence based organization, I think there is to whatever extent studies are out there, there's evidence that that relationship is what patients value, what keeps them staying with the particular product rather than choosing another and also adds to quality care to the extent that you can have an understanding of the human rather than the body part. So I would like to see more support around fostering those relationships and I don't think fracturing those relationships has been anybody's goal with these initiatives, but I think it's nonetheless been an unintended result just because of how fragmented things get when we're always running to catch up rather than able to sort of take scope on things and figure out what's going to be best." –PCP

"The patients like the more material you can give them and they like to feel appropriately that you know about them. And when they see how much you can

> *mobilize their past history of physicians, it's very integrated, it makes us all parts of the team." –Surgeon*

> *"The portal?...It puts a little bit of responsibility for things falling through the cracks on them, actually." –PCP*

In short, participants expressed that their relationships with patients were noticeably affected by the Access Initiative and by their uses if ICT, but analyses did not reveal any consistent or universally-expressed opinions on the net effects as being positive or negative. Because the interview data could not support a more refined explication of this theme, it was reported but not discussed in the published manuscript. Unfortunately an additional cycle of fieldwork was not feasible at the time.

5.3.6 Decreased Provider Job Satisfaction

"Interviews also revealed that provider job satisfaction suffered in primary care and some medical subspecialties due in large part to the workload increases and productivity pressures cited above."[263]

> *"I just heard we're getting a raise for next year. I would gladly take that raise and get rid of it and not take it - I would take a salary cut, if I could get home at 7:30 at night and not have to do extra work. I'd be happy. And I used to - I felt I worked hard but once I was home I was done. Now I can get home and sometimes a little earlier for dinner, but I'll get home at 7 or occasionally even 6 if I need to because I can do the work from home, but it's a lot more of it. I think a 12 hour day is just a typical day, that's what you sort of expect - I'm not happy with it being routinely 15 hours." – PCP*

"If you're only looking at it from the patients' standpoint, it's good, good, good. They get you by beeper, e-mail, phone, a million ways to get you. But I think what Group Health is overlooking is the impact on the providers, what's their satisfaction?" –Medical Specialist"

"I think what hasn't been thought through, which is where I'd like to see this continue, is the doc really doesn't have time in his day [for Secure Messaging] - I don't know that we were prepared on our end to receive all the "Hey, I had gas today, is it my heart?" You know, for those of us who don't type real quick or who have really tight schedules with rounding, I find myself answering these questions very late at night or very early in the morning, really on off hours. That may be impinging our time, and I think that just relates to the physician satisfaction which I can say for the grand majority of us, it's been impacted. And it's all nice to do this, but the price to be paid I think has come from somewhere and that's what I'd like to see just kind of rectified a little bit... we're very motivated, and I think Group Health is fortunate in that they've got a good staff that's willing to do this and stay here all summer to learn Epic and all that. But there's definitely a price to be paid that I think is being completely overlooked, if you were to ask me." –Medical Specialist

"There are times where you simply can't do what you need to do because you don't have time to think and reflect, and sometimes a week or two goes by before a day happens, like yesterday where I decide to give up my personal time to sit down and do the thinking and reflecting I need to circle around and finish up something in a way the patient deserves. So that's one piece, and you know, having said that, professional model for physicians always involved giving extra, and I don't begrudge that, it's just I can't do it every day all the time. It has been a couple of years since I've had lunch. I eat at my computer while I'm doing my charting or looking through my results or other in-basket functions and that's pretty much the way it goes. Sometimes I'm lucky to empty my bladder before I have to run out to catch my bus at

> *the end of the day and that's really not okay. I think I'm reasonably efficient as well. So I don't own that a lot of this problem resides in my capacity to figure out what I need to do and prioritize." –PCP*

> *"In my experience especially in the latter years, I was kind of experiencing progressively more and more professional dissatisfaction because a lot of that quality of care depended upon contact time, the ability to develop enough empathy or understanding of the situation. It became very technically proficient but it was less - I hate to use the word humane, because it wasn't inhumane, but it was less sympathetic, empathetic... I much more enjoyed my previous twenty years at the Co-op than the last five." –Medical Specialist*

"Primary care providers also mentioned the long hours of constant interaction with ICT as a source of frustration and job dissatisfaction.

> *"The [CIS] inbox... you've got this red flag all the time, I think that's part of the burnout for folks, which is you're constantly on alert as the stuff is coming at you. And we don't let air traffic controllers work for longer than X number of hours in that sort of environment, and they get set breaks that are there, but we don't do that in medicine. And so you get people who are doing that for 10 and 12 hours a day now, coming home and doing it on their home computer, and there's this absolute exhaustion that occurs with that, that with just sleep or even breaks or rest, you do not recover from." – PCP"*

The last participant quote illustrates how routine and frequent interactions with ICT had a direct undesirable impact on providers. Combined with the previously-discussed indirect effects of increased provider workload and inhibited work pace, these effects yielded the undesirable consequence of significantly reducing providers' job satisfaction.

5.3.7 The Patient-Centered Access Model is Unsustainable As-Implemented

Participants expressed that the sustainability of Access Initiative's gains and continued progress towards achieving its objectives would require further changes at Group Health, and that maintaining the status quo was not a viable option. "In the context of discussing the impact of the Access Initiative on provider satisfaction, many participants also expressed concern about the sustainability of patient-centered access, and of primary care medicine in general.

> *"Yeah, we chose [our profession], but there has to be some balance. ...They're [PCP's] not going to do more practice sharing later on because screw it, they're burned out, they can't do it. ...No, I don't think it is [sustainable]."*
> *–Medical Specialist"* [264]

> *"You know, the net effect of these initiatives has been to totally change every work process that we do... No, I would not want to go back, but that doesn't mean that things are okay as they are. The burnout rate among my colleagues is huge and I think that those of us that have managed to retain some semblance of balance do it by almost unacceptable levels of compromise. Either for ourselves and our personal time or what we define as good enough care... We didn't get to where we are today by saying 'Ah, easy come, easy go, I'm doing the best I can, and if I don't feel like it, well, you know' - that's not what we're here for... The burden of multi-tasking that Epic and secure messaging and our appointing schedules for three patients an hour requires is really punishing... I'm exhausted... Something's gotta give somewhere."*
> *– PCP*

"Participant opinions varied about the likelihood of reversing these trends via additional organizational change efforts. While some expressed hope that further changes required to sustain primary care and patient-centered access were imminent, others expressed more pessimistic views.

> *"The way in which [patient care] is structured it has shifted such an increased amount of work onto primary care that it is not sustainable at all, so I'm actually looking to get out of primary care because I can no longer work at that pace." –PCP"*[265]

> *"They won't come to work with us because they think we work too hard. We have very few residents come here." –PCP*

The unintended consequences of primary care provider burnout and inability to recruit new primary care physicians were not the only examples of indicators cited by participants that the Access Initiative yielded some unsustainable practices, and that systemic changes would be required to continue progress towards achieving and sustaining the Initiative's objectives and care quality in general. Analyses revealed several unique instances of unanticipated undesirable consequences that – over the long term – could threaten the sustainability of the care model, primary care, and care quality. While these findings did not emerge as "saturated" themes that represented the perspectives of all participants, several of these unique manifestations of potential threats to sustainability are worthy of note.

"Perceived tradeoffs associated with short-term provider productivity and patient access gains included stagnation of providers' clinical knowledge and erosion in the quality of clinical documentation resulting from over-automation of electronic data entry.

> *"I don't read medicine anymore. I don't have time." –PCP"*[266]

> *"Certainly we're losing some information... there are a lot of Epic notes that I think are poor quality because there's so much that's cut and pasted into the notes that just finding out what really is pertinent as opposed to what has been documented is difficult and time consuming. Because we do have to document which, you know, for medical, legal purposes, billing purposes, but so a lot of the cutting and pasting is really to make sure there's adequate documentation, but it really doesn't help the next physician." –Medical Specialist*

> *"I think the note quality has decreased... More often that not, I think the family practice notes - the non-specialist notes in particular - are boilerplate, and I sometimes don't know what was going on from that." –Medical Specialist*

Some participants also commented on the need to address unintended adverse consequences associated with the Access Initiative and CIS implementation in order to sustain acceptable levels of care quality.

> *"I think it was really clear that the priority of the Coop for the last couple years has not been the chronic care issues and so we're kind of going back now and saying 'Okay, we've got these systems in place, how can we use them to help with that?' So it's coming back on the table and becoming more a priority but once again, as a patient satisfier? We could have the best quality in the world and it's not necessarily that they're going to pick us." –PCP*

> *"I would make sure that there is attention placed on the relationship. That access without relationship is not a good thing in health care." –Medical Specialist*

> *"The major issue I have with quality of care is workload, not having time to reflect, not having acknowledgment that that is what I need to do in order to provide quality care and give quality relationships with my patients." –PCP*

Participants' views varied on the likelihood that additional changes required to address these undesirable effects would be realized, but all participants expressed that changes would be required in order to sustain the achieved gains and to make additional progress towards the Access Initiative's objectives.

5.3.8 Good Ideas That Suffered From Poor Implementation

Some components of the Access Initiative – and the ICT – represented good ideas and strategically-sound concepts that suffered from sub-optimal implementation. Two commonly-cited examples of this perspective included suboptimal elements of the CIS' design that yielded usability issues, and the implementation of Direct Access in specialties that were understaffed or that had not yet implemented Advanced Access scheduling and capacity management practices.

> *"Direct access to specialists... If there's a specialty that a patient can get into in a reasonable timeframe, if they can get into a specialist when they call up in that timeframe it all goes fine. If they can't, then what specialty scripts is 'Well, this problem's more emergent than that, so you probably should go to primary care and talk to them about it'. Because one of two things can happen, and they're actually right - either we can take care of it, because sometimes people think they need a specialist and they don't, or if it really is emergent, we're good at triaging that and we can call up the specialist and say 'Hey, I think this person's got a brain tumor, you need to see her sooner'... It looks good but it doesn't work." –PCP*

> *"Getting all the staff onboard and specialty to realize that we all work for the same organization, my patient is your patient, to not punt work back to the primary care office... From the primary care side, at times that seems to be a barrier. Someone who calls [a specialist] should never hear 'Well, we can't get you in, but if you call back to your [PCP's] office, and they call us back...' That just isn't right." –PCP*

> *"It's the execution of it. I like the intent [of the CIS], I like the idea, I like being able to get all this information at my fingertips. But for the amount of money that it costs, it's just stupid...It's sort of like it was one department's project to do this panel and another department's project to do this panel and it's not human engineered, I guess... It could be more intuitively obvious. " –Surgeon*

> *"Things that should have maybe worked better, for instance, are Epic alerts about drug interactions. They pop up so often that I have alert fatigue and I just ignore them and close them out without reading them now." –Medical Specialist*

5.3.9 Inherently Bad Ideas

In contrast, providers also claimed that some components of the Access Initiative were inherently bad ideas or contextually inappropriate strategies. While opinions varied about which specific components were "bad ideas", the primary care physician variable compensation model and the timing and nature of primary care redesign were examples cited by many participants.

Primary Care Physician Variable Compensation

> *"The variable compensation and all the rest - is based on stuff that is just stupid. Through-put of patient means nothing as far as quality of care, absolutely nothing. Yet if that's what you're going to compensate, that's what you're going to get... I think the organization was in survival mode and made survival choices, but survival choices that I think were basically wrong." –PCP*

> *"Like I said, the variable compensation - it is silly for an HMO that is trying to keep its people healthy to do that. It's almost - I don't want to say it's insulting but it sort of is like 'You're not working hard enough, here, let's promise you some more money*

if you see more patients.' Well, I'm already seeing as many patients as you send me, you know? ...So that I would just - that was just wrong." –PCP

"I think that the productivity piece should be done, monitored – but that's what leadership and administration's for, to make sure the staff is productive. I think you should tie the variable piece to outcomes, to immunization rates, to aces and statins, diabetics with hemoglobin A1-c's below a certain level. It just doesn't feel right tying it to the visits. I think there are better ways to keep – there are better ways to manage the productivity component other than citing the salary... Manage the low performers and basically say 'Look, you're an outlier, and this is what the standard is, you're below the standard and this is what'll happen if this doesn't change'." –PCP

"You know, to be honest, variable comp I think has just been a can of worms and I personally think it should just go away. ...And I've made money every time so it's not like I've lost, you know? ...It sends the wrong messages and - I just don't like the way it feels... Pay us what's fair – really, take that money and hire another doc here then, because that's the only thing that's going to get us out of here earlier every night is another body to see the patients, one less inbox to cover, you know? Less non face-to-face work. Because they're spending a ton of money in variable comp, and I'd rather see it in bodies. Because... the money's fine, but on a day-to-day basis everybody's here way too late, not spending enough time with their families. That's where I'd like to see the money put, you know? Screw whatever numbers they're counting – give us the bodies so that we can – whatever it takes for people to feel like they have a life." –PCP

Timing and Nature of Primary Care Redesign

"Well, it's no secret that they cut too deep. So I think the impact [of Primary Care Redesign] on morale and the feelings that primary care is at the bottom of the list as

> *far as where things roll down to, sort of just made that all worse. And I think we're still suffering from that negativity around what happened with primary care, really felt that we were screwed." –PCP*

> *"Just about as soon as we reached advanced access and doctors were surprisingly happy, content and enjoying their schedules, they fired a bunch of PA's and we've lost advanced access and we've never gotten it back. We were there, they convinced us. People worked their vacation days, they worked their days off to get down to advanced access, and... It was 'Oh my gosh, this really does work. This is fantastic.' At which point there was a budget crunch, they fired a bunch of people, we lost advanced access, and pretty much everybody just said 'Well, forget it.'" –PCP*

These last two themes pertaining to organizational intent and competence appeared to offer limited significance at the time that the analysis was conducted. However, these findings suggest that participants viewed the Access Initiative and concurrent ICT implementation as externally-imposed "top-down" change initiatives.

5.4 Discussion and Conclusions

"Providers were clearly pleased that patients noticed and appreciated the improvements in access due to the Access Initiative. They also expressed feelings of satisfaction and fulfillment with their abilities to provide higher-quality patient care primarily as a result of using the aforementioned ICT. However, the results of this study also bring into question the long-term sustainability of ICT-enabled patient-centered access without further organizational redesign. For example, patient-provider secure messaging may not offer the efficiency gains and visit substitution potential its proponents claim. Integration of secure messaging, phone visits, and other electronic patient-provider interactions will require new provider productivity metrics and compensation methods. Fundamentally different staffing models and scheduling methods may also be required to accommodate new demands for these alternative forms of ICT-enabled patient access."[267]

"Specific components of the Access Initiative called for increases in primary care provider productivity without a change to total scheduled in-person patient contact time. When combined with using new ICT, each primary care provider's job required more working hours outside of direct patient contact. This study reveals providers' perspectives on meeting these new productivity expectations in the context of ICT use.

Provider organizations pursuing ICT-enabled patient-centered access might be increasing primary care physician attrition and/or exacerbating provider recruiting challenges. This is particularly concerning given the current and projected shortages of primary care physicians in the U.S.[268] and some of the prominent national perspectives on the value[269] yet questionable long-term viability of primary care medicine.[270] [271] The perspectives of our study participants offer supporting rationale for demonstration studies and pilot implementations of alternative models of care team staffing, clinical ICT configuration, and health services financing."[272]

5.4.1 Study Conclusions

"The success of Group Health in achieving gains in patient satisfaction and care quality as reported by physicians speaks to the ability of provider organizations to undergo fundamental changes in structure, process, and culture in order to satisfy the unmet needs of patients. Providers liked that these reforms are mostly good for their patients, but disliked the negative impacts on their own quality of life – especially in primary care. Further changes and enhancements may be required to sustain ICT-enabled patient-centered access. In the words of one primary care provider:

"I'm exhausted... Something's gotta give somewhere." – PCP"[273]

5.4.2 Study Limitations

“Single interviews with participants occurring over a four-month time period have provided a cross-sectional “snapshot” view of provider perspectives on their first five years of experience with a long-term organizational change initiative. As such, significant shifts in participants’ perspectives that may occur beyond their fifth year of experience with the Access Initiative (i.e., after March 2006) have not been captured.

Also, despite the purposive sampling strategy, self-selection biases may have affected results given the strictly voluntary nature of participation. Providers with relatively stronger opinions about the Access Initiative – both positive and negative – may have been more likely to volunteer for the interviews.

The low participation rate was likely due to several factors. Because no productivity credit was offered to participants who agreed to interviews during regular clinic hours, providers experiencing a comparatively greater sense of productivity pressure may have been less likely to volunteer an hour of their scarce personal time to participate in this study. Participation in this study required providers to volunteer an uninterrupted hour of their time during regular work hours for a face-to-face interview. Given the time-constrained and interrupt-driven nature of the participants’ work environments, participation in this study required a significant sacrifice. The protocol also limited direct contact for recruitment to one telephone call or e-mail following a solicitation letter. No repeat follow-up calls or e-mails were placed to non-respondents.” [274]

5.5 Summary

This study succeeded in eliciting and describing physicians’ perspectives on the Group Health Access Initiative, and their experiences working with ICT in the context of this organizational redesign strategy. Specifically, in relation to the two original research questions posed in Chapter 2, this study found the following:

Question #1: How are primary care providers integrating ICT into their practices, and how is their use of ICT affecting their relationships with patients, staff, and other providers; care quality; and their quality of work life?

Answer #1: Through an incremental, "top-down" approach to practice redesign that produced mixed (+ and –) effects on these relationships; mostly positive perceived effects on care quality; and significant job satisfaction decreases for primary care physicians.

Question #2: What can elicitation and description of provider perspectives teach us about their adoption of healthcare ICT?

Answer #2: That the consequences associated with ICT use in the Patient-Centered Access model – i.e., key determinants of "innovation adoption" – were perceived by participants to be yielding an unsustainable emergent care model.

Furthermore, the nature and extent of undesirable consequences resulting from the Initiative – many of them unintended or unanticipated from the participants' perspectives – suggested several competing forces were at play and raised several questions that warranted further investigation in this organizational setting:

Are the physician workload increase and task redistribution effects associated with the CIS and patient Website implementations reversible or otherwise amenable to change? Must ICT-enabled patient-centered access come at the expense of physician quality of work life? Is there a zero-sum relationship between ICT-enabled patient-centered access and provider job satisfaction?

Physicians reported that the CIS enables them to provide better visit-based care – but can it and the other ICT also serve to enhance and maintain the population health focus required to provide high-quality preventive and chronic care?

Providers suggest that ICT use is affecting their relationships with patients – but how? Are the net effects positive or negative, and what might be the long-term implications for quality of care?

Are these effects and provider experiences inevitable, or were they indicators of a sub-optimal approach to concurrent enterprise ICT implementation and patient-centered organizational redesign? Can other care redesign models or approaches that leverage the same ICT yield better provider experiences and perceived outcomes?

Further qualitative observational studies of organizational and provider experience with ICT in the Group Health Patient-Centered Medical Home (PCMH) pilot provided timely opportunities to pursue these and other related questions. Chapter 6 presents a case study of the organization's experience with the design, development, and implementation history of this prototype care system model, and includes descriptions of its key defining traits and components. Chapter 7 presents a study of practicing providers' experiences with this model, and their perspective on the role of ICT in it and the effects generated by their use of these ICT. Chapter 8 compares and contrasts these findings, and discusses their significance.

Chapter 6: Participatory Design of a Patient-Centered Medical Home Care Model

This chapter presents an original case study of the design, development, and implementation history of the Group Health Patient-Centered Medical Home care model. Descriptions of the design principles are included, as are descriptions of the defining traits and components of the care system model that has emerged from this experience during the first 18 months of implementation – including an inventory of ICT components and their intended use contexts within this model.

Chapter 2 presented a description of the Patient-Centered Medical Home model (PCMH) and its emerging role in current U.S. healthcare reform initiatives, and Chapter 4 presented some of the historical strategic context relevant to this pilot initiative at Group Health. Chapter 7 presents a study of provider and staff experiences working within the emergent PCMH care system model 12 to 18 months post-implementation, and was conducted prior to initiating the study presented in this chapter partly to avoid the potential for biases in data collection and/or interpretation. Provider and staff perspectives on and perceived effects resulting from this initiative were elicited and interpreted first, then followed by this chapter's study of organizational intentions, activities, and desired effects.

Appendix F contains additional detailed information pertaining to study design, data collection/fieldwork, and analysis.

6.1 Study Introduction and Background

Group Health initiated a Patient-Centered Medical Home (PCMH) demonstration in January 2007 at one of its 20 Seattle-area clinics that serves approximately 11,000 adult and pediatric patients. The clinic redesign effort was guided by a set of organizing principles derived from a participatory review of the theories and evidence on the PCMH,[275] [276] [277] [278] [279] the Chronic Care Model,[280] [281] [282] and effective primary care.[283] This chapter presents a case study designed to yield a detailed description of the Group Health PCMH care model; its strategic origins and intended effects; and the guiding principles, methods, and evolution of its design.

As described in Chapter 4, the national and regional healthcare business environment of the late 1990s led Group Health to implement a series of organization-wide redesign strategies between 2000 and 2006. These organizational redesign strategies, collectively called the Access Initiative,[284] succeeded in improving patient access to care and patient satisfaction, but also contributed to declines in primary care provider job satisfaction. [285] [286] During this same time period the utilization of some consulting specialty, emergency room, urgent care, and hospital services increased. [287] The Chapter 5 study of providers' experiences with the Access Initiative provided additional insight into the nature and sources of their job dissatisfaction, which was largely attributed to increased productivity expectations coupled with perceived task redistribution effects and workload increases associated with the CIS implementation.[288]

In 2006, Group Health engaged in various long-term strategic planning endeavors aimed in part at addressing these workforce issues while concurrently sustaining the gains realized through the Access Initiative. It was in this context that the Group Health PCMH demonstration strategy originated.

6.2 Study Design & Methods

This description of the PCMH demonstration was developed using methods of qualitative case study development based on semi-structured key informant interviews and qualitative content analysis of project archive documents. These methods are generally described in the preceding Chapter 3. Specific elements of study design, organizational approach, fieldwork/data collection and sources, document coding procedures, and analytic approach and interpretive perspective are addressed in the following subsections.

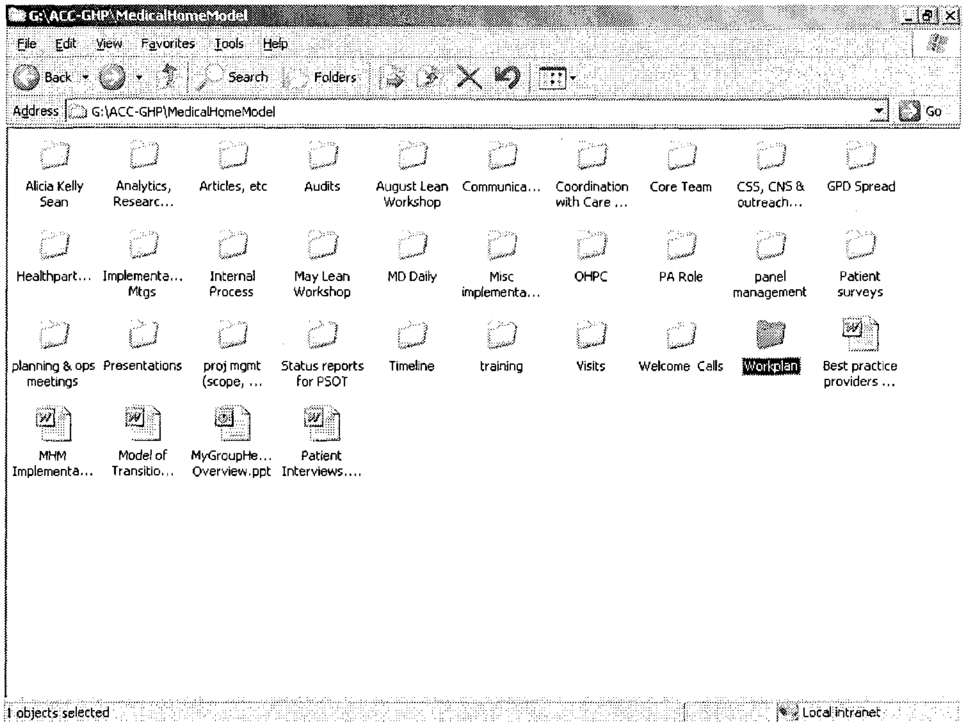
6.2.1 Key Informant and Document Sampling

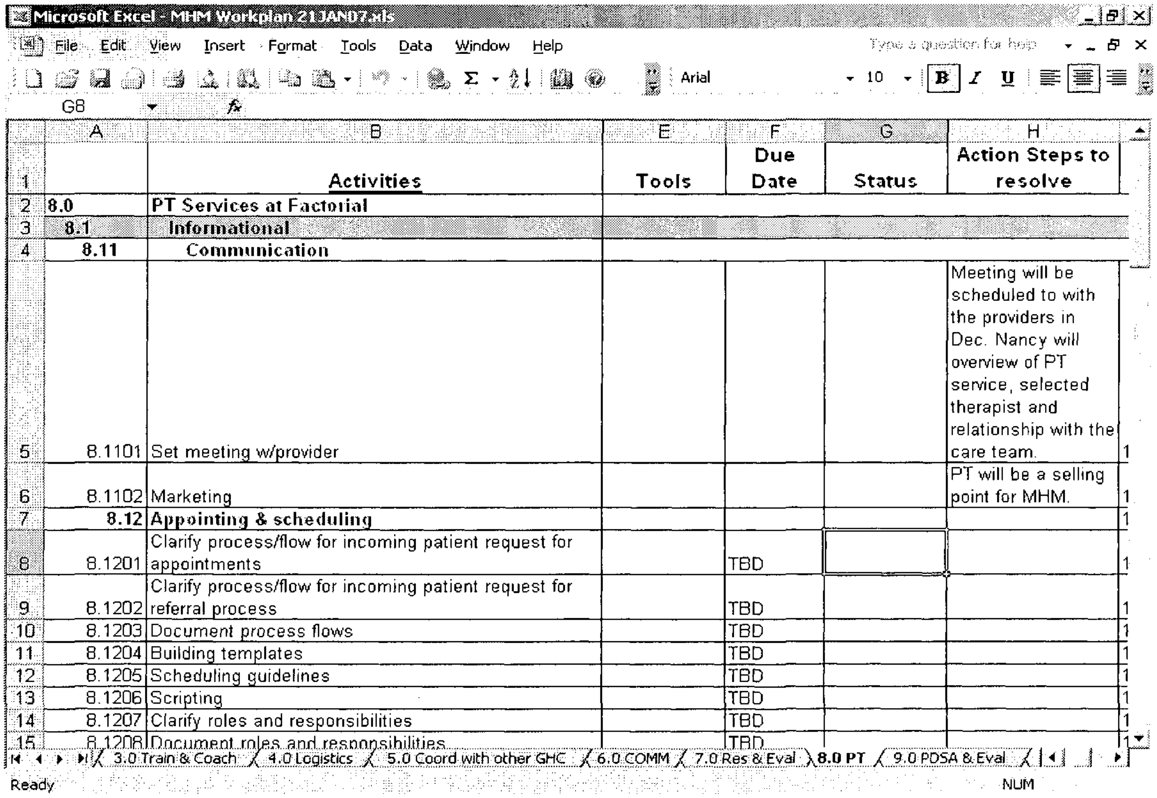
I conducted semi-structured interviews with 10 key informants. Inclusion criteria required that participants had directly participated in leading the strategic visioning, design, evaluation and/or ongoing implementation of the PCMH demonstration. Eight of the participants were directly involved with the initial conceptualization, design, and implementation planning activities, and the other two became involved in later stages of implementation. Nine of the participants held operational administrative and/or medical leadership positions with Group Health at the clinic, region, or executive organizational level. Participants were identified through a snowball sampling procedure initiated with Robert Reid, and were recruited via interoffice email using IRB-approved text.

Interview transcript analyses were also complemented with a review of the project document archive, which contained more than 1,000 documents produced from April 2006 to August 2008. A subset of this corpus (n = 102 documents consisting primarily of meeting minutes, notes, whitepapers, work plans, and presentations) was identified and systematically reviewed. Figure 6.1 provides sample screenshots of the archive structure and contents.

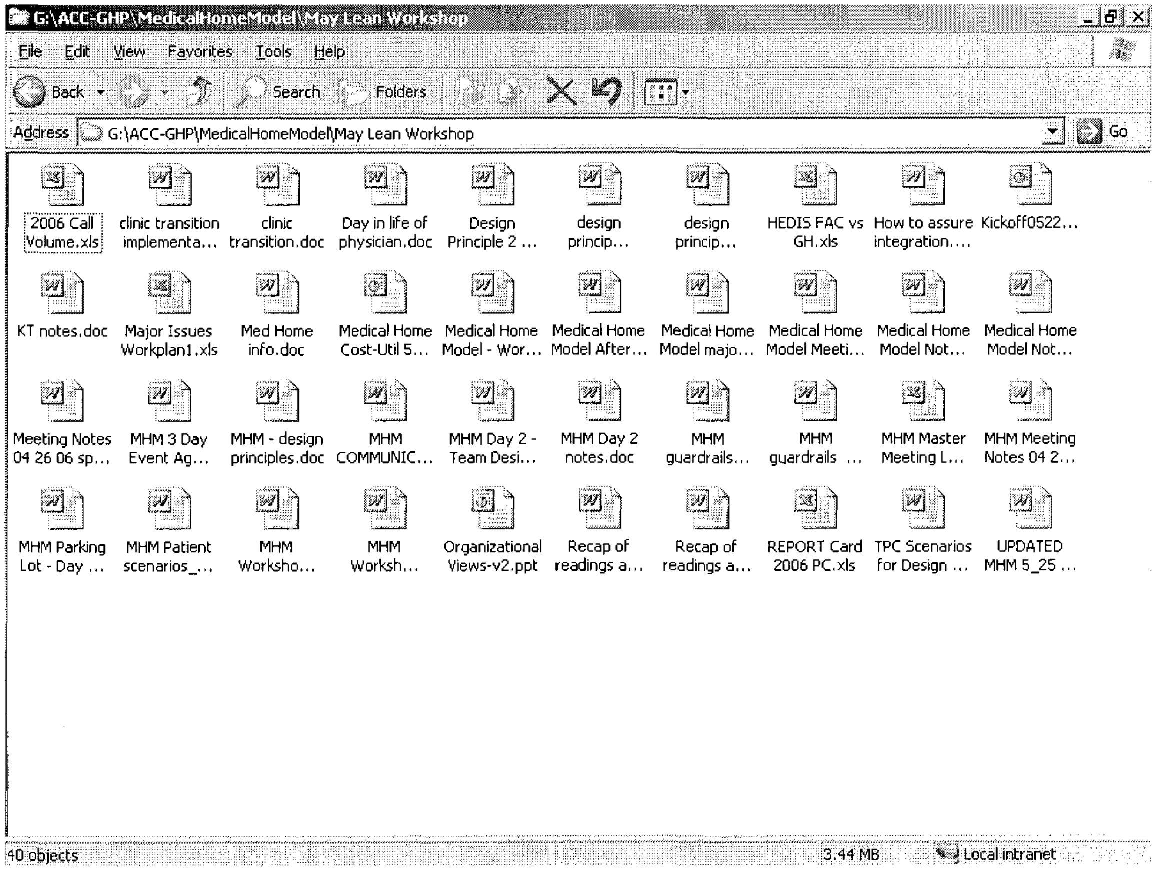
This approach to triangulation of data sources served as a trustworthiness assurance strategy to minimize the risk of recall biases in data collection by comparing participants' responses and comments to the contents of historical text document artifacts. Also, the inclusion of key informants representing three distinct levels of both lay administrative and medical leadership (i.e., local/clinic- , regional- , and executive-level) may have served as a mechanism to mitigate the risk of recall and other biases in participant comments related to their own or others' job performance.

Figure 6.1: Project Document Archive File Directory





	A	B	E	F	G	H	
1		**Activities**	**Tools**	**Due Date**	**Status**	**Action Steps to resolve**	
2	**8.0**	**PT Services at Factorial**					
3	**8.1**	**Informational**					
4	**8.11**	**Communication**					
5	8.1101	Set meeting w/provider				Meeting will be scheduled to with the providers in Dec. Nancy will overview of PT service, selected therapist and relationship with the care team.	1
6	8.1102	Marketing				PT will be a selling point for MHM.	1
7	**8.12**	**Appointing & scheduling**					1
8	8.1201	Clarify process/flow for incoming patient request for appointments		TBD			1
9	8.1202	Clarify process/flow for incoming patient request for referral process		TBD			1
10	8.1203	Document process flows		TBD			1
11	8.1204	Building templates		TBD			1
12	8.1205	Scheduling guidelines		TBD			1
13	8.1206	Scripting		TBD			1
14	8.1207	Clarify roles and responsibilities		TBD			1
15	8.1208	Document roles and responsibilities		TBD			1



6.2.2 Data Collection

Interviews were designed to primarily elicit key informants' factual accounting of the conceptualization and implementation processes of the PCMH demonstration, and their views on the defining components and characteristics of the PCMH care model. Their perspectives on the strengths, weaknesses, or preferred alternatives to the actions taken were not considered in the subsequent interview transcript analyses. Interviews were approximately 60 minutes in duration, and were audio recorded, transcribed verbatim, and de-identified prior to analysis. The IRB-approved interview guide that was used is shown as Text Box 6.1. Interviews yielded a transcript corpus of 176 pages of Microsoft

Word documents (67,965 words) that were converted to .rtf files and analyzed using the Atlas.ti software application.

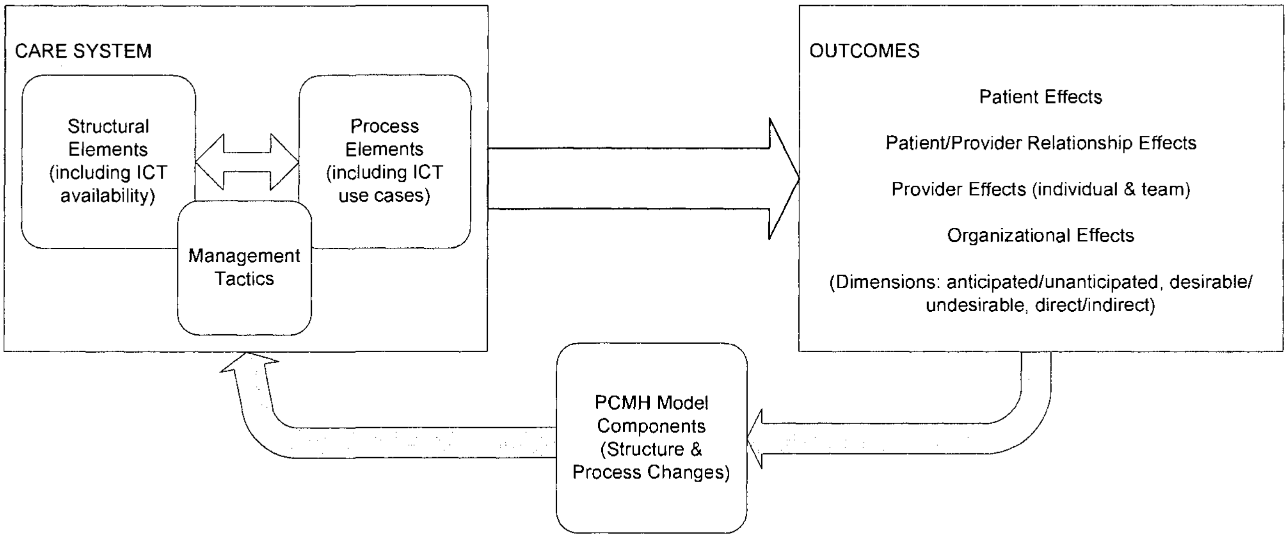
Text Box 6.1: Key Informant Interview Guide

1. Please describe your involvement with the history of the Medical Home Model pilot at Factoria.
2. What is the Medical Home Model?
    - What are its key attributes and objectives?
    - How is it different from the current "standard practices and models" at Group Health? In the larger community of primary care practices beyond GHC?
    - How is it different from the "standard practices and models" that were in place at Group Health five years ago?
    - How is it different for patients?
3. How were these concepts and design principles of the Medical Home Model operationalized at Factoria? What processes were used to design and implement the pilot?
4. What are some of the key "lessons learned" from your experience with designing and implementing the Medical Home pilot? Have you been particularly surprised by any element of your experience with this pilot?
5. Why was Factoria chosen as the site for the pilot? In retrospect, was that the right choice (why/why not)?
6. Is it working? What parts of it are working well, and what parts have not been working well?
7. What role is information technology playing in this?
    - Secure Messaging
    - Staff Messaging
    - Health Profile
    - After Visit Summaries
    - Shared Care Plan
    - EpicCare – other functions & feature sets (e.g., alerts)
    - MyGroupHealth – other functions & feature sets (e.g., lab results)
    - Telephone Encounters and other uses of telephones and fax
8. How do you think the use of these technologies is affecting providers? What about patients, how is the use if the IT affecting them?
9. Is this model something that can be replicated and scaled? Should it be? If so – how?
10. What do you suppose might be some "indicators of readiness" or "pre-requisites" for any clinic to have in place prior to implementing the Medical Home Model.

6.2.3 Analysis

I analyzed the interview transcripts and project archive documents using a primarily deductive indexing (or template organizing) approach.[289] [290] Analyses aimed to identify and corroborate via information source triangulation a) the composition of the Group Health PCMH care system model in terms of its constituent structural and process components, and b) the intended purpose and intended effects of each model component and of the model in its entirety. Participants' perspectives on the strengths, weaknesses, or preferred alternatives to the decisions made or actions taken were not considered in the analyses. Analyses were guided by the conceptual framework illustrated in Figure 6.2. The a-priori transcript indexing codebook and document archive abstraction template based in this conceptual model are included as Appendix F.

Figure 6.2: Study Organizing Framework



This framework, like the one developed for the first study presented in Chapter 5, is based heavily on the Donabedian framework discussed in Chapter 3. Influences of Diffusion of Innovations Theory and Sociotechnical Systems Theory (see Chapter 3) are evident in the addition of the various dimensions of effects or "consequences" associated with care model adoption, the bi-directional arrow representing the relationship between structural and process elements of the care system, and the feedback loop that suggests care model design innovations are influenced by the outcomes and effects generated by the care system.

6.3 Findings

Findings were subjected to member checking with several of the key informants. Six of the participants participated in member checking of findings via their review and written critique of a case study manuscript targeted for submission to a peer-reviewed medical journal. No significant content revisions were identified during this process. Informal follow-up discussions were also held with 2 of the 10 key informants to clarify issues raised during the document review. Example tables, text, and figures drawn from the archive are included in this chapter in their original form or with formatting modifications as indicated.

6.3.1 Vision of the Patient-Centered Medical Home and Pilot Strategy Origins

In early 2006, the group practice medical director began promoting awareness of the PCMH concepts among the organization's medical and administrative leaders as a way to address physician dissatisfaction and burnout, and advocating for an organizational strategy based on these concepts.

A multidisciplinary working group comprising the organization's senior administrative and physician leaders was formed shortly thereafter. This group was charged with formulating and implementing a medical home demonstration strategy, establishing a demonstration project timeline and budget, developing an evaluation strategy, and providing sponsorship and oversight of its two-year implementation via a comprehensive redesign of one of the organization's primary care medical centers. Organizational leaders selected the demonstration clinic based on the clinic location, size, and the stability and experience of the clinic's leadership and medical staff in implementing practice level changes.

The working group reviewed prevailing concepts, theories and empirical evidence about the PCMH, the chronic care model, and effective primary care to establish guiding principles for the clinic redesign. Text Box 6.2 presents the 5 design principles that emerged from 3 iterations of participatory development and review, which also incorporated review by several external experts. These principles provided the foundation for all subsequent design, planning and implementation activities of the PCMH demonstration.

Text Box 6.2: The Core Design Principles

The relationship between the personal care physician and the patient is the core of all that we do. The entire delivery system and the organization will align to promote & sustain this relationship

The personal care physician will be a leader of the clinical team and be responsible for coordination & integration of services, and together with patients will create collaborative care plans.

Continuous healing relationships will be proactive and encompass all aspects of health and illness. Patients will be actively informed and encouraged to participate in all aspects of their care

Access will be centered on patients' needs, be available by various modes 24/7 and maximize the use of technology

Our clinical and business systems are aligned to achieve the most efficient, satisfying and effective patient experiences

Source: GH-PCMH project document archive, file created 4/28/06

6.3.2 Conceptualizing the Care Model and Practice Redesign

Preparation activities were initiated in mid-2006 with the full participation of the demonstration clinic's administrators and medical staff. Two 3-day participatory workshops were held in the spring and summer of 2006 to design the PCMH demonstration. Approximately 35 people attended each of these workshops, which applied future-state visioning, workflow mapping, and job scope analysis. Participants included front-line physicians, nurses and other clinical staff from the demonstration clinic, organizational leaders, and a patient representative from the demonstration clinic. The second workshop yielded a high-level implementation work plan document prioritizing redesign activities for physical infrastructure improvements, appointing and scheduling template changes, clarification of staff roles and responsibilities, patient flow changes, and further tasks for implementation planning and execution.

6.3.3 Creating Organizational Capacity for Change: Required Precursors

The working group identified several baseline changes that were required before the demonstration project could begin. Most notably, physicians, non-physician clinical staff, and other human resources were hired to increase the demonstration clinic's labor capacity (see Table 6.1). These capacity increases were required to enable patient re-distributions to achieve panel size reductions (from 2300 to 1800 patients per 1.0 FTE physician) and to accommodate appointment scheduling templates that offered longer standard visit times (30 minutes) and scheduled time for providers to perform patient outreach and follow-up activities by telephone and email ("desktop medicine time"). To allow for panel size reductions, 2790 (approximately 25%) of the clinic's patients were re-assigned from one primary care physician to another using a systematic process that accommodated patient requests to decline reassignment.

Table 6.1: Clinic Staffing Models: Pre-Pilot (2006) vs. Current (2008)

Provider Type	Pre-Pilot Staffing (FTE/1000 Enrollees)	Current GHMH Staffing (FTE/1000 Enrollees)
MD	0.51	0.6
PA/ARNP	0.09	0.16
RN	0.15	0.18
Flow LPN/MA	0.72	0.94
Clinical Pharmacist	0.05	0.18

Source: Adapted from a presentation slide in the GH-PCMH project document archive, file created 7/18/08. Note: only adult enrollees are represented here.

The PCMH working group also determined that the demonstration clinic would be granted "immunity" from select other organization-wide change initiatives and policies that exhibited potential to adversely affect the implementation and success of the PCMH demonstration. One noteworthy example was that, for the duration of the 2-year pilot, the physicians would be solely compensated by a fixed salary rather than the organization's variable incentive compensation model in which salaries are modified from 80% to 120% based on relative value unit production, quality-of-care performance indicators, and patient satisfaction survey results.

The PCMH demonstration planning effort also included a commitment to a systematic evaluation focusing on assessing effects on patient experience, the staff work environment, quality of care, enrollment, utilization, and costs.

6.3.4 Physician-Delegated Care Team Model and Facility Re-configuration

The PCMH demonstration utilized a physician-led multidisciplinary care team model as the primary strategy to achieve the first two design principles (see Text Box 6.2). The roster of each physician-led team remains constant although some personnel serve on more than one team (e.g., a 1.0 FTE clinical pharmacist may serve as a member of 3 care teams). Physicians work with their own dedicated medical assistant (MA) or licensed practical nurse (LPN) in a 1:1 staffing ratio. Each of the physician-led care teams also comprises and is supported by other personnel, each at an FTE level < 1.0. These partial-FTE care team members include a designated registered nurse (RN); clinical pharmacist who is directly involved in patient care; physician assistant (PA); and a "desktop" LPN who manages calls and emails and serves as a central communications hub. Clinic facilities were also re-configured to provide common workspaces, shared physician-nurse offices, dedicated patient exam rooms for each care team, and co-location of care team members including the clinical pharmacist and the desktop LPN.

The roles and responsibilities were reviewed and reconfigured for each non-physician care team member with the goals of providing flexibility within teams and adhering to scope-of-care licensure requirements (Table 6.2).

Table 6.2: Care Team Member Roles & Responsibilities

Functions	Flow Staff (Medical Assistant/Licensed Practical Nurse)	Advice Licensed Practical Nurse	Team Registered Nurse	Primary Care Physician	Physician Assistant	Clinical Pharmacist	CORE/Injection RN
Office Visit	• Outreach to patients prior to visit • Attend daily huddles • Huddle with PCP to anticipate visit support needs; prepare for visit • Perform and/or assist provider with procedures • Schedule f/u appointments	• Attend daily huddles	• Co-lead daily huddles with PCP • Clinical nursing resource for team • Patient education in 1:1 and group visits • Perform complex nursing procedures	• Co-lead daily huddles with RN • Review schedule & huddle with MA in preparation of visits • Shared-decision making with collaborative care planning • Lead Group Visits	• Attend daily huddles • Routine & acute care as extension of PCP	• Attend daily huddles • Complex patient med review and education • Clinical resource to team related to medication use • Participate in Group Visits related to medications	• Attend daily huddle • Triage drop-in patients • Perform routine & complex procedures
Call & Secure Message Management	• Answer patient phone calls • Handle Epic messages as delegated by RN or provider	• Triage/answer patient phone calls & Epic messages • Team resource for MAs	• Answer patient phone calls & Epic messages • Team resource for LPNs & MAs	• Answer patient phone calls & Epic messages	• Answer patient phone calls & Epic messages	• Answer patient phone calls & Epic messages related to medications	• Answer patient phone calls & Epic messages
Outreach Care	• Make planned care outreach calls • Outreach to ED discharges		• Outreach to hospital, SNF & ED discharges	• Direct outreach care performed by clinical team members		• Make planned care outreach calls related to medication use • Outreach to hospital discharges as referred by Team RN	
Care Coordination		• Coordinate referrals	• Outreach and active management of high-risk patients	• Refer patients to Team RN and Advice LPN for care coordination		• Outreach and active management of high-risk patients related to medication use	

Source: GH-PCMH project document archive, file created 7/18/08

Because team roles are often not transparent to patients,[291] team members are also expected to communicate with patients about how they support and interact with their personal physician. Care team members use standard "scripted" approaches to introduce themselves personally to patients and describe their respective roles and responsibilities in relation to the physician. Patients are reassured that while each team member has a unique role, his or her activities are directed, endorsed, and supervised by the physician. Physicians also personally introduce patients to care team members, and explain their primary functions, roles, and responsibilities. The intended effect is to provide transparency into the working relationships within the care team, build patient confidence and trust, and strengthen the bonds between patients and providers.

6.3.5 Group Health PCMH Care System Model Components

Figure 6.3 illustrates specific components of the system of care that continues to evolve in the Group Health PCMH pilot. It differentiates the model's components by their primary intended role in opportunistic point-of-care processes, outreach care processes, or management of team-based rapid cycle process improvement endeavors. These components are described in the following subsections.

Figure 6.3: Components of the Group Health Medical Home Model

	PCMH Care System Components	Mode of Provider Engagement	
	Implementation Precursors Patient panel size adjustments (1800 per 1.0 FTE physician) Fixed salary physician compensation method 30 minute standard appointment times Scheduling slots designated for provider outreach activities	**Opportunistic/ Point-of-Care**	**Outreach**
Information & Communication Technologies	Patient as primary end user		
	• Online appointment scheduling		
	• Online medication refills		
	• Automated mailed patient reminders		X
	• Online & printed after-visit summaries		
	• Online vetted health literature		
	• Online test results reporting with trending functions		X
	Patient and provider end users		
	• Online health risk appraisal	X	X
	• Patient Website with medical record and secure email	X	
	• Direct routing of patient phone calls to care team	X	
	• 24 hour telephone nurse consulting	X	
	• Scheduled telephone encounters	X	
	Provider as primary end user		
	• Longitudinal electronic medical records	X	X
	• Rapid online specialist consults	X	
	• Health maintenance provider reminders	X	
	• Best practice provider alerts	X	
	• Automated predictive risk modeling		X
	• Abnormal test result flags	X	
	• Disease registry databases		X
	• Performance report visual displays	X	
Care Processes	Intramural care team interactions		
	• Daily MD-MA (or MD-LPN) huddles	X	X
	• Pre-visit chart review and visit preparation outreach		X
	• LPN as care team communications hub	X	
	Patient-care team interactions		
	• Scripted care team member introductions	X	
	• Motivational interviewing & brief negotiation	X	
	• Group visits	X	
	• Medication adjustment outreach by team pharmacist		X
	• New patient outreach	X	X
	• Collaborative care planning		X
	• Care team RN management of complex cases		X
	• Next-day follow-up to discharges, UC and ER visits		X
	• Outreach for preventive and chronic care services		X
	Patient self-management support		
	• Health coaching for lifestyle concerns		
	• Peer-led self-management support workshops		
Management Tactics	Daily care team huddles		X
	Performance reporting via visual display systems		X
	Rapid-cycle process improvement	X	X

6.3.5.1 Point-of-Care Tools, Processes and Tactics

One-on-one physician-MA (or physician-LPN) daily huddles are used as a mechanism for anticipating and adjusting daily work priorities. Physicians briefly meet each morning with their MA or LPN to review the schedule and prepare for each patient's visit. For instance, MAs are directed to pre-order tests, prepare for procedures, anticipate medication refill orders, and review needs for screening tests and other prevention services. These huddles may also involve other members of the care team, especially when needs arise for flexing individual roles and responsibilities to cross-cover specific functions. For instance, when medication issues arise, the clinical pharmacist joins this planning effort.

Appointment scheduling templates incorporate standard 30-minute appointment times and slots for dedicated "desktop medicine" time to let physicians and other care team members complete charting and documentation work, manage email inboxes and phone messages, and directly field incoming patient calls at various times throughout the day. The desktop medicine time slots are also used by physicians and team members to use the CIS to systematically identify priority patients for outreach, proactively telephone and email patients, track patient care trajectories (e.g., specialist referral completion), and email or phone patients as planned follow-ups to previous encounters. The primary intended effects are to reduce or eliminate work backlogs, and to enhance patient access by telephone and secure email. The longer appointment times are also intended to reduce work pace pressures, enabling physicians to inquire about a wider range of patient concerns and health needs during in-person visits, and to elicit patient preferences in care decisions. Longer appointments are also intended to give physicians enhanced opportunities and motivation to act on health maintenance alerts and best-practice reminders that are automatically generated by the CIS. Longer appointment times are also intended to better enable providers and patients to collaboratively seek real- and near-time consultations from specialists within the context of the visit via the internal online messaging capabilities of the CIS. This system of secure internal provider-to-provider email coupled with the electronic medical record system lets the primary care physician request consultant advice during the course of the visit. Responses are often received during the same visit, while the patient is present and available for discussion. Primary care physicians also use consultant reports received after the visit as triggers for additional email or telephone patient follow-up with patients.

Physicians have also taken deliberate actions to modify their practice styles and patient communication practices. Physicians and other clinical staff received training in brief negotiation and motivational interviewing techniques to improve their communication and patient self-management support skills. During patient encounters, physicians are encouraged to use these techniques to guide patient decision-making and care planning. Providers use these communication strategies to take a patient-centered approach to initiating discussions about prevention or chronic illness care issues. These issues (e.g., breast cancer screening, tobacco cessation, asthma management, and advance directives) are identified in advance via pre-visit chart review that is often supplemented with email or telephone exchanges between the patient and the care team LPN or MA. Patients are asked to help prioritize these issues and physicians work to present and discuss evidence-based treatment and care options. Patient and physician roles and responsibilities are negotiated and a care plan is established to guide explicit "next steps" for each party. Physicians are encouraged to document these care plans in the patient's medical record following a standardized template for entry into their "after-visit summaries".[292] These documents are printed and reviewed with patients at the conclusion of each office visit, and are also available for subsequent online review via the patient Website. The intended effects of these modifications to practice style, patient communication, care planning, and documentation are to let providers anticipate, identify, and address the comprehensive and complete list of patient needs at every encounter, and to elicit and honor informed patient choice in all patient-provider interactions.

6.3.5.2 Outreach Tools, Processes and Tactics

Outreach to proactively identify and address patients' care needs is another defining trait of this PCMH demonstration. Patient registries and longitudinal electronic patient medical records serve as information sources that are actively and routinely searched both manually (by care team members performing pre-visit chart review) and automatically (via embedded CIS reminder and alerting functions) to identify prevention and chronic illness care needs. Predictive risk modeling algorithms are also routinely applied to these source data to identify high-risk candidates for outreach by the care team RN. A customized monthly report based on patient-level quality of care indicators (e.g., patients meeting clinical blood pressure targets) also serves as a means of identifying candidates for care team outreach. Patients identified through any of these mechanisms are contacted by their physicians or other care team members via telephone and/or secure email. The intended effects are to encourage patients to obtain preventive and chronic care services, support their self-management efforts, and raise their awareness of their providers' availability and desire to provide care and guidance.

Outreach activities are also initiated by other care team members, who employ a comprehensive approach. For example, a clinical pharmacist phoning a patient primarily to discuss diabetes medication adjustments will also discuss recommendations for cervical cancer screening if appropriate. Both telephone contact and secure email messaging are tactics that are heavily leveraged in these outreach endeavors. Physicians also receive daily notifications of their patients' hospital discharges, emergency room encounters, and urgent care encounters from the previous day. These patients are discussed at the next day's team huddle, and the team RN routinely calls them to ensure that ongoing care needs are met and care is coordinated. RNs also perform telephone follow-up with all patients admitted to skilled nursing facilities and nursing homes. Providers follow a standardized discussion guide template to identify problems commonly associated with care transitions in each of these cases.

Patients are also encouraged to complete or update an online health risk appraisal (HRA) at the time that they call or message for an appointment. The HRA is used to identify a comprehensive array of prevention and chronic illness care needs for patients and their care teams. Data exchange between the online HRA and the CIS enables its use as a mechanism to efficiently document family and medical history, health risks, and chronic illness management needs in the patient's electronic chart. Patient-reported information is available in the CIS for manual review by care teams prior to visits, and also serves as source data that may trigger automated CIS decision support reminders and alerts if patients are assessed to be in poor control of one or more chronic illnesses. New members who have not yet been seen for an in-clinic visit are systematically identified, mailed a new patient welcome packet and invited to register their Website account. Once they have initiated a Website account, they are asked to complete the HRA, and if any poorly-controlled chronic conditions are reported (e.g. diabetes, depression, COPD) the physician's office receives an outreach opportunity message via the CIS. The intended effects are to prompt patient-provider communication and promote patient activation, particularly among those members who are identified with preventive or chronic illness care needs or concerns.

6.3.5.3 Management Tactics

Another defining trait of this implementation of the PCMH is the participatory and iterative nature of its development. Demonstration clinic physicians, staff, and leaders have continued to play a central role in the model's evolution since the first design workshop.

Daily team huddles are a primary mechanism for ensuring broad and active participation in PCMH implementation and improvement efforts. Providers, staff, and clinic leaders meet as a group each morning prior to seeing patients. The purpose of these meetings is to engage in collaborative problem-solving and process improvement, discuss successes and failures, and plan for the upcoming day. Attendance is mandatory.

Common areas are also furnished with visual performance measure display systems. Performance data reports, charts, and graphs that pertain to current-priority improvement initiatives are formatted to highlight actionable improvement opportunities at the clinic, care team, and individual physician levels. The intended effect is that providers and staff will maintain heightened awareness of their shared and individual improvement priorities by routinely encountering this information throughout the day and by proactively reviewing it during daily team huddles.

6.4 Discussion and Conclusions

The key informant interviews and document archive review provided insight into the ongoing evolutionary nature of this implementation of the PCMH. The demonstration clinic's staff and leaders continue to leverage participatory team-based rapid-cycle improvement methods to address operations improvement and model refinement opportunities. Development of a feature-complete online shared care plan within the CIS continues as a high-priority work-in-progress. Discussions continue regarding how to best integrate hospital and skilled nursing facility rounding into this model. Achieving consistent use of the standard appointment scheduling templates on Mondays has been challenging, when pent-up demand from the weekend often requires defaulting to 20 minute appointments. These and other issues identified through experiential learning continue to drive efforts to innovate, evaluate, improve and expand the PCMH model.

6.4.1 Study Conclusions

The Patient-Centered Medical Home – if viewed as a comprehensive and integrated system of care rather than a constellation of evidence-based components – is a theory in need of empirical validation. As such, the imperative is growing for development, implementation, and rigorous evaluation of care delivery system models based on the theory of the PCMH. While this study has not attempted to build an argument for a normative model of the PCMH, nor provide an assessment of the "goodness of fit" of the Group Health PCMH with any such normative models or classification frameworks,[293] [294] it has yielded a detailed account of one large integrated healthcare organization's approach to comprehensive care system redesign based explicitly on a unique interpretation of the theories and evidence of the Patient-Centered Medical Home, the Chronic Care Model, and effective primary care.

6.4.2 Study Limitations

Qualitative case study research methods are intended to provide rich descriptions of concepts, phenomena, and situations, but not to support formal hypothesis testing or generalizable claims of causality. The object of study in this case is a practice-level care system model, and as such the presentation of findings has been limited to descriptions of its development and implementation history, design principles, and defining components and their intended functions and effects. This study has not addressed the critical roles played by organizational culture, change management, or leadership in this endeavor. Also, the nature of the key informant participants' roles as organizational leaders responsible for operational performance creates the potential for selective recall and other biases in their reported statements. However, these risks were mitigated using several techniques. Data collection involved two forms of source triangulation: 1) inclusion of unaltered information artifacts that were produced throughout all phases of the PCMH conceptualization, design, and development/ implementation, and 2) key informants were sampled across three levels of administrative and medical leadership (e.g., clinic, regional, and executive/organizational). These risks were also mitigated via an analytical approach that aimed primarily to develop descriptive accounts of structure, process, and intended functions and effects using an a-priori conceptual model and coding scheme.

This analysis did not aim to develop or describe nuanced interpretations of perceived effects, outcomes, or "successes and failures" as did the Chapter 5 and Chapter 7 studies of provider experience. This case study incorporated a more descriptive and less interpretive analytical approach focused primarily on identifying specific reported and documented elements of structure and process and their intended functions and effects. Document analyses consisted of index coding instances of these dimensions of the PCMH care system model found in the relevant text documents; refining the a-priori classification schema to more accurately reflect the emergent inventory of findings; and developing descriptions of these components and classification categories. Analysis also incorporated a member-checking procedure to ensure the face validity of findings.

6.5 Summary

The processes used to design and plan the implementation of the Group Health Patient-Centered Medical Home care model were participatory and iterative, providing a contrast to providers' perspectives on the redesign approach used to implement Patient-Centered Access. The PCMH care model specified uses of pre-existing ICT (i.e., intended use cases with specified care team member roles & responsibilities), which were viewed by the key informant participants as defining structural components of the model. Also, risks of potential organizational misalignment of the types reflected in the Chapter 5 study themes "good ideas that suffered from poor implementation" and "inherently bad ideas" were identified prospectively and mitigated in the PCMH care model design and implementation planning process. The study presented in Chapter 7 reveals provider perspectives on the extent to which these risk mitigation strategies were effective, as well as how their experiences compared to the other findings emerging from the Chapter 5 study of provider experience with the Patient-Centered Access care model as implemented in the Access Initiative.

The critical review of relevant scientific literatures presented in Chapter 2 and Appendix A concluded that ICT and ICT-enabled interventions and effects are inadequately described in the vast majority of studies, and that most published accounts of ICT evaluation studies lack relevant contextual information about the conditions of intervention implementation. The study presented in this chapter directly addresses these weaknesses by providing a detailed description of the overall designed care system model and its specific ICT components. Much contextual information pertaining to the origins and evolution of its development and implementation is also included.

Key informants' descriptions of the specific ICT components were offered and are presented here in terms of their intended primary use cases and intended desirable effects. These technologies were viewed by the participants as enabling components of a more holistic re-designed system of team-oriented human activity. As such, it appears that the concept of joint optimization of social and technical subsystems was implicitly recognized in this endeavor. This trait along with the participatory nature of the model's design, implementation, and ongoing evolution are consistent with the sociotechnical systems perspective of healthcare delivery as described in Chapter 3.

The original study presented in the next chapter extends the foundational work presented in this descriptive study of the Group Health PCMH care system redesign intervention, and examines its effects on the practicing physicians and other providers and staff that continuously drive its ongoing evolution.

Chapter 7: Provider Experience With The Patient-Centered Medical Home

This chapter presents an original study of physician and clinical staff perspectives on the effects resulting from Group Health's Patient-Centered Medical Home clinic re-design after their first year of experience working in this evolving care system. Elicitation of their views on the roles, importance and effects of information and communication technologies was emphasized.

The Patient-Centered Medical Home model and its proposed roles in healthcare reform and sustaining primary care are discussed in Chapter 2. The design, implementation, and intended effects of Group Health's PCMH pilot initiative are described in greater detail in the preceding Chapters 4 and 6. Chapter 8 examines the significance of these findings in the context of this overall program of dissertation research. Appendices G and H also contain additional detailed information and documentation pertaining to this study, and may be particularly helpful in addressing questions about study design, data organization, and analysis. The material in this chapter is also being concurrently prepared for submission as a peer-reviewed research manuscript and thus there are some minor redundancies with prior chapters.

7.1 Study Introduction and Background

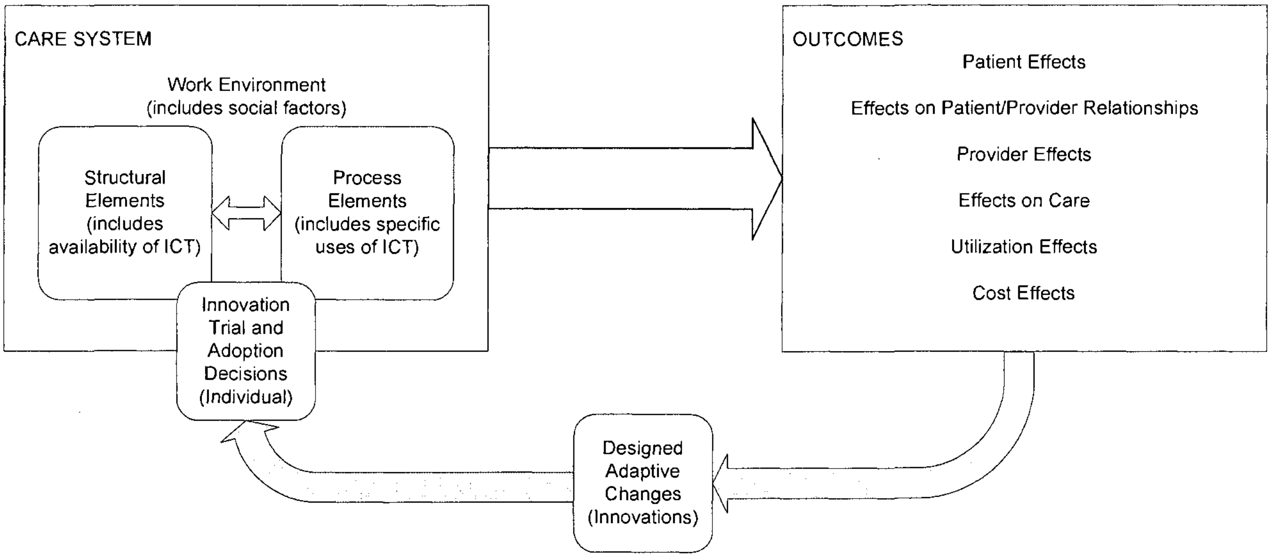
Chapter 6 presented a detailed description of Group Health's interpretation and instantiation of the Patient-Centered Medical Home model through a pilot redesign of one of its primary care clinics. This "bottom-up" participatory redesign effort manifested as a comprehensive redesign of primary care that also acknowledged and explicitly incorporated strategies for integrating the redesigned primary care model with the larger organization, and integrating patient care across the full continuum. This instantiation of the Patient-Centered Medical Home model (PCMH) also leveraged the organization's existing ICT infrastructure – which, while currently atypical of primary care practices in the United States, might represent one likely facet of a "desired future state" for primary care given current healthcare reform policies.

The objective of this study was to describe and characterize providers' experiences with and perceived effects of implementing a PCMH through comprehensive primary care practice redesign. Elicitation of participants' views on the roles, importance, and effects of ICT use in this model was emphasized.

7.2 Study Design and Methods

This qualitative study of provider experience, like the study presented in Chapter 5, involved semi-structured interviewing and qualitative content analysis of verbatim interview transcripts using a predominantly phenomenological approach to analysis. The

Figure 7.1: Study Organizing Framework



organizing template for the study that informed the approaches to both data collection and data interpretation is presented as Figure 7.1. The interview discussion guide and intial interview transcript indexing codes used in this study were derived from this framework, which like those in preceding chapters is based heavily on Donabedian's framework, Sociotechnical Systems Theory, and Diffusion of Innovations Theory.

7.2.1 Context and Setting

Group Health has pursued a pilot implementation of a PCMH organizational redesign strategy through a clinic redesign demonstration project that was launched in January 2007 at one of its Seattle-area clinics that serves approximately 11,000 adult and pediatric patients. Chapter 4 presents some historical context for this initiative, and Chapter 6 presents a detailed description of the Group Health PCMH demonstration, its strategic origins and evolution through the first 18 months of implementation, and its organizing principles and defining care system model components.

7.2.2 Participant Sampling

Participants included all 8 primary care physicians providing care to adult patients at the demonstration clinic between January and July 2008. An additional sample of 8 clinical staff from the clinic also participated – 2 clinical pharmacists, 1 physician assistant (PA), 2 registered nurses (RN), 1 medical assistant (MA), and 2 licensed practical nurses (LPN).

7.2.3 Data Collection

I conducted in-depth, semi-structured interviews in consented participants' offices or homes between January and July 2008. These and all other study procedures were approved by the Group Health institutional review board. A standardized interview guide consisting of ten open-ended questions was used to facilitate discussion (see Text Box 7.1). Interviews averaged 45-60 minutes in duration and were audio recorded and transcribed verbatim. The 16 interviews yielded a corpus of 230 pages of single-spaced Microsoft Word transcripts (114,799 words) that were converted to .rtf format and analyzed qualitatively using the Atlas.ti software application.

Text Box 7.1: Participant Interview Guide

1. What is the Medical Home Model?

2. Is it working? What parts of it are working well, and what parts have not been working well? Have you been particularly surprised by any element of your experience with this model so far?

3. What are your thoughts on the challenges associated with delivering team-coordinated care? How is your team working differently now?

4. What role is information technology playing in this? To what extent are these ICT's helping or hindering your efforts to achieve the objectives of the Medical Home Model?
    - Secure Messaging
    - Health Profile (online HRA)
    - After Visit Summaries
    - Staff Messaging
    - CIS – other functions & feature sets (e.g., alerts)
    - MyGroupHealth – other functions & feature sets (e.g., lab results trending)

5. In what ways are you using these technologies differently than other providers who practice under more conventional models of primary care? [Probe to drill down on the ICT's listed above]

6. In what ways are your patients using these technologies differently than other patients who get their care under more conventional models? [Probe to drill down on the ICT's listed above]

7. How has incorporating these information and communication technologies into your practice affected you as a provider?

8. How do you think the use of the technologies is affecting your patients?

9. How would you improve the information technologies you use to support the Medical Home Model? What changes would you recommend?

10. Does this model of practice feel sustainable? Would you recommend this model? Was your prior approach to care delivery sustainable?

7.2.4 Analysis

Transcripts were subjected to qualitative content analyses that employed iterative inductive-deductive document coding (i.e., labeling, markup) procedures. I conducted all phases of analysis, with three of my committee members (RR, JR, PTH) and three other colleagues serving as secondary coder/analysts to triangulate analyses and ensure trustworthiness of findings.

Analyses utilized both template and editing organizing approaches and phenomenological and hermeneutic approaches to interpretation.[295] [296] [297] Organization and indexing of transcript text data was guided by the organizing framework illustrated in Figure 7.1.

Prior to engaging in transcript analyses, 16 text labeling codes were developed to represent specific elements of this organizing framework (see Appendix G). The subset of 8 codes representing the process, work environment, and effects components of the framework was used to index the entire interview transcript document corpus using Atlas.ti. One report was generated for each of these codes, and contained all interview transcript text segments labeled with that code.

Phenomenological analyses of these 8 text segment reports were initiated using an inductive open coding approach,[298] which yielded 1,159 salient concept codes. Through iterative cycles of inductive-deductive document coding, codes representing recurring concepts were merged or differentiated, explicitly defined and assigned specific application rules (i.e., text segment inclusion and exclusion criteria). Multiple coder triangulation was used throughout all phases of analysis to ensure trustworthiness of findings by mitigating risks of individual bias in interpretation. Six support analysts coded subsets of the interview transcripts and text segment reports. I met with each supporting analyst to compare coding results, discuss discrepancies, and refine code definitions and application rules. Instances of coder disagreement were resolved through discussion. Twelve themes pertaining to participants' shared experiences with and perceived effects of the PCMH redesign intervention emerged from the analysis.

A second phase of hermeneutic content analysis was conducted to identify specific manifestations of ICT use associated with the 12 emergent themes. Codes developed for each of the 12 emergent themes were applied to the interview transcript corpus using Atlas.ti. One text segment report was generated for each theme code. Participant experience theme reports were then coded for instances of participant-reported ICT use by applying the 8 remaining a-priori indexing codes corresponding to the structural elements of the organizing framework. Iterative analyses yielded 15 unique concepts pertaining to the association of ICT use with participants' experiences with and perceived effects of the PCMH practice redesign. Appendix H illustrates the version of the codebook that was used for the final phase of multiple-coder triangulation and member-checking. Member checking (i.e., participant verification of face validity) involved discussing this document individually with 3 of the 16 participants – 2 physicians and 1 medical assistant. All findings were deemed representative by these participants and required no further refinement based on their input.

The process of writing this dissertation chapter and its journal manuscript analog also resulted in further refinement of some theme and concept definitions. Advisors' critiques of working drafts informed some of these minor revisions. As a result, several of the 15 unique concepts that emerged from the secondary (hermeneutic) analysis were specified at a more granular level and verified through a re-examination of the transcript corpus.

7.3 Findings: Provider Experience Themes and Unique ICT Concepts

The 12 emergent themes are presented along with illustrative interview quotes. The unique concepts pertaining to ICT use are also presented within the context of each relevant theme.

7.3.1 Increased Provider Job Satisfaction

Interviews revealed improvements in participants' job satisfaction resulting from their implementation of the PCMH model. Some participants claimed dramatic improvements in their own and their colleagues' job satisfaction, suggesting that this practice model may offer the potential to reverse trends of primary care physician burnout.

> *"One of the benefits is that I'm not nearly as tired or stressed at the end of the day. I get done, it's huge, there's less stress. I mean we bitch because that's what everybody does in life about every job, but it's not as sincerely felt. It's much - it makes your life more reasonable. And I think it will make practicing medicine possible longer than I would have done otherwise... I have tentatively resigned - uh, planned on retiring in June of '09. I may change that. Because I don't feel the necessity to have to cut out."*
> *-Participant #1, Physician*

> *"I think it was called burnout (sighs) and I would hear one of my providers complaining they wanted to retire. And that was every other day. Now he's actually not retiring. ...He feels a lot better." -Participant #2, LPN*

> *"There were a lot of us thinking about quitting and now this is pretty exciting stuff and we want to - this is good stuff... This is much more pleasant. I come to work, when I wake up in the morning I like coming to work. Two or three years ago, I didn't like coming to work." -Participant #3, Physician*

> *"It certainly works for me. And I think every other physician here would say the same thing, that they're happy that the change has been made." -Participant #7, Physician*

Staff also reported improvements in their own job satisfaction.

> *"It is working and it's - I feel less stressed most days."*
> *-Participant #2, LPN*

> *"I always loved my work, nursing has always been really important to me and I've always felt like I've done a really good job, but there were whole big sections that I wasn't able to really have an impact on people's lives. And now because of this model, I feel like we do have that potential to really have that impact."*
> *-Participant #8, RN*

> *"...this model makes everything a lot easier in the long run."*
> *-Participant #14, MA*

Participants were clearly deriving significantly greater satisfaction from their work since implementing the PCMH pilot. Participants cited four perceived effects associated with their implementation of the PCMH that contribute to their improved job satisfaction – stronger patient connections; effective teamwork; a more supportive work environment characterized in part by the availability of essential ICT; and improved patient care across several dimensions and characterized by a shared commitment to identifying and addressing unmet patient needs. These factors emerged as dominant themes across all participant interviews.

7.3.2 Stronger Patient Connections

Participants reported feeling stronger interpersonal connections with their patients, and sensed that patients also felt stronger connections to them. This sense of "knowing and understanding each other better" was expressed by both the physician and other clinical staff participants.

> *"I'm feeling definitely a lot more connection to these patients... Patients are knowing me by name, they're calling me by name and that's really - I'm just feeling a lot more connected..." -Participant #14, MA*

Participants' use of secure messaging and telephone communications with patients represented a significant increase in the frequency and volume of patient/participant interactions,[299] which many cited as contributing to this effect of strengthened patient connections. They also reported that patients' use of the Website and their own use of the CIS promoted more informed, prepared, and meaningful patient-provider interactions that contributed to this effect.

> *"The net effect is a positive effect in getting patients' questions answered... And they do feel more connected with the doctor, because he or she responds. And sometimes it's real simple, and my nurse will do the responding, they're getting a response from the team. And they really like that connection. And I got a call or a note - I was out for three weeks having surgery and the patient was concerned, 'Are you okay?' So there's a better connection I think with the team with the electronic chart and all the secure messaging... I'm developing stronger ties... They understand their illnesses better, and they're better able to follow through on the treatments... [Office visits are] time that's better spent." –Participant #1, Physician*

This finding represented a different perspective on the effects of care redesign and ICT use on patient-provider relationships compared to that exhibited by the Access Initiative study participants, who reported mixed positive and negative effects. Participants in this study – including both physicians and other clinical staff – reported unequivocal positive effects on their relationships with patients. They also expressed feelings of personal satisfaction associated with this effect, as well as related indirect effects on care quality resulting from these enhanced patient relationships.

7.3.3 Teamwork is Recognized and Valued

Participants recognized the inherent interdependencies of team-based patient care, and both relied on and valued each others' contributions to effective teamwork.

> *"The team works well because we're all committed to the patient's experience. So what we developed here is what works well as a team. And the medical home model helped us develop who's on the team... We're always looking for something to do. And the team so far, everybody will be glad to pick it up." -Participant #6, Physician*

> *"You don't feel like you're alone someplace taking care of the patient, you have all this team with you helping you take care of the patient." -Participant #12, PA*

> *"There's not as much isolation in our group... We're a team. And this includes our staff, our support staff - if you didn't have them on the same page, you'd have a weak link there. It does show." -Participant #1, Physician*

The CIS' staff messaging function was viewed as an enabler of effective teamwork, both within the primary care team and with consulting specialists.

> *"So for me the email is crucial to this - both communicating directly to the patient and also so I can communicate and send an email to [clinical pharmacist]."*
> *-Participant #7, Physician*

> *"I use the staff messages to communicate - say one of the providers is not here on their scheduled day off. I would send them a secure message so I don't - it will go in their file that they can look at today or they can bring it up tomorrow. So I use that a lot, especially when the providers are not sitting around my surroundings, say they're down the hallway or further away in the clinic."-Participant #5, Clinical Pharmacist*

> *"Staff messaging, with the consultative specialist... I can send a question, someone can answer me, and I can email the patient and tell them what the answer is... I am using the consultants more on a staff messaging basis to keep minor things out of their hands or out of their clinic but I am using them more in sort of proactive, more comprehensive ways." -Participant #11, Physician*

Physicians also commented on how staff messaging and telephone interactions with consulting specialists contribute to knowledge-sharing, mutual learning, and team-based care provision.

> *"You just never saw it or you don't know what to do with it. It's some rare thing or it's something that you're not really familiar with. So you're familiar with these diseases and this is something else outside of what you're familiar with. So if you don't address those things, like you can in the Medical Home, then you're not going to learn anything and you're in a rut and you're practicing the same medicine you practiced for 20 years and you're not learning anything new, and you're not doing anybody any favors because you're out of date. And you're not stretching yourself. But if you do, it's not easy to address all these things and call consultants and say 'He had this set of symptoms, I've never seen this set of symptoms before, is this familiar to you? What do you think about this?' And every single day I learn something. I look it up for patients because I can interpret the medical literature better than they can. It might be something I've never heard of, a disease I've really never seen - and that's what the Medical Home allows you to do. It allows you to go on the Internet, it allows you to go into our medical library resource - Group Health has all these incredible resources. It allows you to message or call consultants and say 'What do you think about this?' It also allows you to push consultants because you refer somebody just with that piece of paper and a lot of the consultants are in that rut. And they'll only do what they know and maybe they've not seen a lot of this and so with the Medical Home you saw the patient, you looked it up, and then you sent it to*

> *the consultant. But you call the consultant and say 'I want to tell you about this person, I want to see what you think', and on the phone you can tell they're not that familiar with it and then you can say 'Okay, the medical literature says this and this, so this is what I would like you to help me with.'" -Participant #16, Physician*

Participants expressed that their shared commitment to identifying, anticipating, communicating, and addressing patients' needs was both a critical determinant and reflection of effective teamwork. Patient visit preparation routines included a pre-visit chart review by the MA or LPN that sometimes triggered communication with the provider to request advice or execute a task (e.g., write an order) prior to the patient visit. Preparation activities were also reported to involve provider-initiated communication with patients to request information or provide instructions for carrying out specific tasks prior to the office visit (e.g., reporting to the lab for a blood draw). Many participants commented on their uses of the CIS and patient secure messaging during these pre-visit preparation processes.

> *"In Epic you could just see what they've done for years. So I do a lot more prework using Epic, going into the charts, seeing when their last tetanus was, their last colonoscopy, their last Pap. And then we have other tools to help us do that but Epic definitely gets - a lot of my prework stuff goes off of Epic... One aspect of it is I try and send a secure message to patients about - I attempt to do it about a week ahead of time, remind them of their appointment, whether they should bring in their current medications. And then through Epic I can remind them that they're due for their tetanus, I can remind them that - current meds, tetanus. If they're diabetics I ask them to bring their blood glucometers. I can tell on Epic if they've been diagnosed with hypertension and I can ask them to bring in any readings they've been doing at home. All via secure message, and so it's really helpful to be able to just click click click - oh, they've got hypertension, oh, they've got this, oh, they've got that. I can just put that in the secure message so when they show up, they in theory have their*

> *glucometer, they have their blood pressure readings, they have their whatever we've asked them for. And that way that kind of folds into the doctor can go over a whole scale of things – instead of their sore throat. 'Oh, how has your blood pressure been doing, how have your blood sugars been doing?' So I think that really puts us above what other clinics have been using Epic for, we're diving into a lot more of their medical history, not just what they've been scheduled to be seen for... What else from Epic? Gosh, there's so much there... We can tell whether they've had their mammogram done, we can tell whether they've had their colonoscopy done, we can tell when that referral has been put in. We can tell exactly when they need blood work done that was ordered from Central, when that doctor wanted that done. So it's really amazing the information that we can tell even if it's not at this clinic."*
>
> *-Participant #14, Medical Assistant*

> *"One of the greatest things about secure messaging is – [name deleted], our medical assistant, sends out this thing before someone's physical. And it says 'If you have anything to discuss-'. And the people will write back 'Yeah, they'd like to discuss' - and there's their list! So instead of sitting here in the exam room and writing a list up, and then they forget sometimes too... So I have their full list. Sometimes before they even come in it's like 'Oh, what did we do about that problem? Oh, that X-ray.' And I can look up all these things we can really talk about them... You can prepare."*
>
> *-Participant #16, Physician*

Participants also cited the value of their participation and the participation of others in daily huddles, which serve the purpose of the information-sharing, collaborative work planning, and priority-setting that enables effective teamwork. These huddles also serve as a forum for sharing knowledge about how to use the ICT and to help each other build their information management and ICT use skills.

> *"What we learn from each other is how to use the electronic tools more."*
> *-Participant #1, Physician*

This theme suggests that the PCMH model implementation and ICT use in this model had positive effects on provider/provider relationships both within the clinic and with "extramural" Group Health providers (e.g., consultative specialists).

Other manifestations of the effective teamwork theme pertained more directly to participants' efforts to identify and fulfill of unmet patient needs and their adoption of a more proactive stance toward patient information-seeking and sharing, and are discussed in subsection 7.3.7.

7.3.4 Supportive Work Environment

Participants felt supported in their work – by each other, their consulting specialist colleagues, their manager and clinic chief, and the larger organization.

> *"I always enjoyed my practice. I love being in a room with a patient. I love doing family practice. I never didn't enjoy it. What I didn't enjoy was being punished or not getting the support that I needed... I mean this gives me the support to do basically what I've always done but had to buck up against walls to do. And so now I can't tell you what incredible strides that other practices and that our practice can make. And what a difference for patients, you know? In their daily lives, with chronic conditions, that we just couldn't give the time or we didn't have the tools to do before, we can do now." -Participant #16, Physician*

The work environment of the PCMH provided participants with a greater sense of control and role clarity and a diminished sense of patient visit volume or "throughput" pressure than what is typically experienced in conventional primary care practices. Patient panel size reductions, longer in-person standard visit times, and exemption from the organization's partially RVU-based variable physician compensation program were particularly relevant to participants' perceptions of organizational support for this practice model.

> *"I feel like I have more time and more encouragement, more resources to do comprehensive medical care." -Participant #11, Physician*

Physician participants commented on how their use of the CIS and their collaborative use of secure messaging with patients enabled them to shape and normalize the temporal nature of patient demand in their work environments.

> *"I think it does make it a more livable lifestyle. You've got electronic medical records where you can kind of delay some of the stuff until a better time."*
> *-Participant #10, Physician*

Participants also expressed that a diminished sense of crisis-driven reactivity contributed to a work environment in which they felt and appeared less harried to their patients and co-workers, interacted with each other more frequently, used the ICT more extensively, and realized a greater sense of control over their daily work activities.

> *"And to me personally – this is a personal thing. I don't mind blood and guts, I don't mind people dying if they have to, and I'll do my best. But what I do mind is when I'm behind. And it just bothers the heck out of me being late and behind. That's the one thing in medicine I've never been able to tolerate. Having this kind of system, I'm almost never behind anymore... When you realize why the old way wasn't sustainable, those factors are gone." –Participant #3, Physician*

Overall, participants expressed that they felt supported by their work environment, which was characterized in least in part by the availability of "useful" ICT.

7.3.5 Necessary and Sufficiently-Designed ICT

Participants expressed that their ICT infrastructure was an essential enabler of the PCMH, and operationalizing this model would be very challenging if not impossible without these tools.

> *"We couldn't do it without it." -Participant #1, Physician*

> *"This would not work without the electronic medical record."*
> *-Participant #6, Physician*

> *"Taking advantage of the technology is crucial." -Participant #7, Physician*

> *"Well, could you do it without an electronic record? Wow, it would be hard. That would be really hard. Could I do it without being able to email patients? Yeah – but harder, harder than with it. I mean I think the IT is integral to it. Certainly it facilitates all of it... EMR I think is probably essential. The rest of it is extremely helpful." -Participant #11, Physician*

> *"Interviewer: So would the medical home model be possible without the clinical information systems? If you were doing this in a paper world – paper, telephone, fax? Participant: Absolutely not." -Participant #14, Medical Assistant*

> *"Essential. You cannot do this without the - I don't think - without the electronic medical record." -Participant #16, Physician*

Participants cited opportunities for improving the usability of the CIS, and also developing new CIS features or extensions to assist with collaborative care planning and care plan documentation efforts. However, the current ICT infrastructure was viewed as sufficient for their needs, and they did not feel significantly limited by it.

> *"I guess I look at what I have and am grateful for [the ICT]. I'm not looking - it works fine for me. There isn't anything that I immediately would say needs changing." -Participant #6, Physician*

> *"Well - the fact I'm struggling to come up with an answer suggests that (laughs) – tools aren't the problem... In terms of the things I can do or not do - I don't see any major problems. I guess in part I'm not - even though I rely so much on the electronic medical record and email and stuff, I'm not a technology person. So there might be other people who say 'Well, I wish you could do...' Maybe I'm not aware of what other capabilities there would be! (laughs)" -Participant #7, Physician*

This finding contrasted sharply with the perspectives of the Chapter 5 study participants, who appreciated the availability of the ICT but who were often critical of their designs, usability, and functionality, and the work pace inhibiting effects associated with their use.

7.3.6 Effective Care

Participants expressed that the PCMH practice redesign resulted in their enhanced abilities to provide effective primary care and to fulfill their roles as primary care providers.

> *"One of the first things that I feel as a primary care physician is that for what I was trained to do - I'm finally able to do everything that I learned family practice docs are supposed to do. And I even do more than I thought I could do. ...I think we all know*

> *this is the right way to do medicine so we want to make sure our patients always have that experience. We're really focused on our patients, making sure that that service and quality of care is always there." -Participant #6, Physician*

Provider perspectives on the effects of this practice redesign intervention on patient care manifested as both general comments of this type as well as comments pertaining to their perceptions of improvements in the timeliness of patient access to care, care coordination, the extent of patient involvement in setting care priorities and making care decisions, and the comprehensiveness of care – including enhanced support of patients' self-care efforts.

7.3.6.1 Effective Care: Timeliness and Convenience of Patient Access

Participants reported that they had achieved the ability to consistently provide their patients with timely and convenient (often same-day) in-person appointments and timely responses to their telephone inquiries. Secure messaging through the patient Website was often cited as an efficient and mutually-convenient means of providing patients with timely access to needed care from their providers.

> *"[Secure messaging] plays a huge role on the weekends when I'm at home. I get a lab result, the person needs to know it, I saw them on Friday so I email them the lab result. Plus they're secure messaging me on the weekends also and they have a problem that should be seen or somebody should talk to them about it, and they don't have to sit on the phone for hours and hours with a consulting nurse and then not get the right answer. They get it directly from me." -Participant #16, Physician*

7.3.6.2 Effective Care: Coordination

The CIS was also viewed as being particularly helpful in enabling care coordination across multiple settings, time periods, and providers by actively promoting shared situational awareness among its users. Encounter notes, test results, and other information found in the CIS were cited as providing informational continuity and transparency into the past, present, and future trajectories of patients' care processes and the roles played by other providers in these care processes.

> *"The computer makes it so that it's just right in your face. You know when a person's been seen, you get a report, you can immediately access their problems, what their abnormal labs were. It's totally different than the era where you had to hope you got a notification that a person was seen. It's light years different as far as the electronic age, things happen quickly - making possible pretty much the resource of knowing where people are and when you need to respond." -Participant #3, Physician*

> *"They're getting more care, and they're getting continuity of care. It's not like they walk in and we go 'Oh well, what's happened, tell me about it' or 'I didn't know about that'. I know about it ahead of time. Then also we can look [in the CIS] at where they're going to get care and where we need to pick up if they've seen a specialist. I'll read the specialty note and I'll see that the specialist - they'll say 'Follow up with primary care'. I will call the patient and say 'I want to follow up on this'. We do outreach on that. We link them back to us. They don't get lost. We then closely watch the emergency room visits and we're calling our emergency room patients to follow up afterwards." -Participant #6, Physician*

The CIS' internal staff messaging feature was also cited as a convenient means of coordinating provider-initiated changes to care prompted by finding information in the patients' records.

> *"There was an X-ray that showed a fracture. Did the ER know it or did the PA? And this happened the other day, no mention of fracture, they obviously missed it. So then I sent a [staff message] to my LPN 'Let him know he has a fracture, bla bla bla'. So*

> *that it was dealt with so we didn't drop it. So within a few minutes maximum you can pretty well figure out what's going on." -Participant #1, Physician*

This perspective was similar to the Chapter 5 study finding that providers perceived positive effects on care quality mostly associated with their use of the CIS to better coordinate their patients' care, and the role that the CIS plays in promoting and enhanced sense of situational awareness of patients' care trajectories among its users.

7.3.6.3 Effective Care: Comprehensiveness

Participants also reported that since implementing the PCMH they were personally delivering more comprehensive care to address a wider range of their patients' illness and wellness needs. They exhibited a shared motivation to "do it all, do it right, and do it now" rather than restricting the scope of care activities to dealing with the most pressing clinical need in the present and handling other recognized needs in future visits.

> *"In the Medical Home, the time spent with a person is longer or the appointed time is longer and that allows for delving into complex problems, delving into multiple problems, addressing every concern that the person has rather than putting it off to future visits and having them come back and back... The system supports them asking all the questions that they want to ask... So in conventional primary care when a physician is really pushed and they're way backed up, they see a person, they know they're depressed, they know there's a lot going on and they do everything possible not to ask and not to address that. What the Medical Home does is it allows you to say 'You know, I've known you for a long time', or 'I don't know you at all, but you sure look depressed. What's going on?' Or to go into that territory... So in conventional care a person might not ask that, but the medical home allows you to ask that question, 'Well, what are your stresses?' And then all this stuff comes out. You know? So I always did ask those questions and I always did take care of multiple*

> *problems, but I would run hours behind... No good deed goes unpunished is what people said... And so if you address that one problem and you don't seek out other problems or you don't look at it as a whole person or a complex issue, you would dismiss a lot and you would send people off, and you would not be thorough and you would not be helping these people. Because they might get a Band-Aid, but they're not getting the real treatment. They're not getting what's going to really help them."*
> *–Participant #16, Physician*

Participants often cited their use of the CIS as enabling them to identify and address patients' needs for preventive and chronic care. They also reported that since implementing the PCMH model they are more likely to act upon CIS-generated health maintenance alerts and best practice reminders.

> *"Preventive care - man, how do I quickly and efficiently look up whether you've had a mammogram, your colonoscopy, your cholesterol checked and all of that quickly without [the CIS]? Forget about it. ...Plus which you know I have reminders - bing, I have a bright yellow banner that says 'You haven't had your Pap smear in over 3 years'. That's kind of in my face, hard to ignore that. Actually I did a lot of ignoring those before but now I get to address them." -Participant #11, Physician*

Physician participants also claimed that the CIS and collaborative use of its staff messaging feature with consulting specialists enabled them to personally provide care that might otherwise have required a specialty referral.

> *"Here's an example of – I had a patient that had a kidney problem, and I couldn't quite make up my mind about it. And I said 'I'm not sure whether we should do this or that.' But right there in front of the patient I sent a message to the urologist on call – and you send it to a pool and usually within a couple of hours they answer it. And then I'll tell the patient, 'Now what I'll do is send this message in and as soon as*

> *I get an answer back I'll call you with the result of what we need to do next'. They love it. And sometimes within 30 minutes I have a response back... I give them the lab work and they can look up the lab work and see the patient and tell me 'Here's what you should do next'. And really that has saved a lot of referrals. And the key was I had the time to do it, where before I was seeing 3-4 patients an hour, I was busting buns just trying to stay ahead, and I'd refer them. So as a result I now get consultations by email and then communicate with the patient, and save a visit."*
>
> *-Participant #1, Physician*

This theme and the next one reveal provider assessments of the effects of the PCMH redesign initiative and ICT use on population-oriented care and fulfillment of their patients' preventive and chronic care needs that contrast sharply with the study findings reported in Chapter 5.

7.3.6.4 Effective Care: Promotion and Support of Self-Care

Participants also cited many uses of the available ICT in enabling their efforts to both promote and support patient self-care. Providers cited a positive motivational impact associated with encouraging patients to use the Website to access information found in their after visit summaries, test results, and other portions of their medical records.

> *"The ability, actually the real leveraging for me is the power that patient access to their medical record allows them in terms of managing their care... I can share it with the patient and motivate the patient to make the changes." –Participant #6, Physician*

Participants also reported the perceived effectiveness of encouraging their patients, especially those living with chronic conditions, to use the Website to complete and update a personalized health risk assessment, trend their lab results, and engage in ongoing information exchange with them and other care team members through secure messaging. These activities were perceived to promote and/or support self care efforts to varying degrees depending on the given patient.

> *"I have one diabetic who hasn't sent me anything in a couple weeks, actually. But like every week or two would send me an update on his blood sugar readings. And I mean, that's a patient who I didn't have to motivate. I mean he had the motivation and he's taking advantage of the email system to make that communication clearer to me and to [RN] how he's doing. I think that for other people they're finding how easy it is to - it takes a little convincing to tell people to purchase a blood pressure cuff to monitor blood pressures at home. But when - there's a blood pressure monitor that I've found works real well for forty dollars. When you say 'It will quickly pay for itself in co-pays, because - I mean I don't necessarily need to see you for blood pressure itself. You're not going to be coming in every 3 months to monitor blood pressure. If we know you've got an accurate cuff, you can send the readings to me.' So those patients are patients that otherwise probably would not have done anything." -Participant #7, Physician*

7.3.6.5 Effective Care: Patient Involvement in Care Decisions

The act of offering patients the option to engage in secure messaging and telephone encounters with their providers was also viewed as an effective means of increasing patient involvement in care. Participants reported positive effects associated with offering these forms of contact as options during care planning discussions.

> *"They'll look at me and I'll say, 'Look, the old way, me telling you to lose weight, doesn't work. Your blood pressure's up, your blood sugars are up - all those are affected by the weight. How can I help you? I mean, is it something you want to do? Now you tell me, if you don't want to deal with the weight, that's the end of it, we don't talk about it. But if you want to, let me know.' And I've had two or three guys,*

> *when I present it that way, tell me 'Well, I need to be checked, but I can't always come in'. I say 'Well, what about a phone call? How about email? Okay, in four weeks...'" -Participant #1, Physician*

Participants also commented on the participatory nature of care in general under the PCMH, and how the ICT supported their efforts to involve patients in setting their care priorities and making decisions about their acute, chronic and preventive care. Specifically, providing patients with access to information in their medical records through the Website was viewed as a means of informing their care decisions.

> *"We need to make sure that patients are aware of the benefits and side effects, and each patient responds differently to treatment. Also each patient would make a different decision, given the same information situation. And the electronic medical records and tools, the IT stuff, allows us to do better – to give the patients that information." -Participant #6, Physician*

The Website's interactive health risk assessment application was cited as being particularly relevant to identifying patients' individual preferences and needs, and establishing a foundation for engaging patients in discussions of their care needs, preferences, and priorities. Physicians reported that information elicited via this application and displayed in the CIS provided "cues" and "icebreakers" that helped them to engage patients in relevant discussions.

> *"So I get this Health Profile before they come in and so I look at them, look at what issues they mentioned, so that I can prepare for them, what to talk about... When I look in the Health Profile if they mention for example alcohol or if they mention weight issues or if they mention mild depression, those kinds of things, which they may not be able to bring it up when they are coming for a regular visit, now I have that information. And so what I'll do is now - given that with the medical home model*

> *I have the time - I'll start bringing them up saying 'Hey, you mentioned this'... There is no way I can directly ask some questions, but now that I have the tools I can say like 'Hey, you mentioned in your Health Profile that you're drinking a little bit more alcohol, so how about – what's happening?' So I have a starting point there and then I can kind of ask them and get them into an intervention. So patients - I have seen a lot of people, when I mentioned that I read in their Health Profile 'You mentioned this', they'll be looking at me like I know what's going on... I'm paying attention... So this may definitely be used as a tool to get the patient engaged in their care."*
>
> *-Participant #13, Physician*

7.3.7 Proactive Provider Information Seeking and Information Sharing Behaviors

Participants expressed that their efforts to seek information pertaining to patient needs were not constrained to opportunistic interactions with medical records and patients prompted by events occurring during office visits.

> *"We're using the IT more, emailing the patient. Yeah, for outreach is the main thing. And then the other thing is chronic care also, how we're dealing with chronic conditions... It all comes to outreach, not necessarily just before the physical, but even with diabetes or COPD... We'll email them and then we'll ask them to get the tests done." -Participant #13, Physician*

Many cited their self-initiated uses of ICT to mine for information residing in multiple sources – including patients themselves – in their efforts to identify and address patients' unmet needs.

> *"I'm using [the ICT] much more extensively and leveraging them more, taking more time to use them. Looking for opportunities for me to change something, intervene, plan ahead. As opposed to in the past, with the previous scheduling – I just*

> *basically, whatever they presented me in the office with, that was pretty much, I tried to get through that. I felt lucky for that... And then trying not to create more issues for patients to bring up. Whereas now I will ask them, 'Is there anything else?' or 'What about your preventive screening?' or 'You're on this medicine and this probably is not a good medicine for you to be on, or at some point you need to stop it' - estrogen would be a classic one, or maybe they're on some sleep medicines. Then reaching out and spending some time to plan on that." -Participant #6, Physician*

The entire care team has adopted a proactive stance towards identifying and addressing unmet, unvoiced, or otherwise unrecognized patient needs. Interviews revealed that the problem identification component of care extends beyond acknowledgement and diagnosis of the patients' expressed chief complaint(s). Every contact with patients or their records is treated as an opportunity to discover and address additional problems, issues, or needs.

> *"And so she [team clinical pharmacist] had contacted this patient to find out why he was on atorvastatin and he had reported that it was inaccurate. He had reported that the simvastatin wasn't strong enough for him in the past. So I just go back in his records, and I'm able to filter through his medications and I see well, actually there's a little gap in there that doesn't - I'm not exactly sure when the switch was made. But he had been on ten milligrams of simvastatin and was switched to ten milligrams of atorvastatin, Lipitor, and throughout that whole period of time, his cholesterol is - his goal cholesterol would be less than 130, and his have always been less than 100. So simvastatin was plenty strong - and I think the reason the switch was made, I looked back through an email with [colleague Dr. X] and to me it sounds like it was made because his HDL had been on the low side. But if you look at his HDL on Lipitor, it's actually lower on Lipitor than it is on Zocor, which is unusual. And so I mean there's an example where I was able to use not just secure messaging but I was able to use the medical record and quickly make sense of this... I mean here it's a couple clicks of*

> *the button and you can get five years of cholesterol medication prescriptions, they're right in front of you. And then with another couple clicks you can get the cholesterol readings over that same five year period. And you can quickly see the cholesterol readings on the simvastatin versus the atorvastatin. He was actually doing better with simvastatin. So it's a no brainer. He's a Medicare patient, and he's been paying ten times more for a medication which is no more effective… I don't know how long it took me, but five minutes or something like that to figure that all out… Well, here's another good example. [Another patient] had a colonoscopy two years ago with a couple of polyps. And because of that result one of those was a little ab - not cancerous but a little abnormal. He should have another colonoscopy in five years. And I can put the plan in there, June of 2011." -Participant #7, Physician*

In many cases when unmet patient needs or opportunities are identified, participants reported that they use staff messaging to share information to raise physicians' or other care team members' awareness of these issues. They also reported initiating secure messaging or telephone contact with patients to promote or confirm their awareness of these unmet needs, prompt them for more information, solicit their input into care decisions, engage in collaborative problem-solving, and/or advance their existing care plans.

> *"Through [secure messaging] I can remind them that they're due for their tetanus, I can remind them that - current meds, tetanus. If they're diabetics I ask them to bring their blood glucometers. I can tell on Epic if they've been diagnosed with hypertension and I can ask them to bring in any readings they've been doing at home. All via secure message. And so it's really helpful to be able to just click click click – 'oh, they've got hypertension, oh, they've got this, oh, they've got that'. I can just put that in the secure message so when they show up, they in theory have their glucometer, they have their blood pressure readings, they have their whatever we've asked them for. And that way that kind of folds into the doctor can go over a whole*

> *scale of things instead of their sore throat. 'Oh, how has your blood pressure been doing, how have your blood sugars been doing?' So I think that really puts us above what other clinics have been using Epic for. We're diving into a lot more of their medical history, not just what they've been scheduled to be seen for."*
>
> *–Participant #14, MA*

Participants cited these exemplar and other specific uses of the available ICT to support effective care cross all five of these dimensions of what they viewed as effectiveness. In contrast to the Chapter 5 study findings, the PCMH study participants expressed that acute, chronic, and preventive care were all well-supported in their care model, of which the ICT and specific ICT use cases were viewed as integral defining components.

7.4 Discussion and Conclusions

Participants' perspectives on the overall effects of their clinic redesign based on the PCMH model were overwhelmingly positive. This study revealed their perspectives on the specific contexts of ICT use in this care system model, and the resulting effects.

Specifically, participants reported stronger patient connections, effective teamwork, and a supportive work environment – each of which contributed to their enhanced abilities to provide effective care, and to significant increases in their job satisfaction. They cited specific uses of various ICT in their efforts to deliver more comprehensive, coordinated, timely and convenient care, and to both promote patient involvement in their care decisions and support patients' self-care efforts. Participants also exhibited a markedly proactive stance toward information-seeking and information-sharing in their efforts to identify and address unmet patient needs, and viewed the CIS and other ICT as necessary and sufficiently-designed enablers of these activities. While the participants also cited several areas of needed improvement for both the ICT (e.g., need for a shared online care plan feature within the CIS) and other components of the care model (e.g., need to improve in-person patient visit access on Mondays), none of these identified improvement needs were viewed as essential to sustaining any of the gains they had achieved or to the continued success or viability of the care model.

One of the more pronounced differences in providers' reported experiences using ICT in this model compared to conventional practice is the frequency with which they engage in email contact with patients and perceive to derive mutual benefit from these ICT-mediated interactions. The systematic and frequent contexts in which many of these emails are initiated by providers are atypical of conventional practices in which providers are overwhelmed with reacting to demands for their time and attention. The extent to which the nature and frequency of this alternative form of patient contact is perceived by providers to contribute to improved care and enhanced patient relationships, not just between patients and physicians but also between patients and other clinical staff, is particularly noteworthy.

These findings suggest several areas of research need and opportunity. The participants' adoption of a proactive stance towards information seeking and sharing as it pertains to identification and fulfillment of unmet, unvoiced, or unrecognized patient needs might be of particular interest to the informatics research community. Participants' comments about the prevalent information avoidance "coping" behaviors[300] exhibited by overwhelmed and throughput-pressured primary care providers contrast sharply with their self-reported experiences of proactively engaging patients, patient information sources, and ICT to seek out and address additional needs beyond their patients' presenting chief complaints.

The participants' perspectives on the critical role of teamwork in this model also indicate opportunities for studies informed by theories and constructs drawn from the sub-discipline of Computer-Supported Cooperative Work. Studies of consulting specialist and patient experience with this ICT-enabled care model – specifically, studies of specialists' ICT-mediated interactions with primary care providers and each other – could further illuminate how the PCMH model affects specialty consultations, referrals, care coordination, service utilization, and costs. Studies of this type offer potential to fill significant gaps in the current evidence base about both the care quality effects and the economic viability of the PCMH model as a central component of U.S. healthcare reform.

Perhaps most importantly, this work highlights the need for studies aimed at assessing patient effects and eliciting patient perspectives on the PCMH and care redesign initiatives that heavily leverage electronic medical records and other ICT. Given that strong patient-provider relationships and effective communication serve as key determinants of quality in primary care, studies of the effects of ICT use in the context of patient-provider interaction would be particularly valuable.

7.4.1 Study Conclusions

Primary care providers practicing in the Group Health PCMH for the first 18 months felt supported by their organization, colleagues, and ICT infrastructure in their efforts to provide what they perceived to be improved patient care across several dimensions. This sense of support, stronger patient relationships, effective teamwork, and enhanced abilities to provide effective care yielded significant improvements in their job satisfaction.

7.4.2 Study Limitations

Single interviews with participants occurring over a 7-month time period have provided a cross-sectional "snapshot" view of provider perspectives on their first 18 months of experience with a comprehensive practice redesign initiative. As such, significant shifts in participants' perspectives on the effects of this practice redesign that may occur beyond this time period have not been captured.

The focus on a single study setting that represents an operating unit within a larger integrated financing and delivery system might limit the potential transferability of some findings to other similar organizations (e.g., risk-bearing multispecialty medical groups). The applicability of findings specific to ICT might be limited to the EpicCare products, legacy systems, and organization-specific user interfaces and/or technical configurations of these ICT.

Also, qualitative observational research methods are intended to provide rich descriptions of concepts, phenomena, and situations, but not to support formal hypothesis testing or generalizable claims of causality. As such, additional mixed-methods and quantitative evaluation studies of the Group Health PCMH and other instantiations of the PCMH model would provide valuable means of methodological triangulation in assessing the model's comparative effectiveness as a primary care practice redesign intervention.

7.5 Summary

The preceding Chapter 6 presented a descriptive study of the structure, development history, and intended effects (i.e., "anticipated desirable consequences") of the Group Health PCMH care system redesign intervention (i.e., "designed innovation"). The findings generated by this study – which was intentionally conducted prior to the Chapter 6 study in part to avoid bias – complemented those findings by illuminating provider perspectives on the innovation's emergent effects.

Specifically, in relation to the two original research questions posed in Chapter 2, this study found the following:

Question #1: How are primary care providers integrating ICT into their practices, and how is their use of ICT affecting their relationships with patients, staff, and other providers; care quality; and their quality of work life?

Answer #1: Through a comprehensive, "bottom-up" participatory approach to practice redesign that produced pronounced positive effects on these relationships; positive perceived effects on care quality across multiple dimensions of effectiveness and across the full continuum of preventive, chronic, and acute care; and significant job satisfaction increases for primary care providers.

Question #2: What can elicitation and description of provider perspectives teach us about their adoption of healthcare ICT?

Answer #2: That the consequences associated with ICT use in the Patient-Centered Medical Home model – i.e., key determinants of "innovation adoption" – were perceived by participants to be yielding an effective and sustainable emergent care model.

These findings contrast sharply with the findings of the Chapter 5 study of provider experiences with the Access Initiative and their perspectives on the same ICT in the context of that organizational redesign initiative. Specifically, in relation to the additional questions that emerged from the Chapter 5 study, this study found the following:

Are the physician workload increase and task redistribution effects associated with the CIS and patient Website implementations reversible or otherwise amenable to change? Must ICT-enabled patient-centered access come at the expense of physician quality of work life? Is there a zero-sum relationship between ICT-enabled patient-centered access and provider job satisfaction?

Participants in this PCMH provider experience study claimed success in their efforts to provide ICT-enabled patient-centered access and also reported significant increases in their job satisfaction.

Physicians reported that the CIS enables them to provide better visit-based care – but can it and the other ICT also serve to enhance and maintain the population health focus required to provide high-quality preventive and chronic care?

Providers in the PCMH viewed the ICT as essential to their efforts to provide care in this model, which they perceived to be effective across several dimensions of quality and the full continuum of preventive, chronic and acute care.

Providers suggest that ICT use is affecting their relationships with patients – but how? Are the net effects positive or negative, and what might be the long-term implications for quality of care?

Many uses of ICT in the context of the PCMH pilot were reported to be directly associated with enhanced patient relationships and stronger patient connections.

Are these effects and provider experiences inevitable, or were they indicators of a sub-optimal approach to concurrent enterprise ICT implementation and patient-centered organizational redesign? Can other care redesign models or approaches that leverage the same ICT yield better provider experiences and perceived outcomes?

These effects were not reported by participants in this study of provider experience with ICT and the PCMH, which yielded generally positive and in many cases polar opposite effects from the participant's perspectives.

Chapter 8 explores these contrasting provider perspectives on the roles, importance, and effects of ICT in care redesign initiatives based on the Patient-Centered Access and the Patient-Centered Medical Home. Findings of this overall program of research are discussed in terms of their contributions to the healthcare ICT evidence base and the discipline of Biomedical & Health Informatics, as are potential implications for policy.

Chapter 8: Significance and Limitations

The preceding original studies chapters have presented discussions and conclusions about the significance of each individual study. This chapter opens with a summary, synthesis, and discussion of the original research findings generated by this program of dissertation research. Section 8.2 draws conclusions about the significance and contributions of this body of work. Potential policy implications are also identified. Section 8.3 acknowledges the limitations of this work. Section 8.4 describes future directions for this program of research, and the chapter closes with personal acknowledgements and statements of appreciation in section 8.5.

8.1 Summary, Synthesis, and Discussion of Findings

This section reviews and summarizes the findings of the Chapter 5, 6, and 7 studies in chronological order. Study findings are then discussed in relation to each other and in relation to Sociotechnical Systems Theory and Diffusions of Innovations Theory.

The Chapter 5 study of physicians' experiences with the Access Initiative found that participants' conceptualizations of care quality were multi-dimensional, and they perceived that different dimensions of care quality were not equally affected by this ICT-enabled organizational redesign. The Access Initiative's perceived negative effects on population-oriented preventive and chronic healthcare were differentiated from its predominantly positive effects on individual encounter-based care. These findings raised questions about the ability of ICT to simultaneously promote population-oriented and patient encounter-oriented perspectives among end users, and to effectively and efficiently support the full continuum of comprehensive preventive, chronic, and acute care activities. These questions served to inform the Chapter 7 study, and also warrant further investigation by the BHI research community.

Findings of the Chapter 5 study also revealed primarily negative provider attitudes towards ICT use in the context of what they perceived to be an incremental, fragmented, internally inconsistent, and "top-down" approach to organizational redesign. Specific dimensions of care and the vehicles for producing, delivering, and coordinating it appeared to be inconsistently and adversely affected by the use of ICT as components of or concurrently-deployed adjuncts to the Access Initiative. Findings suggested that the very technologies that were being implemented with the intent of enabling improvements to the access, safety, coordination, and patient-centeredness dimensions of care were possibly contributing to the erosion of other dimensions of care (e.g., population-oriented preventive and chronic care). Use of these ICT within the context of the Access Initiative care redesign model was also cited as contributing to decreases in provider job dissatisfaction of such a magnitude that they appeared to threaten the viability of the organizations' service production system core – i.e., its primary care physician workforce. Participants' asserted that further organizational changes were required to sustain the realized gains and to improve the quality of work life for primary care physicians to a sustainable level.

These and other findings emerging from this study identified opportunities for BHI studies focused on the representation and evaluation of different methods and models of ICT-enabled healthcare redesign – specifically the comparative effects of various ICT-enabled care redesign models on provider and staff workload redistribution, job satisfaction, patient/provider interaction, and specific dimensions of care quality.

The Chapter 6 study of the organizational experience with interpreting, designing, and implementing the Group Health Patient-Centered Medical Home pilot as a primary care-based care system model identified a sharp contrast in approaches to single clinic pilot implementation and organization-wide enterprise implementation of these same ICT within the same organization. This comprehensive, facilitated, and participatory approach to fundamental "bottom-up" pilot practice redesign included specification of intended roles for ICT use, information management, and communication practices within the redesigned care system model. Risks of strategic misalignment with the larger organization that could have resulted in conflict and adverse outcomes similar to those associated with the Access Initiative (see *good ideas that suffered from poor implementation* and *inherently bad ideas* themes) were also identified prospectively and mitigated by explicitly granting the pilot clinic "immunity" from select other organizational strategies and policies (e.g., patient panel sizes were reduced from the organizational standard to allow for longer in-person visit times and appointment scheduling templates that incorporate dedicated "desktop medicine" time slots for physicians to engage patients, colleagues, and information via the ICT). Furthermore, this approach used participatory processes that extensively involved the physician and clinical support staff ICT end-users in redesigning and continually refining their own work roles and responsibilities that manifest as routine ICT use cases (e.g., management of secure message inboxes, pre-visit chart review using the CIS, review of after visit summaries with patients).

These findings all support the classification of the Group Health PCMH as a sociotechnical care system model according to the principles of Sociotechnical Systems Theory. They also raise additional research questions about the relative role of provider and staff participation in care redesign efforts, and the extent to which the participatory approach used in the Group Health PCMH pilot can or should be replicated as any re-designed care model is scaled and spread throughout a larger provider organization.

This view of the Group Health PCMH as a sociotechnical system of primary care delivery offers a unique perspective on what actually constitutes an "ICT intervention" in evaluation studies. Perhaps the first two weaknesses identified in the healthcare ICT literatures – i.e., vague descriptions of the specific ICT being studied and lack of contextual information about their development, implementation, use, and/or evaluation – are actually unique manifestations of a single underlying weakness: that the ICT whose properties and/or effects are being studied are in fact only structural components of re-designed sociotechnical care systems comprising specific technologies *and* their specific (intended and unintended) use cases *and* use contexts. This interpretation suggests that it might not be possible to accurately evaluate the effects of ICT on care quality or other (proximal or health) outcomes without evaluating the systems of human activity that they shape and support (i.e., the sociotechnical care systems that emerge with their implementation and use). This assertion implies that the construct validity of most healthcare ICT evaluation studies is questionable, and the challenge becomes one of accurately, precisely, and pragmatically representing the "interventions" being studied – robust systems modeling challenges well suited to the BHI research community. The Unified Modeling Language (UML), the Integration Definition (IDEF) family of modeling languages, or other standardized systems modeling languages that graphically represent both declarative and procedural knowledge might be suitable for representing sociotechnical care systems for purposes of evaluation. Suitable mathematical approaches to modeling might also be found in publications by the Tavistock Institute investigators who first conceptualized and developed Sociotechnical Systems Theory. [301]

These assertions that ICT should be conceptualized and evaluated as components of sociotechnical care systems are supported by the Chapter 7 study of primary care provider experiences with ICT in the Group Health Patient-Centered Medical Home. Findings revealed profound differences in participants' perspectives on the roles, importance, and effects of ICT use when compared to the perspectives of the Chapter 5 study participants. The same ICT (i.e., structural elements of the system) that had been perceived as directly contributing to what Diffusion of Innovations Theory would characterize as "undesirable consequences" resulting from the Access Initiative (e.g., job dissatisfaction and burnout; compromised population health focus; vaguely defined but often undesirable disruptions to doctor-patient relationships) were viewed by PCMH demonstration clinic providers as essential enablers of a care system that yielded "desirable consequences" that were in many cases direct polar opposites of the reported

Access Initiative effects (e.g., increased job satisfaction and reversal of burnout; enhanced population health focus; stronger patient connections). Clearly there were elements of the two re-designed care systems other than the ICT involved in creating these effects.

The contrasting stances exhibited by the Chapter 5 and Chapter 7 study participants toward information seeking in the context of what Starfield describes as patient problem (or need) identification is also noteworthy. This finding highlights opportunities for studies in this domain that use and advance theories of information behavior that incorporate information avoidance and information overload constructs.[302] The contrasting findings pertaining to ICT-associated enhancement of team functioning (Chapter 7) versus undesirable ICT-associated workload redistribution and "funneling more work to the physician" effects (Chapter 5) also suggest opportunities for studies that leverage and advance theories of team dynamics, human-computer interaction, and computer-supported cooperative work.

This entire body of work supports a rather simplistic but unassailable conclusion – that meaningful evaluations of healthcare ICT, provider adoption of ICT based on their assessments of usefulness and net comparative advantage associated with use, and the effects of ICT use on patients, providers, and healthcare organizations require specifying the sociotechnical systems of care that they both define and support, and the care redesign methods used in their implementation. Modeling these care systems and redesign methods to support empirical studies of ICT presents significant challenges, but also robust opportunities for collaboration among BHI and health services researchers.

8.2 Research Significance and Contributions

This program of dissertation research offers significant original contributions to the discipline of Biomedical & Health Informatics (BHI) that manifest primarily in two forms – contributions to the evidence base on the roles, effects, and importance of clinical ICT in healthcare redesign and quality improvement, and generation of empirically-grounded research questions, hypotheses, and theories well-suited to further exploration by the BHI research community.

8.2.1 Contributions to the ICT Evidence Base

The reviews of the healthcare quality and ICT evaluation research literatures presented in Chapter 2 and Appendix A revealed four significant weaknesses in the evidence base pertaining to ICT effectiveness. First, this review of the evidence reveals that 1) ICT and ICT-enabled quality improvement interventions and effects are inadequately described in the vast majority of studies. This deficit significantly limits the generalizability of study findings. The second identified weakness is that 2) most published accounts of ICT evaluation studies lack relevant contextual information about the conditions of intervention implementation and assessment, and/or do not account for relevant contextual variables in their study designs. Third, 3) studies of mature internally-developed ICT deployed at a small number of academic medical institutions are over-represented in the subset of published studies that exhibit significant findings. The fourth significant weakness revealed by this examination of the literatures is that, given the scope and priority of the relevant healthcare reform challenges and policies, 4) there is a relative paucity of evidence in general about ICT effectiveness in promoting healthcare quality, and that additional studies are warranted – particularly studies of the role of emerging healthcare ICT designed specifically for use in primary care and other ambulatory care contexts.

Chaudry, Ammenwerth and others who have recently reviewed the evidence on the ICT effectiveness in healthcare quality have concluded that there exist both timely opportunities and urgent needs for studies of healthcare ICT implementation, use, and adoption that will address these four weaknesses. Specifically, they call for more studies of the use of commercially-available ICT in primary and other ambulatory care settings and contexts. They also stress that these studies should offer more detailed descriptions of both the ICT being evaluated and the contexts of their implementation, use, and evaluation.

The review of methods presented in Chapter 3 highlighted opportunities and provided supporting rationale for addressing these deficiencies by leveraging qualitative observational methods. This chapter posits that qualitative observational studies of provider and provider organization experiences with the use of ICT in primary care-oriented healthcare redesign contexts offer the potential to both account for and represent the relevant contextual information.

The original studies described in Chapters 5, 6 and 7 aimed to address these four areas of evidentiary weakness and the identified methodology application opportunities through original qualitative observational studies conducted in the traditions of phenomenology, hermeneutics, and grounded theory. The ICT involved in these studies were primarily commercial products deployed in a non-academic community-oriented healthcare delivery organization (addresses weakness #3 – most studies involve mature CIS' developed internally at one of four large academic medical centers). Furthermore, the description of Group Health's ICT infrastructure provided in Chapter 4 provides transparency into the specific commercial ICT products (e.g., EpicCare Ambulatory EMR, Epic MyChart, HealthWise), product versions/releases, and feature sets that were in production use during the study periods (addresses weakness #1 – inadequate descriptions of the evaluated ICT).

The qualitative observational study designs and methods were purposively selected to support the overarching objective to produce highly-descriptive and theoretically-informed contextualized accounts of provider and organizational experience with healthcare ICT implementation and use. These studies generated contextually-rich descriptions of the ICT implementations, uses, and effects, and detailed descriptions of the contexts of fieldwork engagement (addresses weakness #2 – most studies lack relevant contextual information).

In short, these three original studies contribute to the empirically-derived evidence base on the effects of healthcare ICT in primary care settings and contexts (addresses weakness #4 – a relative paucity of empirical evidence in general, particularly in terms of studies of ICT used in primary care). These were not studies focused on the use of hospital EMRs coupled with computerized provider order entry (CPOE) deployed primarily in efforts to promote safer inpatient care through the reduction of medication errors at Regenstrief, Brigham and Women's/Partners Healthcare, Intermountain Healthcare, or the Veterans' Administration. The ICT under study were not limited to EMRs with integrated alerts-based clinical decision support, but also included a shared online medical record deployed via a patient Website that included secure patient-provider email capabilities and an integrated online health risk assessment application. The setting for all three studies was a large primary care-based healthcare delivery system, and the studies focused on healthcare providers' experiences with using a CIS designed to support ambulatory care delivery in their efforts implement two of the leading primary care-oriented quality reform strategies of the past five to ten years – Patient-Centered Access and the Patient-Centered Medical Home.

8.2.2 Contributions to Biomedical & Health Informatics

This body of work identified specific areas of opportunity for BHI to contribute to healthcare quality improvement and healthcare reform, and generated empirically-grounded research questions, hypotheses, and theories well-suited to further exploration by the BHI research community. Several research questions and opportunities for future research that emerged from the original study findings were identified in the previous chapters and in this chapter's section 8.1.

The Chapter 2 literature review concluded that although safety is an important dimension of care quality, reduction of medical errors of commission has been disproportionately emphasized as an objective of healthcare quality reform and as a central construct in healthcare ICT evaluation. This critical review of the literature identified opportunities for realizing greater contributions of ICT and the discipline of Biomedical & Health Informatics (BHI) to healthcare quality reform by promoting multi-dimensional interpretations of healthcare quality that emphasize effectiveness, patient-centeredness, and the defining attributes of primary care. Specifically, this critical examination of the literature inspired the following two questions that served as the overall motivation for this work, and that are worthy of pursuit by others in the BHI research community who strive to contribute to healthcare reform:

> *How are primary care providers integrating the routine use of ICT into their practices, and how is their use of ICT affecting their relationships with patients, staff, and other providers; their efforts to deliver high-quality care; and their quality of work life?*

> *What can elicitation and description of these provider experiences teach us about provider adoption of healthcare ICT intended to support healthcare quality reform?*

Framing the research questions in this manner implies a fundamentally different approach to implementing and evaluating healthcare ICT in quality reform contexts. These questions suggest a re-direction of research by the BHI and Health Services communities that to date has focused primarily on evaluating the effects of ICT – primarily CPOE coupled with medication interaction alerting functions – on care safety achieved thru the reduction of errors of commission made in inpatient settings by medical specialists and medical residents undergoing hospital-based training. Provider order entry and fulfillment typically serve as the “insertion points” for ICT into care processes, and evaluation criteria typically represent measures of patient safety interpreted as reduction or avoidance of preventable adverse events. In contrast, the first question above positions primary care provision as the insertion point for ICT into care processes, and multiple dimensions of care effectiveness and reduction of under-treatment and errors of omission as the primary evaluation criteria. The second question posed above, while not as explicit in its re-direction of current approaches to studying provider adoption of healthcare ICT, implies a focus on evaluating providers' assessments of contextually-determined usefulness and a shift in focus away from assumptions about the need to coerce "problematic", "stubborn", or "irrationally change-resistant" providers into using ICT. It is my opinion – based largely on my experiences with this dissertation research – that framing both formative and summative evaluation studies in this fashion offers much greater potential for the BHI community to contribute to healthcare quality reform.

The use of qualitative research methods to produce vivid descriptions of provider experience also offers opportunities to influence the perspective of BHI researchers and the direction of our ICT design and evaluation studies. This program of research demonstrated appropriate applications of the qualitative observational research methods described in Chapter 3 to highly-relevant research questions about the role of ICT in healthcare quality improvement, healthcare redesign, and the support of primary care. These methods supported a novel approach to studying contextualized human-computer interaction in ICT-enabled healthcare quality reform across three emergent dimensions of context – care model, the method/approach to care system redesign, and concurrent use of a constellation of ICT.

Because these methods are well-suited to generating detailed descriptions and grounded hypotheses, they often inspire subsequent mixed-methods and quantitative studies of related but previously-unidentified phenomena. For example, Ash and colleagues' qualitative studies of the unintended consequences of providers' use of computerized provider order entry (CPOE) were highly influential and ultimately motivated subsequent (epidemiologic and other quantitative) studies of iatrogenic effects associated with ICT use. Perhaps published accounts of these dissertation studies will inspire and inform additional studies of the roles and effects of ICT in Patient-Centered Access and the Patient-Centered Medical Home – currently two of the more prevalent primary care-oriented quality reform strategies being pursued by provider organizations in the United States.

Perhaps the most significant original contribution of this body of work to the discipline lies in its potential to further advance the sociotechnical paradigm as it continues to gain greater acceptance in the BHI research community. Original studies of the type included in this dissertation serve to identify and represent in meaningful detail relevant provider experiences with integrating ICT into their routine work practices – experiences that play critical roles in their effective use and sustained adoption of healthcare ICT. These studies also provide the transparency, detail, and contextual information needed to adequately define the sociotechnical activity systems that are typically under-specified as "ICT interventions" in evaluation studies that strive to assess their effects.

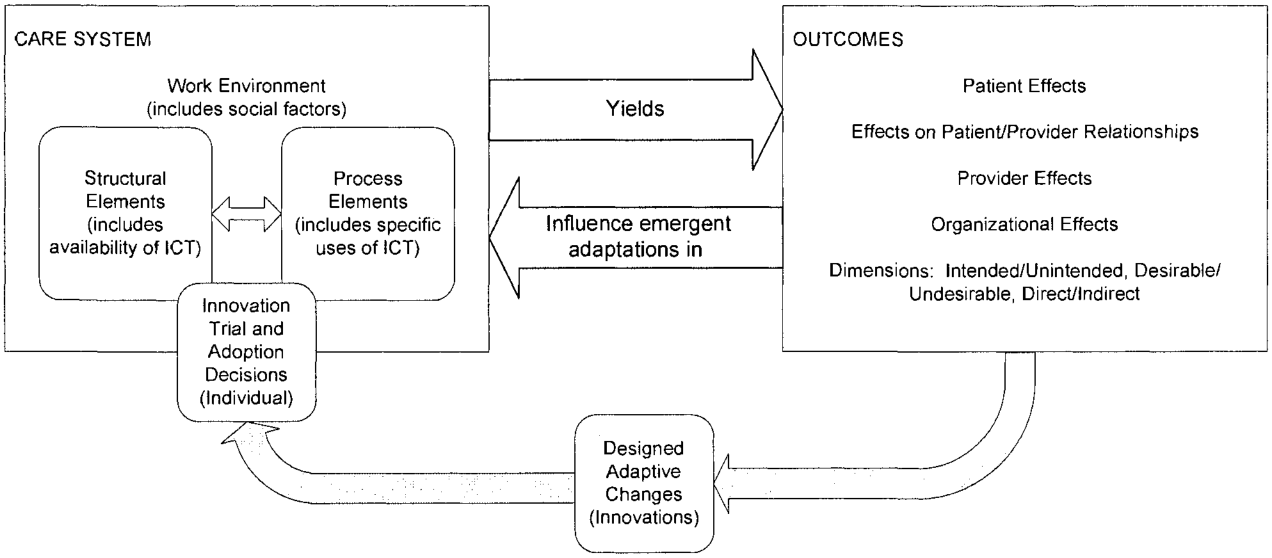
For example, a synthesis of findings generated by all three studies yields the following response to the second overarching research question raised in Chapter 2 that pertains to provider adoption:

> *Question: What can elicitation and description of provider perspectives teach us about their adoption of healthcare ICT?*
>
> Answer: That key determinants of provider ICT adoption – e.g., perceived usefulness and consequences associated with use a) are defined contextually and b) can vary widely even with the same ICT used in the same provider organization

The emergent findings that providers assessed such dramatically different (and often polar opposite) effects associated with the same ICT deployed in the same organization supports the proposition that healthcare occurs in open sociotechnical systems of activity. For example, the Chapter 7 study findings that these ICT can concurrently support multiple dimensions of care effectiveness in a sustainable fashion under the PCMH care model provides compelling evidence that dimensions of the care system other than the presence of the ICT served as determinants of these effects. These qualitative studies did not aim to test hypotheses about which specific elements of these care systems or context serve as critical determinants of providers' success in achieving and sustaining quality reform through the use of ICT. However, these findings reasonably suggest that selection of the *care models* and *care redesign approaches* used to implement ICT in quality reform initiatives, and *the concurrent and synergistic (or conflicting) uses of all ICT present in the work environment* serve as key determinants of sustainable success from the providers' perspective. Identifying these specific dimensions of context as the basis for future studies is a potentially valuable contribution of this research.

Another original contribution of this work is the demonstrated relevance of Sociotechnical Systems Theory, the Donabedian framework, and Diffusion of Innovations Theory to studies of healthcare ICT. The synthesized conceptual framework that drew on these theories both informed my studies and was informed by them, and evolved as a result (see Figure 8.1). As emergent study findings supported or suggested the relevance of these theories and concepts, elements of them were incorporated into the model. Its earlier iterations are shown in Figures 5.2, 6.2, and 7.1. Figure 5.2 reflects the Donabedian framework as well as the "treatment (or intervention) exposure→outcome" paradigm of epidemiology. The influences of Donabedian's "structure→ process→outcome" model and Sociotechnical Systems Theory become more evident in Figure 6.2, which served to inform the Chapter 6 case study of organizational experience with the design and implementation of the PCMH pilot. Concepts from Diffusion of Innovations Theory are explicitly integrated into the framework that I initially used to guide the Chapter 7 study of provider experience with the PCMH (see Figure 7.1). During the course of conducting that study and writing this dissertation, further refinements yielded the version shown as Figure 8.1.

Figure 8.1: A Grounded Framework for Evaluating the Roles, Effects, and Provider Adoption of Healthcare ICT



Concepts from Sociotechnical Systems Theory supplement and extend Donabedian's structure-process-outcome framework by explicitly recognizing ICT and ICT use as elements of structure and process. This framework also reflects the sociotechnical perspective in that it acknowledges the relevance of social factors and the dynamic open systems nature of healthcare through representation of bi-directional influences of structure and process, and their interactions with a work environment that influences and is influenced by the outcomes and effects generated by the care system.

Diffusion of Innovations Theory also suggests that deliberately designed care system structure and process changes (such as those that comprise the Access Initiative or the

Group Health PCMH model) can be viewed as “innovations”. Influences of this theory are evident in the framework components that depict an individual innovation adoption decision process based in part on participants’ perceived effects or “consequences” associated with innovation use. This theory posits that individual adoption decisions are based in large part on the extent to which innovation use is perceived by individuals to be useful and provide net comparative advantage compared to their status quo behaviors.

This model grounded in both pre-exiting theory and in my own research experiences and interpretations of providers’ experiences could serve as the basis for other future (qualitative, quantitative, or mixed-methods) studies, and also as a guiding framework for formative evaluations of ICT-enabled care model design and implementation.

8.2.3 Potential Policy Implications

The critical review of the scientific literatures presented in Chapter 2 highlighted the need for ICT-relevant policies to align with policies designed to support and sustain primary care, which should play a central role in our nation’s healthcare quality reform agenda. Studies conducted by the BHI research community should demonstrate the relevance of healthcare ICT to quality reform endeavors that strive to address prevalent problems of under treatment, errors of omission in care, and the sustainability of and universal access to effective primary care. I have attempted to do this with my program of research.

Clearly this research suggests that simply implementing healthcare ICT and promoting its widespread adoption will not in and of itself yield quality reform – and may in fact cause more harm than good if these endeavors inadvertently serve as the “final blow” to an already strained and at-risk primary care provider workforce. Ensuring optimal contexts for implementation of ICT is critical to achieving provider adoption and quality reform policy objectives, and our healthcare reform policies should reflect this. Comprehensive and fundamental reform of healthcare financing mechanisms will probably be required to create contexts similar to those I studied in the Group Health PCMH pilot, as the range of redesign options available to the majority of provider practices in the United States is limited by the constraints imposed by traditional fee-for-service financing mechanisms. Specifying and evaluating the relevant financing reform alternatives is clearly the domain of health economics, health policy, and health services researchers – but this research suggests a critical need for BHI research and members of the BHI community to inform these endeavors.

One such example of a relevant and specific policy implication of my research findings involves the role of the Patient-Centered Medical Home in current U.S. healthcare reform initiatives. The Center for Medicare & Medicaid Services (CMS) and the National Committee for Quality assurance (NCQA) continue to advance policies and programs designed to promote healthcare reform through certification of provider practices as medical homes. Current classification and certification criteria heavily weight the presence of electronic medical records systems and other ICT as desirable elements of PCMH practice infrastructures, and as such both the Access Initiative study setting clinics and the Group Health PCMH study setting clinic would likely be classified by CMS as Tier 3 medical homes. As certified Tier 3 medical homes, all would qualify for the maximum additional reimbursement. However, provider experiences and providers' perceptions of patient experiences were radically different in these practices, and my study findings clearly indicate that simply implementing healthcare ICT does not equate to implementing a Patient-Centered Medical Home.

The sharp contrasts evident in my study findings suggest that the current NCQA and CMS medical home practice certification criteria would benefit from further refinement. Specifically, these criteria should incorporate measures of effectiveness and patient experience – including health outcomes measures. Proximal care process outcome measures that are highly-correlated with health outcomes measures should also be incorporated into the classification criteria, perhaps including measures of specific ICT use cases to support care. For example, McGlynn's 2003 study of healthcare quality incorporated patient-reported measures of care processes that reflected significant and prevalent under-treatment issues. Similar methods that incorporate both medical claims data to identify patient populations by health condition and patient survey data that assesses dimensions of their care experiences with specific providers could be used as components of practice certification. Given that one of the stated objectives of the PCMH reform movement is to revitalize and sustain primary care, assessments of provider experience – and providers' assessments of patient experience – should also be incorporated into PCMH practice certification criteria.

8.3 Research Limitations

Qualitative observational study designs that specify single interviews with participants provide cross-sectional "snapshot" views of their perspectives during a single point in time. As such, significant shifts in participants' perspectives that may have occurred beyond the study periods were not captured.

The focus on a single organization as a study setting might limit the potential transferability of some findings to other similar organizations (e.g., large integrated healthcare delivery systems, risk-bearing multispecialty medical groups). The applicability of findings specific to ICT might be limited to the EpicCare products, legacy systems, and organization-specific configurations of these ICT.

Also, qualitative observational research methods are intended to provide rich descriptions of concepts, phenomena, and situations, but not to support formal hypothesis testing or generalizable claims of causality.

8.4 Future Directions

Studies of patient experience with these and other similar ICT-enabled quality reform and care redesign endeavors would complement this research. Also, as many of the participants from my Chapter 7 study suggested that ICT-enabled support from their consulting specialist colleagues was instrumental to their perceived success with providing more comprehensive care in the PCMH, studies of ICT-mediated provider/provider interaction in the context of consultation, referral, and patient care transition contexts would present logical extensions to this research. Such studies could be particularly relevant to both risk-bearing and conventionally-financed multi-specialty medical groups, hospitals, and specialty care providers who will likely be challenged to initiate care redesign reforms that will enable them to interact effectively with emerging PCMH practices and providers with whom they are affiliated and from whom they receive their referrals and admissions. Methods development studies that explore various approaches to modeling ICT "interventions" as sociotechnical systems for purposes of empirical evaluation and studies of comparative effectiveness also present natural extensions of this work.

8.5 Acknowledgements

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- James Ralston, MD, MPH
- Rob Reid, MD, PhD
- Bryant Karras, MD
- Karen Fisher, PhD (GSR)

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- My studies and research activities from July 2004-June 2007 were also supported by a fellowship funded by a National Library of Medicine informatics training grant (PI Peter Tarczy-Hornoch)

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- 48 Group Health providers, staff, and leaders

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APPENDIX A: Patient Safety as a Dimension of Quality

This Appendix explores safety as the dimension of healthcare quality that has served as a primary driver of healthcare quality reform and efforts to promote widespread healthcare ICT adoption. This chapter also reviews the emerging evidence that suggests a greater potential for contributions of informatics and healthcare ICT to healthcare quality reforms focused on the healthcare quality dimensions of effectiveness and patient-centered care in the context of primary care.

Patient Safety: Adverse Events and Iatrogenic Injury Due to Medical Error

Over the past thirty years, several studies of iatrogenic morbidity and mortality have had a significant and lasting impact on the national health services research agenda and the organization, delivery, finance, and regulation of health services in the United States. The 1978 California Medical Insurance Feasibility Study,[303] the 1991 Harvard Medical Practice Studies[304] and the 2000 Utah and Colorado studies of adverse events due to error and negligence[305] [306] each provided evidence of shockingly high incidence of injury and death due to medical errors occurring in hospital settings. These studies provided foundational evidence supporting the Institute of Medicine's 1999 report *To Err is Human: Building a Safer Health System,* which cited these studies as evidence that as many as 98,000 deaths occur annually in American hospitals due to preventable medical errors.[307] Due in large part to these claims, this report has had a profound impact on the patient safety movement in medicine, the research agenda of the medical informatics community, the technology investment priorities of hospitals and medical group practices, and the product development and marketing strategies of commercial healthcare ICT vendors. Some have characterized *To Err is Human* as the most influential healthcare publication of the past 20 years,[308] and its influence on the patient safety movement and forces promoting healthcare ICT adoption in the name of healthcare reform cannot be overemphasized.

Evidence on ICT in Patient Safety and Iatrogenic Injury

Electronic medical records (EMRs) coupled with computerized provider order entry clinical decision support (CPOE) have drawn significant international attention and funding priority given their perceived and demonstrated potential to decrease medical treatment errors that lead to adverse events.[309, 310, 311, 312, 313] The assertion and fundamental belief that the widespread adoption of interoperable EMRs coupled with CPOE applications will yield improvements in patient safety, efficiency and quality of care also lies at the heart of the National Health Information Infrastructure (NHII) imperative, which has been actively promoted by the United States Department of Health and Human Services (DHHS) since 2003. The potential benefits claimed by the proponents of the NHII (most notably the National Committee on Vital and Health

Statistics, the primary information policy and strategy advisory group to DHHS) include dramatic improvements in clinical quality, including medical error reduction, which it is hoped will yield significant cost reductions. The formation of Canada Health Infoway and ongoing pursuit of the National Health Service's National Programme for IT (NPfIT) provide further evidence of the widespread conviction that these ICT will play a significant if not fundamental role in reforming our healthcare systems to better serve patients.

Although there have been multiple studies of the effectiveness of these technologies in reducing medical error, there is still much debate about these findings. The findings generated by a comprehensive literature review commissioned by the Agency for Healthcare Research and Quality (AHRQ) in 2001 presented perhaps the first significant challenge to the patient safety movement and the forces promoting widespread adoption of EMRs with CPOE. Of the prevailing healthcare quality improvement strategies found to have a significant evidentiary basis, this study concluded that very few were based on patient safety research.[314] It also reported that CPOE had yet to prove any significant impact on iatrogenic injury.[315] Contributing co-investigators, which included patient safety and CPOE advocates Kaushal and Bates, concluded that although limited evidence exists pertaining to the effectiveness of EMRs with CPOE in reducing medication treatment errors, that there is a relative paucity of effectiveness evidence in general. They also concluded that the evidence that we do have is very limited in scope, and that almost without exception the few safety evaluation studies that do exist were conducted at large academic medical centers with mature internally-developed systems, yielding results that can not be generalized to the hospital organizations, ambulatory patient care settings, or commercial products that comprise the bulk of healthcare ICT implementation initiatives.[316] Similar conclusions were reached in a hotly-contested July 2005 Health Affairs article by Jaan Sidorov.[317] Kawamoto et al's 2005 comprehensive systematic review of the literature yielded little compelling evidence of success or failure of EMRs with CPOE, regardless of the definitions chosen for "success" or "failure". [318]

Ammenwerth et al's more recent 2008 quantitative systematic review of the published evidence on CPOE effectiveness in reducing medical errors that result in adverse drug events (ADEs) was slightly more encouraging. Risk ratios were calculated and compared for each of the 27 qualifying studies (literature available through April 2006), leading to their conclusion that CPOE and electronic prescribing "...appears to be a useful intervention for reducing the risk of medication errors and ADEs".[319] However, they also concluded that both the quality of CPOE studies and the reports of these studies are generally weak and offer little potential for generalizability to other settings, particularly outpatient care delivery settings.[320]

Perhaps even more troubling than the relative lack of evidence supporting claims of CPOE efficacy in reducing iatrogenic morbidity and mortality is the evidence suggesting that adoption of these technologies may actually introduce new opportunities for harming patients with medical errors. Ash et al described a variety of ICT-induced medical errors in rich detail in their highly-acclaimed 2004 paper based on findings derived from naturalistic field studies of in-situ ICT use,[321] and again reported similar findings in their studies with Campbell et al in 2006[322] and again in 2007.[323] Han et al's 2005 paper in *Pediatrics*[324] catalyzed much debate[325] about the validity of its findings that implementation of a market-leading commercial EMR with CPOE system directly resulted in an increase in iatrogenic mortality in a large urban pediatric hospital. Koppel et al's 2005 paper in *JAMA*[326] also provided evidence from quantitative and mixed-methods studies that suggested the existence of a causal relationship between EMR with CPOE implementation and introduction of new types of medication errors into the clinical environment.

In summary, the current evidence pertaining to the effectiveness of EMRs with CPOE as key components of patient safety improvement interventions is scant, of relatively low quality, and offers limited potential for generalizability to the majority of healthcare providers and health services delivery settings in the United States.

Alternate Roles for Informatics and ICT in Healthcare Quality Reform

Despite the success of the patient safety movement in motivating reform efforts and increasing funding for both basic and applied research in medical informatics and health services research, the variable success of these endeavors has led many prominent figures to reach beyond criticisms of the ICT advocacy positions and instead directly challenge the validity of patient safety as the central construct and dominant focus of healthcare quality reform efforts. Included among vocal critics of over-reliance on the patient safety construct are Troyen Brennan, Eric Thomas, and David Studdert, the investigators and lead authors of the Harvard, Colorado and Utah studies of medical error that have been extrapolated in the Institute of Medicine (IOM) reports to create the "98,000 annual preventable deaths" statistic that is cited so broadly in the name of patient safety reform. In their paper with Atul Gawande published in 2005 in the New England Journal of Medicine, they stated:

> *"Hence, the answer to the question being asked five years later – how many deaths have been prevented? – is disappointing. But so is the question. The problem relies on an overreliance on the notion of the individual accidental death. This notion oversimplifies the causal realities of iatrogenic injuries, overpromises on achievable gains, and threatens to skew priorities in quality-improvement initiatives. Moving away from a focus on saving lives solely by preventing errors and instead emphasizing the implementation of evidence-based practices to improve the quality of care more generally will yield better long-term results."*[327]

Despite the rather disappointing evidence about the success of the patient safety movement in reforming healthcare largely through ICT, the patient safety movement has been largely responsible for the introduction and integration of informatics and other disciplines into the larger healthcare quality reform movement. As the "reluctant founding fathers" of the patient safety reform movement also stated:

> *"Our view is that the safety movement has led to the importation of a new basic science into health care quality. The fields of human-factors engineering, cognitive and social psychology, and informatics have now been added to the quality discipline. We also have to allow for time for this basic science to be translated into useful approaches. ...we must recognize that safety introduces new knowledge into quality by way of human-factors engineering and organizational psychology, sociology, and informatics. ...once we get past the limits of the construct of accidental death, we should acknowledge – indeed celebrate – the inflow of ideas from other industries on safety and work to translate those ideas..."*[328]

The patient safety movement has been the predominant force driving the promotion of widespread adoption of EMRs and CPOE for the better part of this decade. But its evidentiary basis in gross estimates of iatrogenic injury due to medical errors of commission has been called into question, as has its reliance on the preventable avoidable death construct. Even the investigators whose work provides the foundational evidence for this movement have challenged its validity and the disproportionate attention that patient safety has received in policies and efforts to improve healthcare quality in the U.S. Furthermore, the evidence on the effectiveness of EMRs with CPOE and other clinical decision support applications is limited in volume, generally weak in quality, and at most shows only modest clinically-significant improvements to patient safety.

Safety, while an important facet of care quality, may not offer the potential for gains exhibited by other domains of healthcare quality. Specifically, the care quality domains of effectiveness and patient-centeredness offer alternative constructs for both identifying (potentially higher-yield) applications of ICT in healthcare quality reform, and for studying its effects. These constructs are particularly relevant when considered in the context of quality reform endeavors focused on preventive and chronic care services, and their dependence on accessible and sustainable primary care.

Implications for Policy

The implications for policy are clear – the disproportionate attention and funding allocated to patient safety and medical error reduction strategies, programs, and research must be corrected to reflect a more holistic and comprehensive approach to healthcare quality reform in the U.S. Furthermore, policies and programs designed to support and sustain primary care medicine should play a central role in our nation's healthcare quality reform agenda, with healthcare ICT promotion policies such as NHII modified if necessary to ensure policy alignment and optimize the potential for success.

APPENDIX B: Candidate's Biosketch/Vitae

BIOGRAPHICAL SKETCH

NAME James T Tufano	POSITION TITLE PhD Candidate (PhC)
eRA COMMONS USER NAME	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
Juniata College, Huntingdon, PA	BS	May 1989	Biology
University of Minnesota, Minneapolis, MN	MHA	June 1995	Healthcare Policy & Administration
University of Washington, Seattle, WA	PhD Candidate (PhC)	Candidacy achieved May 2007	Biomedical & Health Informatics

PROFESSIONAL EXPERIENCE

2004-present University of Washington School of Medicine, Seattle, Washington. Currently a PhD candidate (PhC) in Biomedical and Health Informatics. Research interests include mixed-methods evaluation of informatics innovations, information technology adoption studies (with particular emphasis on eliciting and modeling usefulness and contextual usability of informatics tools and innovations), computer-supported cooperative work, human computer interaction, and grounded theory approaches to knowledge elicitation and modeling. Also pursuing RWJF-funded design research focused on smartphone-enabled diabetes self-care support, and ICT-enabled patient-provider co-management of chronic disease. PhD topic focuses on the design evolution, use, and adoption of EMR's, patient Web portals, online health risk appraisals, and patient-provider and provider-provider email messaging in the context of ICT-enabled team-delivered primary care (e.g., the Patient-Centered Medical Home model). PhD dissertation defense anticipated January of 2009.

2002-2004 Senior Associate, WBI, Seattle, Washington. Responsibilities included direct client service delivery, account management, and organizational leadership functions with a small for-profit firm offering information technology consulting, technical project management, software development, and systems integration services. Industries and clients served include healthcare (e.g., Group Health Cooperative, Premera Blue Cross), transportation (e.g., Port of Seattle) and e-commerce (e.g., Amazon.com). Experience included development of an original Small Business Innovation Research grant proposal for funding of a translational research and development project in health informatics.

2000-2002 Team Leader-Integrated Solutions Division, IDX Systems, Inc., Seattle, Washington (now a division of GE Healthcare, Inc.). Primary responsibilities included leading a team of 16 software engineers, testers, designer/analysts and configuration management technicians; serving as the technical project lead for multiple enterprise electronic medical record (EMR) implementation and system upgrade projects; and serving as a project team member for various ad-hoc cross functional groups within IDX. The team was responsible for installations, upgrades, customization, and standard product development of IDX LastWord/CareCast, an EMR product for large multi-hospital systems and integrated delivery networks. Successful projects included technical implementation of computerized physician order entry (cPOE) at several client sites including Stanford University Medical Center.

1999-2000 Senior Analyst and Project Manager-Web Outreach Development Initiative, Asterion.com Inc., Renton, Washington. Primary responsibilities were to demonstrate ROI and the operational impact of the Asterion.com service to HMO and IPA clients via custom analyses and reports; identify areas of organizational risk and/or opportunity and present relevant decision options and recommendations to executive leaders at client organizations; draft functional requirements documents and specifications; participate in and/or lead various product design, development and implementation teams; advise Asterion.com executive leadership on issues of organizational strategy; meet with external parties to evaluate B2B alliance and co-marketing opportunities; and provide product consulting services to clients and to Asterion.com Marketing and Sales departments. Also served as an operations manager for the Database Reporting & Decision Support Department. Position reported directly to the company founder/CTO/Chairman.

1998-1999 Project Manager & Consultant, University of Washington School of Public Health & Community Medicine, Seattle, Washington (full-time temporary grant-funded position). Managed multidisciplinary research projects pertaining to healthcare economics and finance, including risk contracting and physician compensation methods. Primary responsibilities included management of a cross-functional team of investigators and professional staff from the University of Washington and other universities; fiscal management and progress reporting to grant funding agencies and internal UW departments; development of original research grant proposals; primary data collection, including on-site key informant interviews with over 100 CEO's, CFO's and Medical Directors of medical groups and IDN's; qualitative and quantitative data analysis; website design and content management; and technical writing (see Publications section). Reported to principal investigator Douglas A. Conrad, Ph.D., Professor, University of Washington SPHCM Department of Health Services.

1997-1998 Finance & Decision Support Manager, Virginia Mason Health System, Seattle, Washington. Served as a project and line manager in the Department of Finance & Decision Support at a 350+ physician group practice and tertiary care medical center with annual revenues exceeding $380M. Primary responsibilities included quantitative and financial analysis; managing a cross-functional team of financial analysts, programmers and database administrators; driving the design and development of an Oracle OLAP database management system ("PRM") used to support provider capacity management functions; and serving as the Finance Department liaison and/or primary decision support analyst on various teams and committees.

1996-1997 Internal Consultant & Project Manager, Medalia HealthCare, LLC, Seattle, Washington. Directed a variety of projects for both the CEO and Medical Director of a 330-physician primary care group practice and managed care organization. Also served as a strategy advisor to the CEO, targeted and performed due diligence on potential clinic acquisitions, and provided interim line management services for several clinic sites. Developed numerous white papers, project proposals, executive presentations, program plans, business plans and operating budgets. Position served as a non-voting member of the Executive Committee and reported directly to the CEO.

1995-1996 W.J. Pennington Post-Graduate Fellowship in Health Services Administration, Virginia Mason Health System, Seattle, Washington. Managed a variety of projects and participated in all major governance and management committees, including Group Health-Virginia Mason Alliance planning teams. Provided primary analytical support to the Director of Strategy & Program Planning, and reported directly to the Executive Administrator. Projects included provider workforce planning analyses, development of direct business-to-business marketing plans, clinical program plans, and operations improvement plans.

Other positions held prior to attending graduate school included Pharmaceutical Sales Representative for The Upjohn Company and Biomedical Research Technician at the Jefferson Institute of Molecular Medicine, a participating Human Genome Project research institute in Philadelphia, Pennsylvania.

HONORS

Nominated as a candidate for admission to the U.S. Naval Academy, 1984 (did not pursue).

Awarded a U.S. Navy ROTC scholarship, 1985 (declined acceptance).

Received and maintained two academic scholarships to Juniata College, 1985-1989.

Elected to ββΒ national honors society for undergraduate biology majors, 1987.

Received the John C. Dumas scholarship for academic achievement and leadership potential from the University of Minnesota MHA Program, 1994.

Awarded the Pennington Fellowship in Healthcare Administration by Virginia Mason Medical Center, 1995-1996.

Awarded a three-year National Library of Medicine Informatics Research Training Fellowship by the University of Washington School of Medicine, Department of Medical Education and Biomedical Informatics, 2004-2007.

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APPENDIX C: AI Provider Experience Index Codebook

Study/Project Network Codes

Sunday, April 16, 2006 6:37:36 PM

Study - GH_Access_Study
Project - CodebookAndThemes1

🔑 *Locked Code* ✱ *Code Contains Value Structure*
@ *Code Network has Underlying Structure* ▦ *Code Member of Other Network Structure*

AA2PC 🔑

Brief Definition:
Advanced Access to Primary Care

Full Definition:
This code is used to index text segments that pertain to subjects' perceptions, beliefs, and opinions about the effects of the Advanced Access to Primary Care component.

When to Use:
This code is used to index text segments that pertain to subjects' perceptions, beliefs, and opinions about the effects resulting from the Advanced Access to Primary Care component of the Initiatives.

When Not to Use:
Do not use this code for anything else.

Example(s):
"Advanced Access to Primary Care was a good idea and it really worked, but the RIF that came right along right after it just killed us."

AI_STRATEGY 🔑

Brief Definition:
Pertains to the Access Initiatives as a whole.

Full Definition:
This code is used to index text segments that pertain to subjects' perceptions, beliefs, and opinions about the philosophy and/or strategy that GHC is promoting with the Access Initiatives.

When to Use:
This code is used to index text segments that pertain to subjects' perceptions, beliefs, and opinions about the philosophy and/or strategy that GHC is promoting with the Access Initiatives.

When Not to Use:
Do not use this code for comments made about the structure or function of any specific component of the Access Initiatives.

Example(s):
"Overall, I think that the Cooperative is trying to do the right thing by attempting to improve patient access."

DOC_PT_REL 🔑

Brief Definition:
Provider/patient relationship

Full Definition:
Use this code for comments made about the impact of the Initiatives (or any individual component of the Initiatives) on the provider/patient relationship. This includes but is not limited to comments made about communications, shared decision-making, bonding, trust, and confidence.

When to Use:
Use this code for comments made about the impact of the Initiatives (or any individual component of the Initiatives) on the provider/patient relationship. This includes but is not limited to comments made about communications, shared decision-making, bonding, trust, and confidence.

EPIC

Brief Definition:
Epic

Full Definition:
This code is used to index text segments that pertain to subjects' perceptions, beliefs, and opinions about Epic.

When to Use:
This code is used to index text segments that pertain to subjects' perceptions, beliefs, and opinions about Epic.

When Not to Use:
Do not use this code for anything other than comments that pertain specifically to Epic.

Example(s):
"I hate this system! I didn't go to med school so that I could spend all my time typing in front of my patients."

MD_VARCOMP

Brief Definition:
Physician Variable Compensation

Full Definition:
This code is used to index text segments that pertain to subjects' perceptions, beliefs, and opinions about Group Health's Physician Variable Compensation model and/or physician compensation in general.

When to Use:
Use to code text segments that pertain to physician compensation.

When Not to Use:
Do not use this code for anything other than text segments that pertain to physician compensation.

Example(s):
"It really doesn't motivate me personally - I don't need any extra motivation. But I really do think that some docs need a financial incentive to see that one extra patient at the end of the day that they wouldn't have seen otherwise."

MYGH_SM

Brief Definition:
MyGroupHealth and/or secure messaging and/or email

Full Definition:
This code is used to index text segments that pertain to subjects' perceptions, beliefs, and opinions about the MyGroupHealth portal and/or secure messaging and/or email.

When to Use:
This code is used to index text segments that pertain to subjects' perceptions, beliefs, and opinions about MyGroupHealth and/or secure messaging and/or email.

When Not to Use:
This code is not used for anything else.

Example(s):
"Yeah, I think my patients really like to communicate with me online."

ORG_IMPACT

Brief Definition:
Organization-level impacts of the Initiatives.

Full Definition:
This code is used to index text segments that pertain to subjects' perceptions, beliefs, and opinions about the effects that the Access Initiatives have had or will have at the organization level (GHC-wide effects). This code should also be applied to comments pertaining to impacts on the clinical quality of services delivered by GHC as an organization (e.g., impact of the Initiatives on HEDIS measures).

When to Use:
To code text segments that pertain to organization-wide (or enterprise-level) effects attributable to the Access Initiatives. It should also be applied to comments pertaining to impacts on the clinical quality of services delivered by GHC as an organization (e.g., impact of the Initiatives on HEDIS measures).

When Not to Use:
Do not use this code for effects that manifest at the individual provider or individual patient level.

Example(s):
"I think that the Access Initiatives have helped us to retain market share - but I worry that we're burning out our providers, and we might be facing a mass exodus of docs taking early retirement over the next few years if we don't make some changes."

PAT_IMPACT

Brief Definition:
Effects of the Initiatives on patients/enrollees

Full Definition:
This code is used to index text segments that pertain to subjects' perceptions, beliefs, and opinions about the effects that the Access Initiatives have had or will have on patients/enrollees.

When to Use:
This code is used to index text segments that pertain to subjects' perceptions, beliefs, and opinions about the effects that the Access Initiatives have had or will have on patients - as individuals or as populations.

When Not to Use:
Do not use this code for text segments that pertain to effects on providers, staff, or the organization as a whole.

Example(s):
"Patients really are more satisfied with the level of service we're providing."

PC_REDESIGN

Brief Definition:
Primary Care Redesign

Full Definition:
This code is used to index text segments that pertain to subjects' perceptions, beliefs, and opinions about the effects of the Primary Care Redesign component of the Initiatives.

When to Use:
This code is used to index text segments that pertain to subjects' perceptions, beliefs, and opinions about the Primary Care Redesign.

When Not to Use:
Do not use this code for anything else, and be sure that it is not used to code comments specific to the Advanced Access to Primary Care component.

Example(s):
"Primary Care Redesign? That was just a RIF in disguise."

PROVIDER_IMPACT

Brief Definition:
Effects of the Initiatives on providers.

Full Definition:
This code is used to index text segments that pertain to subjects' perceptions, beliefs, and opinions about the effects that the Access Initiatives have had or will have on providers, at the individual or care-team level.

When to Use:
This code is used to index text segments that pertain to subjects' perceptions, beliefs, and opinions about the effects that the Access Initiatives have had or will have on providers, at the individual or care-team level.

When Not to Use:
Do not use this code for comments about effects on the physician group as an aggregate entity (i.e., at the organization level).

Example(s):
"My work day has become unbearable as a direct result of this access stuff. I've gone from 12 hour days to 15 hour days, and I just can't keep this up."

SPEC_DA

Brief Definition:
Direct Access to Specialists

Full Definition:
This code is used to index text segments that pertain to subjects' perceptions, beliefs, and opinions about the effects of the Direct Access to Specialists component of the Initiatives.

When to Use:
This code is used to index text segments that pertain to subjects' perceptions, beliefs, and opinions about the effects of the Direct Access to Specialists component of the Initiatives.

When Not to Use:
Do not use this code for anything else.

Example(s):
"Well, that only works if the specialists have worked on their access to - otherwise the patients who self refer are told they have to wait 6 weeks, so they end up in my office asking for a referral so they can get bumped further up to the front of the line. How efficient is that? We just turned what would have been 2 contacts into 3 contacts, and annoyed the patient in the process."

APPENDIX D: Access Initiative Provider Experience Preliminary Themes Codebook

Thematic Codes Quick Reference
V10.18.06

Theme Code	**Description & Comments**	**Inclusion**	**Exclusion**
PT_SATISFXN	Providers perceive that the Access Initiatives have yielded changes that have improved patient satisfaction.	Comments reflecting participants' personal beliefs in this phenomenon e.g., "Oh yeah, patients love Secure Messaging."	Any comments based on beliefs attributable solely to GH patient satisfaction surveys. e.g., "Well I've heard that the patient satisfaction surveys show upward trends, so I guess so."
INCREASED_PT_INVOLVEMENT	Patients have become more active participants in their care as a result of the Access Initiatives. May include interactions with Epic in the exam room and over MyGroupHealth.	Changes attributable specifically to the Access Initiatives. e.g., "I actually have patients email me to correct mistakes they've seen in their chart through MyGH."	Changes due to factors other than the Access Initiatives and/or whose cause is unspecified. e.g.,"People in general are just becoming more informed consumers."
POP_HEALTH_QUALITY	Primary Care Providers perceive that the Access Initiatives have undermined their ability to provide population-based preventive and chronic care to their panels of patients.	Changes attributable specifically to the Access Initiatives. e.g., "Before the PC Redesign we had people who routinely looked at my panel's A1c's – but I just don't have the time to do that."	
PCP_QOL_REDUCTION	Providers perceive that the Access Initiatives have adversely affected the	Comments pertaining to subjects' own situation and/or their perceptions about	This code is about net effects on PCP quality of

	quality of life and job satisfaction of Primary Care Providers. The magnitude of these adverse impacts has reached the point where simultaneously sustaining the status quo staffing models/levels, MD productivity expectations, and (both internally- and externally-imposed) quality of care expectations may not be possible.	other providers' situations. e.g., "–The pace is just so punishing. I can't keep doing this. Something's gotta give!"	life and job satisfaction – not the individual effects of specific AI elements. e.g., "I just love that Epic enables me to provide better patient care."
FURTHER_CHANGE_NEEDED	Providers perceive that full realization and sustainability of AIs goals depend on further changes at Group Health. Full realization is not achievable without fixing problems with staffing, continuity of care and direct access (&other?). Gains achieved are not sustainable without changes in staffing and accounting for secure messaging productivity (other?).	e.g., "Advanced Access works great when you have full staffing, but when you don't it totally breaks down. And when do we ever have full staffing? Never!"	
GOOD_IDEA_IMPERFECT_IMPLEMENTATION	Providers expressed that the AIs were a good idea but were imperfectly implemented.	e.g., "Direct access to specialists is a good idea but it really only works if the specialists have worked out their access issues. Otherwise the patients just get bounced back to primary care to ask for a referral."	
BAD_IDEA	Providers expressed that some components of the AIs were simply bad ideas irrespective of their implementations.	e.g., "The variable compensation model just sends all the wrong messages – I hate it!"	
EPIC_SLOWS_ME_DOWN	Epic slows providers down during patient encounters, and as a result they can't see as many patients in a given day as they	e.g., "There's just no way in hell I'll ever be able to type as fast as I could dictate, so there's no way around it – Epic just slows	Comments about productivity defined in ways other than daily

	could prior to Epic.	me down and makes each encounter longer."	patient volumes and workflow.
EPIC_ENABLES_BETTER_CARE	Use of the Epic system enables docs to provide a better clinical care to patients they see.	e.g., "I just love that Epic enables me to provide better patient care."	
EPIC_PT_RELATIONSHIP	Epic has changed the ways in which physicians interact with their patients.	e.g., "I don't make eye contact with my patients when I'm typing in Epic, and that's awkward."	
ROLE_EVOLUTION	The Access Initiatives are changing the nature of the doctor-patient relationship, and the roles and responsibilities that each assumes in this relationship. In the case of physicians, some facets of this role redefinition are in direct conflict with what are felt to be inherent responsibilities of their profession.		

Micro-Theme Number	**Micro-Theme Code**	**Description & Comments**
1	AA_MODEL_SENSITIVITY	Sensitivity of the Advanced Access model to staffing variances. This code is used to markup text segments that refer to the sensitivity of the Advanced Access model to changes in staffing levels and/or in the mix of skill sets and competencies of support staff (e.g., RNs vs LPNs vs MAs).
2	INCREASED_MD_WORKLOAD	Increase in the volume of routine job tasks required of docs. This code should be used to markup text segments that refer to changes in the volumes of routine tasks required of physicians that have resulted from implementation of the Access Initiatives. For example, participants have commented that as direct results of PC Redesign, Epic, and SM they are routinely performing tasks that were formerly performed by other (non-MD) staff as well as

		a variety of new tasks that were previously not completed by any GHC personnel.
3	MD_PATIENT_CENTEREDNESS	MD-centric to Patient-centric orientation. This code is used for text segments in which participants describe a change in the culture, philosophy, and/or behavior of GHC providers from being primarily oriented to and focused on the needs of physicians/providers (e.g., themselves) to being primarily oriented to and focused on the needs of patients/consumers.
4	POP_HEALTH_SUPPORT_REDUCTION	Reduction of organizational support for population health management activities. This code is used to mark up text segments including comments re: the extent to which GHC as an organization has reduced allocation of resources, time, and/or attention/priority to population health management and/or preventive medicine. For example, participants report that they lament the loss of support for personally performing these activities as a result of GHC prioritizing the Access Initiatives/strategy. Participants have also commented on the loss of other forms of organizational support for proactive population health management activities conducted by RNs and other professional staff.
5	RELATIONSHIP_EROSION	Erosion of the doctor/patient relationship. This code is used to markup text segments that refer to facets of the Access Initiatives (e.g., sharing patients) that have resulted in an erosion of the quality of the doctor/patient relationship. The primary use of this code is for marking up text segments that specifically refer to perceived, alleged, or suspected causal relationships that exist between implementation of the Access Initiatives and erosion in the quality of doctor/patient relationships. DO NOT use this code to markup text segments that refer to *consequences* that result from an erosion of the doctor/patient relationship (e.g., compromised continuity of care). Other relevant codes should be used for marking up such text segments (e.g., CARE_CONTINUITY)
6	CARE_CONTINUITY	Access Initiatives impacts on the continuity of patient care. This code should be used to markup text segments that refer to impacts of the Access Initiatives on the continuity of patient care. For example, participants have commented that sharing patients in order to provide 48hr appointment availability in primary care and self-referral to specialists have both resulted in compromised quality and completeness of providers' assessments and diagnoses in some cases - i.e., continuity of care issues.
7	SUSTAINABILITY	Sustainability of the Access Initiatives gains. This code should be used to markup text segments that refer to the sustainability of the gains achieved through the Access Initiatives. For example, participants have commented that without improvements in how GHC as an

		organization deals with provider productivity pressures and variances in clinic staffing levels (of both providers and support staff), the Advanced Access to Primary Care model will not be sustained over the long term. Similar comments have been made re: a low probability of sustainability of the gains achieved due to physician burnout and attrition, and the viability of maintaining the MD variable comp model.
8	ROLE_TENSION	Professional Role vs Organizational Role. This code is used to mark up text segments that include examples of conflict, anxiety or job dissatisfaction associated with providers' inability to simultaneously satisfy both the roles and responsibilities imposed on them by GHC's strategies and the implicit roles and responsibilities associated with the medical profession, and/or their personal professional ethic and mission as physicians.
9	PATIENT_POWER_INCREASE_FROM_INFO	Increase in the relative power of patients in the physician-patient relationship resulting in a more egalitarian and collaborative physician-patient relationship. This code is used to mark up text segments that describe changes in the extent to which patients feel and/or act more empowered to participate in their health care and in medical decision-making. Most often participants cited the increased access to *information* and *remote provider communication* via MyGH, SM, and the visible presence and use of Epic in the exam room as the primary determinants of this phenomenon.
10	MDvsLEADERSHIP_STRAIN	Strained relationships between practicing physicians and the GHC leadership. This code is used to markup text segments in which participants stated that implementation of a particular component of the Access Initiatives (e.g., PC Redesign) resulted in strained relationships with GHCs leadership and/or an erosion of their trust in Leadership's judgement or competence.
11	MORALE_KILLER	Components of the Access Initiatives that adversely impacted physician morale.
12	VARCOMP_CONTROL	Physicians' inability to control the factors and metrics that determine their pay under the variable compensation model. This code should be used to markup text segments that describe the misalignment between the incentives incorporated into the variable comp model and physicians' controllable behaviors/span of control over relevant variables.
13	VARCOMP_PRODUCTIVITY	Physicians' perceptions that the variable comp model provides incentives almost exclusively designed to promote productivity and "through-put", as opposed to quality and/or patient satisfaction.

14	VARCOMP_STICK	Dominance of the downside risk or “stick” feature of the variable comp model as felt by physicians (as opposed to the upside potential or “carrot” feature).
15	ALERT_FATIGUE	Frequency and abundance of inaccurate, irrelevant, or contextually-inappropriate alerts and reminders resulting in desensitization to all alerts and reminders.
16	EPICvsACCESS	Use of Epic reduces productivity and throughput and therefore reduces access.
17	EPIC_LEARNING	Users of Epic face a steep and prolonged learning curve, as well as ongoing needs for skills support and training (“continuing ed for Epic”).
18	EPIC_DISTRACTIONS	Provider use of Epic in exam rooms during patient encounters creates distractions that draw physicians’ attention away from patients (e.g., reduced eye contact).
19	SM_PT_SATISFIER	Secure Messaging is a significant patient satisfier for those who use it.
20	SM_ETIQUETTE	Appropriate use of Secure Messaging by patients requires physicians to set expectations with their patients re: appropriate use.
21	EPIC_QUALITY	Use of Epic improves the quality of clinical care provided by physicians who use it.
22	SM_VOLUME	Comments about how physicians manage to allocate time and attention to keeping up with their increasing volumes of patients’ Secure Messages.
23	REFERRAL_BIAS	Productivity and Advanced Access pressures create incentives for PCPs to encourage self-referral and/or to refer “complex” cases that they could appropriately manage themselves.
24	DA_PT_SATISFIER	Direct Access is a patient satisfier when it works.
25	DA_SPECIALTY_ACCESS_DEPENDENCY	Direct Access illuminates previously unrecognized (or less-apparent) access, workflow, and/or capacity problems in the relevant specialties. This may manifest as an inefficient “two-tiered” patient access model in that patients who self refer are often told that if they request a referral from their PCP they will be moved up in the specialty appointment queue.
26	DA_EFFICIENCY	Direct Access is an inefficient use of scarce GHC resources.
27	DA_DEPENDENCIES	The success of the Direct Access model is largely dependent on the given specialties’ approach to managing access and/or the given specialties’ capacity/staffing levels.
28	DAvsOUTCOMES	There is no substantive relationship between Direct Access to specialists and clinical quality of care/clinical outcomes.
29	SUSTAINABILITY_REQUIREMENTS	Experience to date with implementation of the Access Initiatives has revealed invalid and/or previously unrecognized assumptions made in their design and implementation that render them unsustainable in their current form. Changes will be required in order to hold and

		extend the relevant gains that have been achieved to date.
30	MD_JOB_SCOPE	Changes to routine job tasks performed by docs. This code should be used to markup text segments that refer to changes in the types and levels of tasks performed by physicians that are required to support the Access Initiatives. For example, participants have commented that they are routinely performing tasks that were formerly performed by other (non-MD) staff prior to implementation of the Access Initiatives.
31	UNINTENDED_CONSEQUENCES	The AI's produced undesirable outcomes that were not intended and/or were "unforeseeable".
32	PC_REDESIGN_RIF	The Primary Care Redesign effort was really a "RIF (reduction in force = layoff) in disguise".

APPENDIX E: Medline Abstract of Access Initiative Provider Experience Paper

J Gen Intern Med. 2008 Nov;23(11):1778-83. Epub 2008 Sep 4.
Related Articles, Links

Providers' experience with an organizational redesign initiative to promote patient-centered access: a qualitative study.

Tufano JT, **Ralston JD**, **Martin DP**.

Division of Biomedical and Health Informatics, School of Medicine, University of Washington, Seattle, WA 98195-7240, USA. jtufano@u.washington.edu

BACKGROUND: Patient-centered access is a philosophy and a method that supports efforts to redesign health-care delivery systems to deliver higher quality care and to better meet the needs and preferences of patients. Since mid-2000, Group Health Cooperative has pursued an ensemble of strategic initiatives aimed at promoting patient-centered access, referred to as the Access Initiative. In support of this strategy, Group Health has also engaged in enterprise implementation of an electronic medical record and clinical information system that is integrated with their patient Web site, MyGroupHealth. OBJECTIVE: To elicit, describe, and characterize providers' perceptions of the effects of the Access Initiative, an information technology-enabled organizational redesign initiative intended to promote patient-centered access. DESIGN: Thematic analysis of semi-structured in-depth interviews. PARTICIPANTS: Twenty-two care providers representing 14 primary care, medical, and surgical specialties at Group Health Cooperative, an integrated health-care system based in Seattle, Washington. FINDINGS: Analyses of the interview transcripts revealed nine emergent themes, five of which have particular relevance for health-care organizations pursuing patient-centered access: the Access Initiative improved patient satisfaction, improved the quality of encounter-based care, compromised providers' focus on population health, created additional work for providers, and decreased job satisfaction for primary care providers and some medical specialists. CONCLUSIONS: Providers like that the Access Initiative is mostly good for their patients, but dislike the negative effects on their own quality of life - especially in primary care. These reforms may not be sustainable under current models of organization and financing.

APPENDIX F: GH-PCMH Care System Model Indexing Codebook and Abstraction Template

Key Informant Interview Transcript Indexing Codes

Code-Filter: All

HU: MHM Leader Key Informant Interviews
File: [C:\Documents and Settings\Jim Tufano\My Documents\Scientif...\MHM Leader Key Informant Interviews.hpr5]
Edited by:Super
Date/Time: 12/21/08 09:06:20 AM

Defining Trait or Model Component

Design Principle

Implementation or Continuous Improvement Process

Intended Effect

Pilot Precursors & Org Capacity Building

Selling the Vision

Translating Design Principles Into a Work Plan

Vision Origins

Project Archives Document Review Abstraction Template

#	**Intervention Component Description**	**is a** *<structural, functional, informational, policy, service offering portfolio>* **change**	**that occurred/occurs on a** *<pre-pilot, pre-visit, point-of-care, post-visit, asynchronous>* **basis**	**that affected/affects** *<primary targeted entity or process>*	**by changing** *<trait X or function/behavior Y of this entity or process>*	**and that was intended to** *<produce effects x, y, z>*	**..., a desired effect implied by design principle** *<1, 2, 3, 4, 5, n/a>*	**Implementation Sequencing Dependencies/ Predecessors**	**Standard GHC Practice Prior to MHM Pilot? (Y/N)**

APPENDIX G: GH-PCMH Provider Experience Indexing Codebook

MHM Interview Transcript Indexing Codebook

Author: JTT
Date: 6/20/08

AVS

Definition:
--This code is applied to segments of transcripts in which the participant is discussing the After Visit Summary

CIS

Definition:
--This code is applied to segments of transcripts in which the participant is discussing the EpicCare CIS in a general way, not specific to any feature set and/or commenting on specific features/functions for which no other index code currently exists

Composition of Care

Definition:
--*What* care services are produced, delivered to, and accessed by patients. (This code is applied to comments that primarily focus on descriptions of *the nature and scope of services* delivered to patients and *the content of their encounters with the care team).* These are text segments that address the traits of the care itself, not the means or methods of producing it or enabling its delivery.

Inclusion Criteria:
--Comprehensiveness of services across illness and wellness needs
--Scope of primary care practice vs specialty, hospital, ED/UC
--Clinical quality (accuracy & precision of Dx, effectiveness of Tx, reduction of errors of omission and/or commission)
--Self-management support

Exclusion Criteria:
--Processes of care production and delivery (i.e., *how* care services are produced and delivered)

Cost

Inclusion Criteria:
-Cost of delivering care/service
-Cost avoidance
-Cost reduction
-Cost effectiveness
-Cost recovery/ROI
-Cost of maintaining the MHM
-Cost inflation
-Awareness of/sensitivity to issues related to cost and finances
-Cost to patients
-References to economics/economic viability

Exclusion Criteria:
-Indirect/implied references to cost as a function of enrollee utilization of services (those text segments are coded as Utilization)

Health Profile

Definition:
--This code is applied to segments of transcripts in which the participant is discussing the Health Profile online HRA

Job Satisfaction

Inclusion Criteria:
--Statements made explicitly by participants about how they feel about what they do, and how they relate to their work on an emotional level.

Exclusion Criteria:
--Descriptions of changes to or the nature of the participant's work that aren't accompanied by their opinions about the relative desirability/undesirability of these changes to or elements of work (e.g., segments must include statements about the "goodness" or "badness" of these changes, and/or self-reported emotional responses to these changes).

MyGH

Definition:
--This code is applied to segments of transcripts in which the participant is discussing the MyGroupHealth patient Website

Patient Effects

Definition:
--How patients feel, what they do, and their health status.

Inclusion Criteria:
--Patient satisfaction
--Patient activation
--Patient engagement in care
--Self-efficacy
--Enrollment/dis-enrollment from GH
--Health outcomes
--Patients' communication patterns, practices, behaviors (including uses of SM and HP)

Exclusion Criteria:
--Provider comments about quality of care that don't explicitly address their perceptions or predictions about the relevant impact on patients' health outcomes. Text segments that fit this description are coded as Composition of Care.

Patient-Provider Relationships

Inclusion Criteria:
--Comments made explicitly in reference to "the doctor/patient relationship", "the provider/patient relationship", or "my relationships with my patients"
--Comments that refer to trust between/among providers and patients, and/or comments about patient trust of providers' judgments, decisions, advice, or reactions to their communication
--Comments that refer to "knowing" each other (e.g., "...and as a result of doing that my patients know me better")

Exclusion Criteria:
--Comments about patient/provider communication that are purely logistical in nature, that do not include any reference to associated affective/emotional/behavioral traits or effects (e.g., "They're more likely to

mention concerns about their alcohol use in the Health Profile than they would be in a face-to-face encounter with me.") Text segments of this nature are coded as Patient Effects.

Production and Delivery of Care

Definition:
--*How* care is produced, delivered to, and accessed by patients. (This code is applied to comments that primarily focus on descriptions of *processes.*)

Inclusion Criteria:
--Care planning
--Coordination of care (including specialty)
--Integration of care (including specialty)
--Proactive care and outreach
--Patient access to care
--Clinic workflows
--Operational efficiencies/practice efficiencies
--Division of labor/care team member roles & responsibilities/teamwork
--Provider communication (with patients and/or peers, care team members, consulting specialists, etc).

Exclusion Criteria:
--Content or composition of care services delivered/consumed (i.e., **what** is delivered)
--Comments about provider-patient communication in which a link to the patient-provider relationship is made explicit (these segments are coded as *Patient-Provider Relationships*)

Secure Messaging

Definition:
--This code is applied to segments of transcripts in which the participant is discussing Secure Messaging

Shared Care Plan

Definition:
--This code is applied to segments of transcripts in which the participant is discussing the Shared Care Plan

Staff Messaging

Definition:
--This code is applied to segments of transcripts in which the participant is discussing Staff Messaging

Telephone

Definition:
--This code is applied to segments of transcripts in which the participant is discussing telephone technologies or telephone encounters ("TE's")

Utilization

Inclusion Criteria:
--Statements about activities that impact utilization rates for various services
--Statements about activities aimed explicitly at management of inappropriate, redundant, or unnecessary utilization of services (e.g., reducing clinically unnecessary use of ER and UC)
--Statements about substitution of less costly forms of utilization for more costly ones
--Statements that explicitly address enrollees' use of services and/or aggregate patient population/panel utilization patterns, rates, statistics, etc.

--Statements about the time horizons associated with realizing meaningful changes in utilization patterns
--Statements about providers' and patients' ability to impact utilization

Work Environment

Inclusion Criteria:
--Productivity and pace of work expectations/pressures
--Co-worker support/collaboration
--Team orientation
--Intramural care team relationships
--Extramural provider (e.g., consulting specialist) relationships & communication
--Impact of and/or impact on organization-level factors (system-level)

Exclusion Criteria:
--Explicit descriptions of the division of labor among docs and other care team members. Comments re: specific models of teamwork, care team member roles & responsibilities, and division of labor are coded as Care Production & Delivery

APPENDIX H: GH-PCMH Provider Experience Themes & ICT Concepts Codebook

*****CONFIDENTIAL*****

Themes & Concepts: Provider Experience and Contextual Use of ICT in the Group Health Patient-Centered Medical Home

Author: Jim Tufano
Distribution: [identifiable info deleted]
Date: 11/1/08
Other files included: [participant interview transcripts]

Note: The first 7 "provider experience effects" theme codes are the result of revising my initial codebook of 7 preliminary theme codes that were subjected to inter-coder reliability testing by you and 3 others [identifiable info deleted]. Each of these other 3 people completely coded a unique subset of 4 transcripts and provided detailed feedback and revision suggestions. Feel free to provide me with additional feedback on these 7, but please understand that I consider these to be pretty well validated and complete at this point, and my next step with these codes is a "member checking"/"participant verification" face validity check with 4 of the study participants -- *not* more validation via triangulation with secondary coder analysts.

What I would appreciate from you and the others at this point is a secondary coder triangulation/validation effort on the 15 preliminary concept codes pertaining to participants' experiences with in-context use of ICT in the Group Health PCMH.

Requested Tasks & Suggested Process: Please apply these 15 concept codes (3.1 through 7.4) to the interview transcripts I've given to you and then return the coded hardcopies to me. Procedurally, this means bracketing or highlighting segments of the text and labeling those segments with the relevant code number(s). Or if you choose to work with the softcopy you can do the coding by highlighting text segments and inserting comments. In doing this, I'm essentially asking you to find evidence in the text that supports the propositions made in/by each concept code. After you complete the coding, I'll ask you to provide specific responses to these questions about each of the 15 concept codes:

a) Did you find some indication (at least one instance) of supporting evidence for this code in both of the transcripts? If not - did you find evidence in only one transcript?
b) Did you find any explicit counter-examples that would refute the proposition that this theme is a legitimate interpretation of a role played by ICT or information in the provider experience?
c) Would you re-word or otherwise change the title or definition of this concept code? If so, how?
d) Did you identify any particularly powerful verbatim quotes that should be used as an example instance of a manifestation of this concept, or any facet of it?

THEMES RE: PROVIDERS' EXPERIENCE AND PERCEIVED EFFECTS OF THE PCMH
[Note: "Theme" = directly applicable to/expressed in some form by all participants; "Concept" = potentially applicable to all participants but not explicitly expressed by all. This results from my use of both Phenomenology and Grounded Theory/Framework Analysis approaches during different phases of transcript analysis.]

CODE 1: INCREASED PARTICIPANT JOB SATISFACTION THEME

Participants (physicians and other care team members) are more satisfied with their work lives as a result of implementing and practicing in the Group Health PCMH.

Note: this is fyi, as this code has already been validated so there's no need to apply it

CODE 2: ICT IS ESSENTIAL AND IS SUFFICIENTLY DESIGNED THEME

The current Group Health ICT infrastructure is an essential enabler of the MHM, and it would be highly impractical if not impossible to operationalize the Group Health PCMH model without these tools. Also, participants view the current ICT infrastructure as sufficient for their uses and needs, and do not feel significantly constrained or limited by its current design or functionality.

Note: this is fyi, as this code has already been validated so there's no need to apply it

CODE 3: BETTER CARE THEME

Providers are delivering and patients are receiving higher-quality care under the MHM. In addition to general comments to this effect (e.g., "I'm delivering better care"), these provider perspectives also manifest as comments that pertain to:
1) increased comprehensiveness of services delivered to address a wider range of illness and wellness needs, including explicit attempts to address chronic illness care and prevention needs
2) promotion and provider support of patient self-management efforts
3) more effective coordination and integration of care across multiple settings/time periods/providers (e.g., pcp's, consulting specialists, ER physicians)
4) care that is participatory and elicits and incorporates patients' individual preferences and values
5) care that is more accessible to patients

Exclusion Criteria:

- Comments pertaining specifically to continuity of care are coded as Stronger Patient Relationships (relational continuity) and/or as Effective Teamwork (informational continuity).
- Comments pertaining to provider-initiated communication or information-seeking aimed at identifying and addressing unmet patient needs are coded as Proactive Care.

Unique ICT Concepts Related to Theme #3 - Better Care

Code 3.1: ICT Use Promotes & Supports Comprehensive Care

Participants manually search patient records in the CIS and "mine" historical patient data to discover unmet patient needs, including chronic care and preventive care needs [see Code 5.1]. Many cited their use of patient history and other patient-generated data elicited and captured in the CIS via the Health Profile online HRA.

Participants also act upon CIS-generated Health Maintenance alerts and Best Practice reminders that identify unmet chronic care and preventive care needs [see Code 5.2].

The CIS and Staff Messaging are used to support communication and information exchange between primary care physicians and consulting specialists that physician participants claim enables them to provide care to patients that might otherwise have been provided by specialists via referral.

Code 3.2: ICT Use Supports Patient Self-Management & Co-Management

Participants encourage their patients, especially those living with chronic conditions, to access information in their (hardcopy and online) After Visit Summaries, and to trend lab results and other information in their online medical records via the MyGH patient Website. They also encourage patients to complete and update their Health Profile online HRA. They sense that patient's use of these technologies and information sources coupled with Secure Messaging interactions with them and their Care Team colleagues provides effective self-management support.

Code 3.3: ICT Use Promotes Care Coordination & Integration

Participants cite the use of the CIS, Staff Messaging, and Secure Messaging as ICT that are particularly useful (and perhaps essential in the case of the CIS) to effectively coordinating and integrating care.

Code 3.4: ICT Use Promotes & Supports Patient Involvement in Care

Participants cited use of the Health Profile online HRA as an effective and useful means of eliciting patient needs and preferences. Information gathered via the HRA and captured in the patient record provides physicians with "cues" and "conversational icebreakers" that help them to effectively engage patients in collaborative needs prioritization and care planning discussions. Participants also commented that patients' use of MyGH, AVS' and Secure Messaging often promotes as well as reflects patients' engagement and involvement in their care.

Code 3.5: ICT Use Improves Patient Access to Care [see Code 7.2]

MyGH and Secure Messaging provide "manageable" and mutually-convenient 24x7 asynchronous patient access to information and care providers. Telephone encounters also provide patients with an additional channel of convenient access to providers.

CODE 4: EFFECTIVE TEAMWORK THEME

Participants recognize and appreciate the importance of the interdependencies inherent in team-based care, and sense that they are working as members (or in the case of MDs, leaders) of effective "winning" care teams in which their individual contributions are transparent to and valued by their teammates.

Unique ICT Concepts Related to Theme #4 - Effective Teamwork

Code 4.1: ICT Provides Transparency of Provider Roles & Activities

Information found (sought proactively and/or encountered passively) in the CIS provides participants with transparency into the past, present, and future trajectories of patients' care processes, as well as the role(s) played by other providers in these care processes.

Code 4.2: Daily Huddles Are a Valued Information Exchange Mechanism

Participants value their participation and the participation of others in daily huddles, which serve the purpose of information-sharing and collaborative work planning and priority-setting.

Code 4.3: ICT Enables Effective Division of Labor [see Code 7.3]

Staff Messaging and the CIS enable providers to effectively delegate and spread work to their care team staff. These ICT also enable care team staff to proactively complete tasks that would otherwise impose demands on their physician team leaders.

Code 4.4: Teammates Share ICT Use Skills and Knowledge [see Code 7.4]

Care team members share knowledge about how to use the ICT and help each other to build their information management and ICT navigation skills. Also, physicians' Staff Messaging interactions with consulting specialists promotes clinical knowledge-sharing and learning.

CODE 5: PROACTIVE CARE AND DOING TOMORROW'S WORK TODAY THEME

Participants maintain a long-term focus on the health and care of their patients, and as such they capitalize on every opportunity to seek information in efforts to discover unmet or unvoiced patient needs and to anticipate patients' concerns. They provide as much clinically-appropriate care to patients as possible during any given (virtual or in-person) encounter. Participants strive to "do it all, do it right, and do it now" rather than restricting the scope of their activities to "dealing with the most pressing acute clinical need today and handling the other issues in future visits". Participants maintain the perspective that longer, more thorough/comprehensive, and more effective patient visits in the present will yield fewer visits, better health, and lower utilization of services in the future. Also, physicians sense that the shared care team commitment to proactive care yields patient encounters in which they and their patients are better-informed and better-prepared to interact with each other, and that these encounters are more productive, efficient, and gratifying as a result.

Unique ICT Concepts Related to Theme #5 - Proactive Care and DTWT

Code 5.1: ICT is Used for Proactive Info Seeking & Needs Discovery

Participants manually search patient records in the CIS and "mine" historical patient data to discover unmet patient needs and care quality improvement opportunities. In many cases when such needs or opportunities are identified, participants then use Staff Messaging to raise the physicians' or other care team members' awareness of these needs and opportunities, and/or they initiate Secure Messaging or telephone contact with the patient to promote their awareness and elicit their relevant preferences.

Code 5.2: Automated ICT Decision Support Alerts Are Acted Upon

Participants who passively encounter information about unmet patient needs or care quality improvement opportunities (e.g., via CIS-generated Health Maintenance Alerts, Best Practice Reminders, follow-up "tickler" reminders, etc) view this information as useful and act upon it in situations where they would have previously disregarded or overridden it.

Code 5.3: ICT is Used to Prepare Docs and Patients for Encounters

Care team members (typically MAs/LPNs) use the CIS, Secure Messaging, Staff Messaging, and the telephone to perform pre-visit chart review and to question, inform, and direct the actions of both patients and providers to prepare them for their scheduled in-person visits. Also, physicians use Staff Messaging with their consulting specialist colleagues to both guide their own patient care provision activities and to appropriately inform and work up/prepare their referred patients for upcoming specialist encounters.

CODE 6: STRONGER PATIENT CONNECTIONS THEME

Participants feel stronger interpersonal connections with their patients, and sense that patients also feel stronger connections to them and trust them.

Unique ICT Concepts Related to Theme #6 - Stronger Patient Connections

Code 6.1: ICT Enables More Frequent & Extensive Patient Contact

Participants' use of Secure Messaging and telephone communications with patients represents a significant increase in the frequency and volume of patient/participant interactions. In some cases these ICT-enabled communications are also used to directly engage patients' family members or other caregivers, thereby extending the scope and reach of the participants' patient relationships to include patients' familial and other social support systems.

Code 6.2: ICT Enables More Meaningful Patient/Provider Interactions

Patients' use of MyGH (including online and offline access of information in their AVS') and participants' use of the CIS (including patient-generated data elicited via the Health Profile HRA) promote more informed, prepared, and meaningful interactions with each other during both in-person and "virtual" encounters (via Secure Messaging or telephone).

[Note to support analysts/co-authors: I deliberately use the term "participants" rather than "providers" or "physicians" in these two code definitions. The significance of this - i.e., that support staff as well as docs are building strong direct connections with patients and their families/caregivers - will be highlighted in the manuscript, and discussed in terms of its relevance to General Theme #4 (Effective Teamwork) and the viability and success of the MD-delegated care team model in the GH-PCMH].

CODE 7: SUPPORTIVE AND POSITIVE WORK ENVIRONMENT THEME

Participants feel supported in their work -- by each other, by their "extramural" colleagues (e.g., consulting specialists), and by their manager and clinic Chief. They know, rely on, and trust their care team colleagues, whose consistent support, initiative, and dedication to the team effort are viewed as critical to their own individual and each others' success.

Participants also feel supported by the larger organization/system in which their work activity is situated. Reduced work pace and productivity pressures related to panel size reductions and immunity from the standard productivity-based variable MD compensation program are particularly relevant in terms of physicians' sense of organizational/system support. The resulting diminished sense of time pressure a) creates a work environment in which providers both feel and appear less rushed/harried to their patients and co-workers, and which b) enables them to spend more time interacting with their patients, interacting with each other, seeking and sharing information, using the ICT, and "staying caught up" with work.

Also, participants report that positive attitudes towards work are both "contagious" and self-perpetuating, and that frequent interaction with others who exhibit positive attitudes has the effect of improving one's own attitude and demeanor. "High morale begets high morale" - and morale is high at the demonstration clinic.

Unique ICT Concepts Related to Theme #7 - Supportive Work Environment

Code 7.1: Reduced Environmental Time & Pace Pressures Enable ICT Use

Participants - most notably the physicians - are making greater use of the available ICT because they have the time available to do so.

Code 7.2: ICT Use Shapes & Normalizes the Patient Demand Environment

Providers use Secure Messaging and MyGH to shape the temporal nature of patient demand in their work environments, to provide "manageable" and mutually-convenient 24x7 asynchronous patient access.

Code 7.3: ICT Spreads Physician Work Throughout the Work Environment

Staff Messaging and the CIS enable providers to effectively delegate and spread work to their care team staff. These ICT also enable care team staff to proactively complete tasks that would otherwise impose demands on their physician team leaders.

Code 7.4: ICT Use Contributes to a Learning Environment

Care team members share knowledge about how to use the ICT and help each other to build their information management and ICT navigation skills. Also, physicians' Staff Messaging interactions with consulting specialists promotes mutual knowledge-sharing and learning.

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Vita

Jim Tufano was born in Abington, Pennsylvania. Currently he calls Seattle his home. He lived in the greater Philadelphia area until the age of 18, after which he attended Juniata College and earned a Bachelor of Science degree in Biology. At the University of Minnesota he earned a Master of Healthcare Administration, and then spent several years working in medical group practice administration and healthcare information technology development and implementation. In 2009 he earned a Doctor of Philosophy in Biomedical and Health Informatics at the University of Washington.