IMPACT OF AN ORGANIZATION WIDE ELECRONIC HEALTH RECORD SYSTEM ON CLINICALLY INTEGRATED PATIENT CARE

by
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***To Mark!!!!!

Abstract

This research explored the impact of an organization-wide electronic health record system (EHR) on clinical integration through an affordance-actualization lens, focusing on Primary Care perspectives on communication, care coordination, and physician engagement. Clinical integration supports horizontal care delivery across entities and time. We constructed a 4-stage model based on the literature to create a conceptual framework of how integration evolved over time from vertical integration bringing different health care entities into the same organization to technical integration using the same organization-wide electronic health record (EHR) system across the disparate entities, for health care systems in the United States. Technical integration can encourage collaboration and communication to enable clinically integrated care across the care continuum, resulting in improved patient outcomes and cost savings. While technical integration facilitates clinical integration, it is likely not sufficient for achieving clinical integration that requires significant organization change. Few studies have examined the organizational dynamics by which clinical integration occurs.

We carried out our research at a large health care system that had recently implemented the Epic EHR system organization-wide. Using an IRB-approved protocol, we interviewed 10 Primary Care Physicians (PCPs) in 2019-2020, with a second round of interviews conducted in 2022 with 7 of the same PCPs. Using grounded theory, we explored four research questions related to the impact of an organization-wide EHR on Primary Care, specifically examining: overall effects (RQ #1), inter-practice communication (RQ #2), coordination of care (RQ #3), and physician engagement (RQ #4). We also identified themes that broadly reflected PCPs' experiences using the EHR, capturing enablers and challenges at environmental and individual levels.

Our analysis identified that overall, PCPs interviewed believed the organization-wide EHR offered value and required thinking like a system. The EHR gave the PCPs a voice in proactively communicating care plans and rationale, and technical integration enabled by the EHR supported improved communication. The PCPs interviewed were enthusiastic about the use of Epic Secure Chat to directly address patient care issues requiring rapid response. They considered their role as the "Grand Coordinator" of care, supporting care teams with greater access to patient information as well as an ability to manage urgent patient needs. In terms of engagement, PCPs used EHR features to find new ways to facilitate care and appreciated the connectedness afforded through EHR use. Challenges identified by the PCPs included different practice cultures, information

overload, varying clarity of communications, noise in the system from reminders, distribution of duplicate information, additional workload, and frustrations with EHR usability.

Based on these findings and the literature, we used an affordance-actualization lens to investigate harnessing technical integration to accelerate clinical integration. We identified five affordances including (1) accessing and using patient data through a unified data source, (2) visualizing system requirements and patient needs, (3) facilitating provider-to-provider communication, (4) engaging Primary Care physicians throughout a health care system, and (5) coordinating care across providers and sites. We found that the actualization of the care coordination affordance (Affordance #5) most closely aligned with clinical integration and that improving care coordination depends on visualization (Affordance #2), communication (Affordance #3), and engagement (Affordance #4). We identified 8 drivers representing conditions or factors that enable or constrain actualization of care coordination, including for example, health care system decisions regarding resources and PCP concerns about workload. Drivers help to define effective actions that support affordance realization. We also applied three key performance indicators (KPIs), alignment, consistency and extent, to explore how individual level actions can facilitate or hinder organizational actualization of care coordination.

This work contributes to the literature by introducing the engagement affordance and by presenting dependencies and drivers that enable actualization of clinical integration through care coordination. Another contribution from our analysis is practical insights that can inform the implementation of an organization-wide EHR to facilitate movement towards clinical integration.

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1.0 Dissertation Overview

In 2016, United States health care spending reached an all-time high of $3.3 trillion or $10,348 per person, accounting for 17.9 percent of the country's Gross Domestic Product (CMS.gov website updated). Additionally, an observational study found that overall Emergency Department (ED) spending went from $79.2 billion in 2006 to $136.6 billion in 2016 (Scott et al., 2021). Of all the dollars spent on health care, current estimates show that almost 30 percent, or close to $530 billion per year, is spent on unnecessary services that yield no benefit or improvement in patient health (Ganz et al., 2018). In one study it was reported that "Inefficiencies in coordination of chronic care are a significant source of waste in the United States (USD $25-$45 billion in 2011) and a blockage to achieving the Triple Aim of improving patient experience of care, lowering per capita costs, and accomplishing better population health (Ganz et al., 2018, p. 492).

For all the spend on health care, the United States does not perform well in comparison studies with other countries. In 2018 it was reported that the United States lowered its index ranking in health care by 21 spots when compared with other countries (Lim et al., 2018). The United States was found to be behind in 8 categories out of 13 specific metrics (60% of total), and mostly in areas related to general health and preventive care (Garg, 2020). In a comparison ranking on overall performance of access, administrative efficiency, equity, and health care outcome domains, the United States ranked last in these categories (Schneider et al., 2017).

Opportunities to address these issues include eliminating waste, such as health services that have no real value, and reducing healthcare cost through improved care coordination, by engaging patients in their own care and utilizing digital health solutions. Such actions could save an estimated $183 to $271 billion (Gibbings and Wickramasinghe, 2021).

Additionally, in a concerted response, healthcare systems and the US government have explored levers such as payment reform, restructuring, and use of technology including the Electronic Health Record (EHR) system (Doherty et al., 2020; Erickson et al., 2020; Wang et al., 2022). While individually each area is important, health care challenges can only be fully met when all three areas are coordinated to efficiently work together, achieving maximum benefit overall.

1.1 Payment Reform

The spiraling cost of health care has caused both public and private payers to require greater accountability from health care organizations for improved quality and total cost of care (Chesluk et al., 2018). Payers are requiring reform in payment measures including the move from fee for service to value-based care. This substantial change in payment reform requires improved collaboration by providers than is currently seen today (Chesluk et al., 2018). Payment reform requires motivation and incentive to move provider organizations to limit their spending on health care (Rathi, 2020). The bottom line is that getting payment reform right requires thinking beyond financial risk. This has not been easy to accomplish as a standalone solution (Doherty et al, 2020; Erickson et al., 2020; Scott et al., 2021).

1.2 Restructuring – Vertical and Horizontal Integration

In terms of restructuring, integration has been promoted as a possible solution. Integrated care is viewed as a strategy to improve health care quality and efficiency (Heeringa, 2020). Organizational restructuring is characterized in multiple ways. In our work we consider health care silos, considering the opportunity for horizontal and technical integration with a focus on improving care delivery across the spectrum of providers. Siloed relationships can be improved by structured continuity of care processes, care coordination, and physician communication.

When departments are grouped functionally or professionally, silos often result in health care systems because of an organizational structure. A recent article stated that "Silos in healthcare are detrimental to patient outcomes and increase costs" (Sperling, 2020). When Primary Care, for example, is grouped as an entity, the structure may create a silo where caregivers interact efficiently within their own structure. They often need to cooperate and communicate with other areas within the overall system along the care continuum, including hospitals, outpatient specialists, and labs, often with less efficient interaction (Alves and Meneses, 2018).

Health care systems are complex. To work across functions and organizations requires a mindset and willingness to cooperate, communicate, collaborate, and to understand more about how various professional areas with different perspectives function. In response, health care systems have pursued different organizational structures, including vertical integration that brings more services within a single healthcare system and horizontal or clinical integration to provide more seamless patient care across different functions and services. Such organizational structures

have been implemented with or without the use of technology (Alves and Meneses, 2018; Sperling, 2020). While there are many ways to define clinical integration (Kodner, 2002; Singer et. al., 2011; Valentijn et al., 2013; World Health Organization, 2008, 2016), in this research we use elements of the AMA definition of clinical integration and define it as,

> *The ability to provide patient care across the continuum of patient health care needs for acute and chronic conditions, delivering patient-centric care to the right patient, at the right time, in the right place, that is safe, appropriate, timely, and equitable (based on AMA reference https://www.aha.org/websites/2012-09-12-clinical-integration)*

1.3 Health Information Systems and Technical Integration

Silos may also result from lack of technical integration. The use of e-prescriptions sent directly to a pharmacy allows for direct electronic contact making the process of filling prescriptions more efficient and timelier (Wang et al., 2022). A single health care information system may be used in a silo, but when it is not integrated with other health care information systems within the overall health care system, this results in continuing difficulty accessing patient data needed from other areas of the health care system internally as well as externally (Wang et al., 2022). Recognition of the usefulness of technical or information systems integration, and improved technology, organization, and environment, enables this integration of technology to support health care evolution (Mathews and Pronovost, 2011; Wang et al., 2022). Mathews and Pronovost (2011) found that while there were modern day intensive care units and operating rooms that contained electronic equipment, the equipment, and technologies "did not communicate or work efficiently in an integrated fashion, posing a safety risk." Technology systems integration has been cited as required as part of the need in health care to improve quality and safety (Mathews and Pronovost, 2011; Singer et al., 2020).

To support the need for improved collaboration and communication, as well as address other care coordination, quality, and care delivery issues, healthcare organizations have implemented electronic health record (EHR) systems (Dixon et al., 2018; Door et al., 2018). EHR systems allow patient data, once kept on paper-charts, to be digitized. EHR data is entered into the system by health care providers and others. Once entered the data is immediately available in a secure system to those with the authority and privilege to access the information (HealthIT.gov website).

Adoption of electronic health record systems has increased significantly in recent years. According to HealthIT.gov and based on source data from the American Hospital Association (AHA)

Annual Survey Information Technology Supplement, in 2021 approximately 96% if hospitals and 78% of office-based physicians adopted a certified electronic health record system (HealthIT.gov, 2021). Contrast the most recent data with 2008 when only 9% of hospitals and 17% of office-based physicians adopted a certified EHR (HeathIT.gov, 2021).

Integration of technology systems can encourage the collaboration and communication needed for more efficient and effective patient care. Using a single EHR system such as Epic across a health care system allows an organization to become technically integrated. Integration can be improved by structured continuity of care processes, care coordination, and physician communication. Although not a requirement for organizations, the integration of IT systems from silos of care to integrated care systems can help build interconnection between providers who care for patients. In integrated delivery models such as the Patient-Centered Medical Home and Accountable Care Organizations, EHRs are considered foundational elements that enable real-time communication among team members to promote a team care approach (Bates and Britton, 2010; Door et al., 2018) and continuity of care.

Improved coordinated care across integrated healthcare systems is expected to result in improved patient outcomes and cost savings throughout the care delivery system continuum. Through changes in governmental and technology policy (Gatiti et al., 2020; Kawu et al. 2023; Malhan et al., 2022; Modi and Feldman, 2022;), high expectations have been set for the use of electronic systems to aid in care coordination resulting in wide-spread benefits to patients and systems.

1.4 Dissertation Goal and Research Questions

Despite major organizational changes and technology investments, major questions remain related to adoption, use, and capability in realizing expected results from the use of EHRs within integrated healthcare systems. While published research on EHR systems provides some insight, significant limitations exist in the specific application to Primary Care (Doherty et al., 2020; Erickson et al., 2020; Funk et al., 2023; Terry, 2014) and the move to organization-wide EHR systems (Doherty et al., 2020; Erickson et al., 2020; Tsai et al., 2020). Addressing this gap is the foundation for research questions addressed in this study.

The goal of this research was to develop a greater understanding of the effects of an organization-wide EHR on clinically integrated care delivery, from a primary care perspective. Specifically, the research questions addressed are:

- RQ #1 – What is the impact of an organization-wide EHR on Primary Care?
- RQ #2 – What is the impact of an organization-wide EHR on Primary Care inter-practice communication?
- RQ #3 – What is the impact of an organization-wide EHR on care coordination?
- RQ #4 – What is the impact of an organization-wide EHR on primary care physician engagement?

This dissertation is organized as follows:

- Chapter 2 describes a research framework and literature review supporting the exploration of the research questions;
- Chapter 3 presents the methodology, based on interviews with primary care physicians and analysis using grounded theory methods;
- Chapters 4-7 report the results of the interview analysis, with each chapter exploring findings related to one of the research questions;
- Chapter 8 develops broader implications of the research, focused on understanding how technical integration can foster greater clinical integration, exploring theoretical affordances and practical actualization;
- Chapter 9 presents conclusions, limitations, and recommendations for future research.

2.0 Literature Review and Conceptual Integration Framework

The United States spend on health care of almost 18% of the GDP is greater than any other country, with lower rates of insurance coverage and uneven health outcomes (Doherty, 2020; Erickson, 2020; Heeringa et al., 2020). Yet it has been estimated 30% of health care spending may be waste, which continues even with current waste reduction efforts (Shrank et al., 2019). Shrank et al. (2019) found that waste in health care spending included failure of care delivery with an estimated annual cost of waste $102.4B to $165.7B and failure of care coordination with an estimated annual cost of waste $27.2B to $78.2. Eliminating waste in these two categories was estimated to generate savings of $44.4B to $97.3B for care delivery failures and $29.6B to $38.2B for care coordination failures (Shrank et al., 2019). Recognizing the enormous cost of waste in care delivery and care coordination and the potential for cost savings motivates the need for research to identify means by which cost savings and care improvements can be recognized and implemented.

Current literature identifies that the "silo mentality in health care services" decreases efficiency and posits that eliminating barriers could generate value in shared services and information (Alves and Meneses, 2018; Mathews and Pronovost, 2011). Integration has been proposed as a possible means to address this challenge. As healthcare systems have evolved, integration has occurred in different levels of growth and maturity. Integration implies a level of cross functional clinical, financial, operational, and technical integration, as well as integration within the context of the organization itself locally, regionally, nationally, and globally (Gatiti et al., 2021; Heeringa et al., 2020; Norton et al., 2019; O'Rourke, 2020; Singer et al., 2020).

In this research we approach integration from a technological perspective and investigate the impact of implementing an organization-wide electronic health record (EHR) system on care delivery from a primary care perspective. This chapter provides a literature review supporting the dissertation research, including the concept of integration, the role of primary care, and electronic health record (EHR) systems. A conceptual model is presented to describe the evolving experience of integration within U.S. health care systems.

2.1 Defining Integration Within Health Care Systems

Many definitions of integrated care, integrated healthcare services, and integrated healthcare systems exist in the literature today (Kodner et al., 2002, p. 1; Valentijn et al. 2013, p. 3; WHO,

Technical Bulletin No. 1, 2016, p. 1). The World Health Organization defines integrated service delivery as, "the organization and management of health services so that people get the care they need, when they need it, in ways that are user-friendly, achieve the desired results and provide value for money"(WHO Technical Bulletin No. 1, 2016, p. 1). Integrating systems involves arranging parts to connect them to form a whole body (Shortell, 1988). Kodner et al. (2002) state that integration refers to bringing or merging elements or components together to form a more complete whole, and is at the heart of systems theory, central to organizational design and performance.

Integrated health care models are designed to provide a framework or structure to assist in visualizing efficiency and effectiveness in implementation. They provide a tangible view to show integration along different dimensions including horizontal, vertical, system, organizational, professional, clinical, functional, and normative (Singer et al., 2020; Valentijn et al., 2016). Describing a continuum of integrated care strategies Kodner et al. (2002) cite the need for shared clinical record(s), common decision support tools, and joint care planning, among others. Heeringa et al. (2020) describe horizontal and vertical integration of health care providers through different organizational structures, finding that organizational structures, along with composition and other factors, influence cost and quality performance. Valentijn et al. (2016) report key elements of primary care include first contact care, continuous care, comprehensive care, and coordinated care, elements that may be related to integrated care.

In 2013, Becker's Hospital Review named, "100 Integrated Health Systems to Know" designating systems that were focused on "the continuum of care from wellness and preventive services to urgent care, inpatient care, outpatient care, hospice, health plan offerings and more (Becker's Hospital Review, 2013)." Intermountain Healthcare (Salt Lake City), Kaiser Permanente (Oakland, CA), Geisinger health System (Danville, PA) were named as three of the 100 systems. Systems are varied in their offerings and implementation, yet all deliver the defined elements of integrated care (Becker's Hospital Review, 2013).

There are multiple ways organizations integrate. These may include structural, functional, cultural (normative), interpersonal, or process related (Singer et al., 2020). Burns et al. (2021) described healthcare policy in the U.S. as focused on integrating healthcare to address fragmentation. Structurally, integration may occur on multiple levels either vertically or

horizontally, or on both dimensions. Heeringa et al. (2020) considered horizontal and vertical integration of health care providers. In an operations context, horizontal integration connects delivery across different settings and services. Vertical integration incorporates supply chain elements within a single organization. Integration within health care systems may also address the divisional, departmental, or "silo configurations." Currently, promoting provider integration and coordination is considered important as part of the overall goal of viewing organizational structures, composition, and characteristics that influence cost and quality performance (Heeringa, et al., 2020).

To date, multiple models have been identified including models defined as horizontally integrated organizational structures such as single specialty group practices, independent practice associations, multispecialty group practices, and others (Heeringa et al., 2020). Vertically integrated structures include physician-hospital organizations, managed services organizations, and others (Heeringa et al., 2020). These models are affected by local market pressures, payment policies, and provider regulations in the United States (Heeringa et al., 2020, p. 6). Integration may also occur in other aspects of an organization, including culturally and technologically. Cultural integration refers to the amalgamation of all areas within a health care system aligned with the vision, mission, goals, and objectives of the organization regardless of the physical structure. Technical integration focuses on the overall organizational infrastructure assuring cross platform communication, system availability 24x7 every day of the year, and continued growth and evolution in support of HC provider communication and collaboration.

In assessing the value added by connectedness through horizontal or vertical integration, Shortell found that many hospital systems were not integrated. Shortell (1988) considered common culture, financial planning/control, strategic planning, human resource planning, decision and input support systems, and quality assurance in a model of hospital system-ness where each factor played an important role. Evidence on how best to organize and integrate health care delivery systems to achieve greater provider integration and coordination is limited (Heeringa et al., 2020).

2.2 The Role of Primary Care in Integrated Health Care Systems

As part of the care continuum, primary care is complex, diverse, unique, and requires teamwork (Fiscella and McDaniel, 2018). Traditionally, the primary care provider was the "face" seen by the

patient. Nursing and staff functions supported the provider physician. The advent of scientific and medical discoveries, technology advancement, changes in payment models and regulations, medical training, the need to become patient and family centered, and the use of EHR systems have changed the way primary care is practiced. Primary Care has been identified as unique in health care and needs to be managed differently than other areas of health care (Fong, 2021). Fong (2021, p. 2) noted "At the heart of primary care's success remains a unique relationship between physicians and patients built on trust."

Today, Primary Care functions as the "hub" in a hub and spoke model (Doherty et al., 2020), where the PCP works with the patient, patient's family, other HC clinicians and providers to coordinate patient care. PCPs play a major role in care coordination, which is defined by the Agency for Healthcare Research Quality as "the deliberate organization of patient care activities between two or more participants (including the patient) involved in a patient's care to facilitate the appropriate delivery of health care services. Organizing care involves the marshalling of personnel and other resources needed to conduct all required patient care activities and is often managed by the exchange of information among participants responsible for different aspects of care (AHRQ Website)."

When envisioning improvements in the U.S. health care system, it was reported that underinvesting in primary care in the United States also contributes to suboptimal health care outcomes (Doherty et al., 2020) and that the United States spends less on Primary Care than other peer countries (Doherty et al., 2020). Increased use of primary care services is "associated with decreased health expenditures, higher patient satisfaction, fewer hospitalizations, and emergency department visits, and lower mortality" (Doherty et al., 2020, p. 4). However, it is reported that the "national investment for primary care investment is approximately 5% to 10% of total health care spending, depending on how primary care is defined" (Doherty et al., 2020, p. 4); the investment level varies across the United States. In contrast, the Economic Co-operation and Development countries spend an average of 14% on primary care (Doherty et al., 2020, p. 4).

Models of primary care delivery are changing. Models such as the Patient Centered Medical Home require an integrated, team-based approach that has become a norm in delivery of care. Team-based approaches to delivery of care increase the complexity of care delivery, requiring improved communication and information flow, coordination of care across multiple disciplines to

meet expectations in improved patient satisfaction, reduction in cost, and better patient outcome measures (Fiscella and McDaniel, 2018).

2.3 The Role of Health Information Technology and the Electronic Health Record System

To improve communication and collaboration between primary care and the health care system, and to ensure primary care is integrated into health care delivery itself, a growing body of research finds that integrated care systems need to be supported by electronic information systems (Meaker et al., 2018). The Electronic Health Record (EHR) system is a major component of integrated health care systems that require a continuous and ongoing flow of information by providers to communicate and collaborate.

An EHR system, also known as an Electronic Medical Record System (EMR), stores medical information about a patient on a computer. It is a "digital version of a patient's paper chart" (HealthIT.gov). The patients' EMR may include information, "about a patient's medical history, diagnoses, medications, treatment plans, immunization dates, allergies, radiology images, and laboratory and test results (HealthIT.gov)." Health Care providers use patient information contained in the EHR when making clinical decisions about patient care. The EHR allows for information sharing between HC providers within a health care system and with other providers outside the health care system, and other organizations when authorized. According to the HealthIT.gov website, using EHRs "can help build a healthier future for our nation (HealthIT.gov)."

The introduction of EHRs created complexity in established communication channels while adding new dimensions and capabilities. Positive outcome expectations for EHR implementations are remarkably high. Early publications reported expectations including higher quality care, better care coordination, improved patient health, higher patient satisfaction, reduced costs, improvement in quality and safety of care (Bates and Britton, 2010). These same expectations are often repeated in current literature (Doherty et al., 2020; Modi and Feldman, 2022; Savoy et al., 2023).

One study on expected outcomes of EHR implementation reported in 2021, that 96% of hospitals and 78% of office-based physicians had adopted a certified EHR (HealthIT.gov). Modi and Feldman (2022) report that 76% (16/21) of studies in this research found a positive relationship between EHR adoption and financial outcomes. This same research study also investigated financial and clinical outcomes finding that EHR adoption did result in overall cost

reduction, improved reimbursement, and a "positive relationship between EHR adoption and clinical outcomes" in a number of areas (Modi and Feldman, 2022, p. 10). Another review of studies found "that there was no one study that failed to demonstrate a positive effect on quality of health care" (Uslu and Stausberg, 2021, p. 1). While adoption of EHRs may have increased (Wang et al., 2022), high cost, additional workload, and cybersecurity issues are a few of the barriers identified to EHR adoption (Wang et al., 2022).

Health care institutions implementing an EHR also expect the system to afford change and opportunities not previously possible. For example, EHR systems are expected to provide greater availability of data for research and development work, the potential to develop a more structured population health management program, the ability to participate more broadly in institutional research, and to improve clinical patient care through improved communication and care coordination (Meyers and Stevens, 2016). The major enabling factor is a single source of patient data, emanating from a single EHR system, implemented organization wide.

Gatiti et al. (2021) found that although the implementation of EHRs can be challenging, the implementation of EHRs in hospital systems has had a positive effect on healthcare quality. Their research identified improvements in patient safety from EHR implementation, as well as "ensuring effective, efficient, timely, equitable, and patient-centered care" (Gatiti et al., 2021, p.1). These results occurred even in light of challenges from health care organizations and professionals, technology, and ethical issues; finding a way to minimize the challenges identified is needed (Gatiti et al., 2021).

According to Norton et al. (2019), standardization of EHR systems in health care organizations is a driver for greater use of advanced health information technology capabilities. A recommendation from this research is that advancing adoption of HIT capabilities and features requires greater focus on standardizing EHRs in the organization itself (Norton et al., 2019). A 2020 report published in the Annals of Internal Medicine found that, while health information technology may be able to assist with "improvements in care, reduce administrative burdens of practice, and help both physicians and patients communicate and navigate the complexities of the health care system, (Doherty et al., 2020, p. 5)," health IT was not attaining these goals and in fact was "adding administrative burden to clinical practice (Doherty et al., 2020, p. 5)."

2.4 Four-stage Conceptual Model of Health Care System Integration

To understand integration at a deeper level, we constructed a 4-stage model based on the literature to conceptualize in broad terms the stages that US health care systems have gone through relative to integration. Initially, patient information and other health care related data was stored on paper, in notes and in handwritten paper charts. The need to store health care information using electronic means was recognized in the 1960's (Spatar et al., 2019). Over the past decades the EHR has taken an increasingly important role in realizing greater benefits from digitalization of records (Kim et al., 2019).

2.4.1 Stage 0 - Independent Processes and Organizations

Figure 2-1 shows a conceptual view of traditional health care organization. This view is referred to as 'Stage 0 – Independent Processes' of the multistage model. In this structure, different services along the care continuum (e.g., hospitals with in-patient and emergency services, primary care offices, and laboratories) are part of separate organizations (represented in Figure 2-1 by thick vertical lines), each initially on a pen-and-paper-based medical record keeping system.

Stage 0 is one of siloed, independent entities using independent processes. We broadly define "entities" as representative of areas within health care that are distinct and independent from each other structurally yet tied together with the overall aim of providing health care services to patient populations. In Stage 0, the traditional paper method for collecting medical record information is used. The paper-based method was used to develop patient observations and plans for patients and to record important patient information (Umashankar et al., 2022).

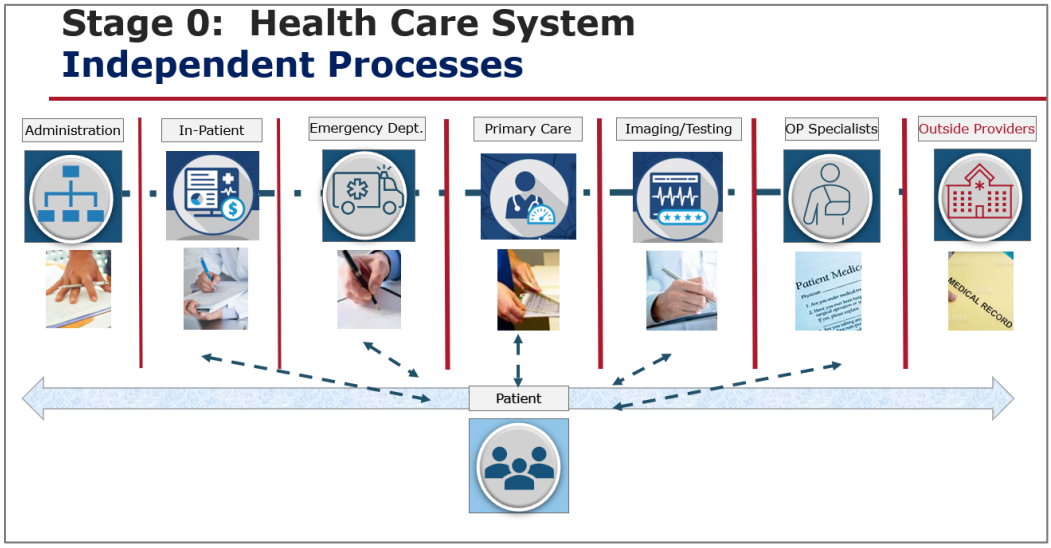

Figure 2-1: Stage 0 - Health Care System, Independent Processes

In Stage 0, we represent the idea that the overall organization of care is not vertically, technically, nor horizontally integrated. We examined several dimensions including organizational structure, technology implementation, ability to communicate with other providers and with patients, and the care coordination capability of the system. In this structure, each entity functions independently from an administrative, operational, and technical perspective. There is little or no communication between the siloed areas and each entity uses its own methodology and technology to capture paper-based patient information. Inefficiency can be seen in the different business models used by entities, which may or may not be communicating with each other, leading to challenging care coordination issues. There is a lack of transparency.

While each "entity" centers on their patients, the overall focus in Stage 0 is on patients through a situational lens. In other words, at a point in time and perhaps even for longitudinal care, the concern is focused on the current patient's need from a particular provider or service (e.g., a procedure requiring hospitalization, primary care provision). Waste is incurred due to duplication of effort, the result of poor communication and coordination. The patient is the link between providers and often manages communication and coordination.

Through time, U.S. health care delivery has been broadly organized to incorporate more integration as described in the following stages.

2.4.2 Stage 1 - Vertical Integration

In the early 1960s a few clinics designed and implemented home grown versions of Electronic Health Record Systems (EHRs) (Spatar et al., 2019). These systems were expected to help capture patient data for better patient outcomes, with increased expectations for safety, efficiency, better decision making, and more reliable medical data (Spatar et al., 2019).

Figure 2-2 illustrates the move towards vertical integration in US health care (ConnectedMD Website, 2023). During the 1960's and 1970's the first clinical information systems were implemented (Kim et al., 2019). In Stage 1, independent health care entities consolidated to form systems, which occurred during the late 1990's to early 2000-time frame (Hernandez, 2000). During the same period, electronic health record (EHR) systems were continually evolving and being implemented (Kim et al., 2019).

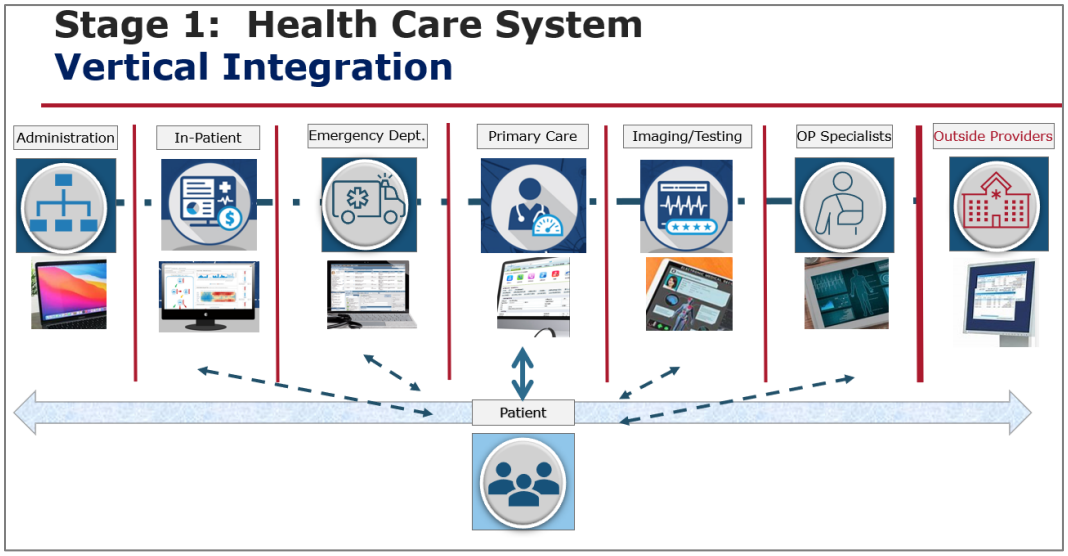

Figure 2-2: Stage 1 - Health Care System, Vertical Integration

In these vertically integrated systems, different entities became part of one health care system that offered services across the care continuum. Some services and providers that patients visited remain outside the system (illustrated by the thicker vertical line). Within the health care system, each entity (e.g., hospital, primary care) often had its own EHR with little technical integration of systems (sometimes due to acquisition). Integration, still decentralized, affords control of more pieces of the process. While there was progress in terms of technology usage vertically, the result continues to be disparate technological solutions across the organization. As health care systems merge, the question of integrating data across systems becomes an important consideration and interoperability is important (Connectedmed.com Website, 2023).

In this conceptual view, communication continues to be an issue between different parts of the system, and while improved in silos (vertically), it does not necessarily improve horizontally. In Stage 1, lack of technical integration is a barrier to horizontal integration. In our research, we are not so much interested in vertical integration, but in the movement of health care systems to become more technically and horizontally integrated as defined in the following stages.

2.4.3 Stage 2 - Technical Integration

In Stage 2, shown in Figure 2-3, the concept of technical integration is represented. Over time, and with improvements in IT systems, there is broader and deeper understanding by stakeholders in the health care system about the value of becoming more technically integrated across the entire HC system. Health care silos inhibit communication between different functional areas of hospital systems (Kelly et al., 2019). They can interfere with and inhibit care coordination

resulting in lower quality and higher cost (Kelly et al., 2019). A major component of HC Systems implementing integrated care practices is derived from the slow pace of adopting digital solutions (Skilton, 2021). HC professionals need to have a full 360-degree view of their patient to treat the whole patient, not just one aspect of a patient's care needs (Skilton, 2021). As health care evolves, health care systems need to have access to digital resources allowing physicians to make more timely and effective decisions related to patient care (Orenstein, 2018). Digital resources such as EHR systems promote cross functional collaboration between medical professionals allowing for timelier coordination of care through the use of a single system (Vos et al., 2020).

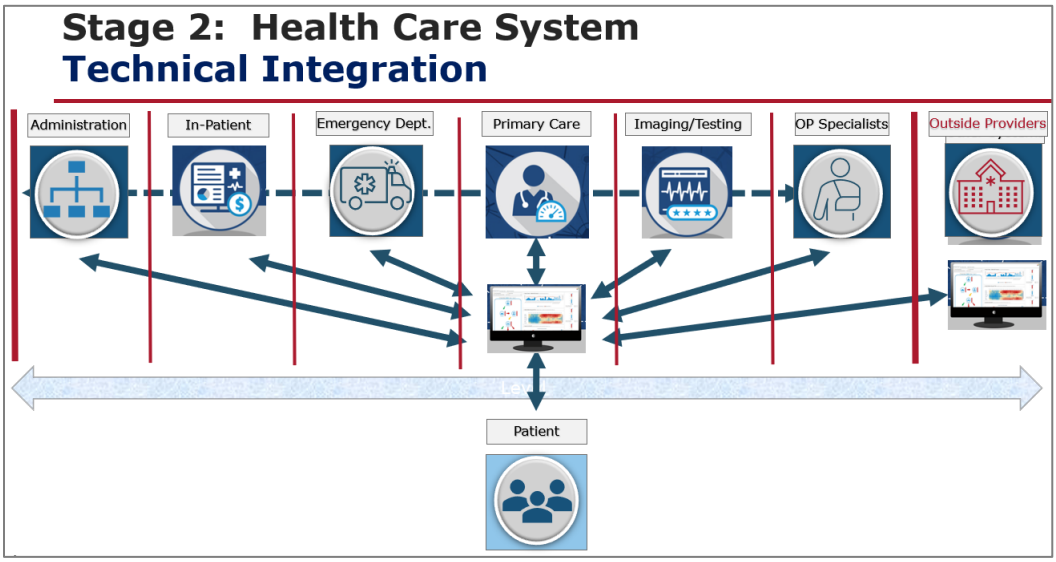

Figure 2-3: Stage 2 - Health Care System, Technical Integration

At this stage there is an exchange of information between health care providers. The literature indicates (with limitations regarding achieved benefits) that communication is the equivalent of information exchange, an improvement from previous stages (Evans, 2016; HealthIT.gov, 2022). While EHR systems contain information about patient medical histories, they were initially also used for exchange of data such as admission information, pharmacy, laboratory, imaging, and other information (Evans, 2016). Some academic medical centers had EHRs with knowledge bases useful for clinical decision making such as Physician Order Entry (POE) (Evans, 2016). However, information exchange does not necessarily equate to the knowledge sharing which is needed for horizontal integration. In Stage 2, each entity may function with different business models and there are still care coordination issues, duplication of effort, role-based confusion in terms of who provides what services to a patient, and communication issues between ambulatory services and the Emergency Department. Having different divisions within a HC System using the EHR was an important step towards documenting and accessing patient records and medical information, with

the ability to use the information to make decisions, and prescribe medication (Evans, 2016). The next movement in the evolutionary integration process is toward the stage of Clinical Integration.

2.4.4 Stage 3 - Clinical Integration

In Stage 3 - Clinical Integration, represented in Figure 2-4, a health care system achieves clinical or horizontal integration, with a care coordination focus and patients as the beneficiaries of improved care delivery organized around their needs longitudinally and across entities and settings. With this evolutionary step, the organization has sorted out policies, processes, and evolved to a knowledge sharing institution to achieve the goal of care coordination for each patient. Clinical integration builds on technical integration, as well as reflecting cultural and functional integration (Singer et al., 2020). Elements of clinical integration include provision of care in a care continuum covering preventive medicine, acute disease treatment, chronic disease treatment, rehabilitative care should it be needed, and palliative care (Goodwin, 2016). Patient care must be addressed throughout the patient life cycle and coordinated with all areas within and external to the needs of the patient throughout their lifetime (Goodwin, 2016).

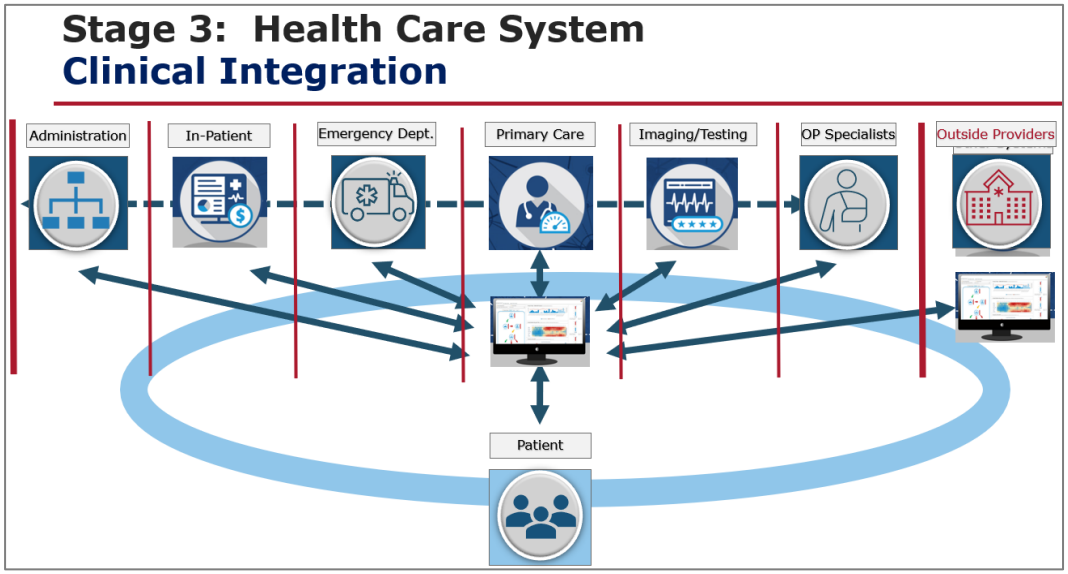

Figure 2-4: Stage 3 - Health Care System, Clinical Integration

While there are many ways to define clinical integration (Goodwin, 2016; Kodner, 2002; Singer et. al., 2011; Valentijn et al., 2013; World Health Organization, 2008, 2016;), in this research we use elements of the AMA definition of clinical integration and define it as,

> *The ability to provide patient care across the continuum of patient health care needs for acute and chronic conditions, delivering patient-centric care to the right patient, at the*

right time, in the right place, that is safe, appropriate, timely, and equitable (based on AMA reference https://www.aha.org/websites/2012-09-12-clinical-integration)

In this research, we focus on clinical/horizontal integration as a key organizational goal. Being part of distinct organizations and on separate systems were barriers to horizontal integration; those barriers have been mitigated by the consolidation in health care and use of system-wide EHRs. Given the elimination of these barriers, we can now consider whether the health care system has come closer to clinical integration, a desired outcome of the overall transformative growth process.

This 4-Stage conceptual model helped to frame our research questions. As health care systems have moved through the stages of the model, we hypothesize that integration on an organizational, process, and technological level advances. As health care systems adopt organization-wide EHRs, we seek to investigate how such technically integrated systems might enable clinical integration. As organizations continue to pursue clinically integrated health care, our research explores three major gaps: understanding the impact of the EHR on communication, on care coordination, and on physician engagement.

3.0 Research Methodology

This research focused on developing a deeper understanding of the impact of an organization-wide Electronic Health Record (EHR) system on primary care physicians and care delivery in an integrated health care system. We wanted to understand more about how primary care fits into the overall system of care given the multitude of outpatient ambulatory practices, clinics, in-patient hospitals, and Emergency Departments that can be part of a health system.

This chapter presents the research methodology, which was based on interviews of primary care physicians (PCPs) using a grounded theory approach. We completed two rounds of interviews with physicians. Round I took place from 2019 to early 2020. Round 2 took place in 2022. Throughout our research we followed an Institutional Review Board (IRB) approved protocol. In this chapter we describe the research site, data collection including the interview protocols and process, the characteristics of the physicians interviewed, and the data analysis process. For each interview round we describe the coding scheme developed to analyze the interview data, emergence of themes, and the evolution from the primary initial research question to deeper levels of inquiry.

3.1 Research Site

The research site was a large academic health care system in Massachusetts (referred to in this document as either "Heath Care System" or "HC System"). The HC System is a not-for-profit /non-profit health care system and is a clinical partner of a medical school and the largest health care system in the area. The first hospital in the current healthcare system was established in the early 1970's with a merger taking place in 1998.

The HC System includes 5 hospitals and behavioral health services, as well as community-based physician services and home health and hospice programs. Affiliated services include urgent care and an outpatient surgery center. Across the entire system, according to 2023 statistics, HC System reports over 1,200 licensed beds with 818 beds (plus 69 bassinets) at the Medical Center, 181 beds (plus 21 bassinets) at one of the affiliated hospitals, 79 at another, 129 at a fourth, and 119 at the 5th hospital. The HC System reported over 200,000 Emergency Department visits, over 1,700,000 Outpatient visits, and greater than 55,000 hospital discharges, not including newborns) in 2023. It has over 16,000 employees, employs approximately 1,300 active medical staff and more than 3,000 registered nurses (online HC system 2023 statistics).

Primary Care Physicians (PCPs) work for the medical group affiliated with the HC System and work in clinics on hospital campuses and in private practice-like community settings. The research institution utilized in this study identified Internal Medicine, Family Medicine, Pediatric Medicine, and Geriatric Medicine under the category of Primary Care. For this research, we worked with Internal Medicine and Family Medicine Physicians, defined by the system as follows:

- Internal Medicine Physicians - caring for adults and seniors, "specifically the diagnosis and nonsurgical treatment of diseases and internal disorders" (Health System website)
- Family Medicine Physicians – caring for all family members, and some deliver babies, providing "comprehensive medical care with particular emphasis on the entire family. This includes newborn, pediatric, and adolescent care, adult medicine, geriatrics, and gynecological care" (Health System website).

The research site was chosen because the organization had recently adopted an organization-wide EHR system moving from a siloed, hybrid health IT infrastructure that utilized EHR systems from Cerner (in the Medical Center for inpatient care), Allscripts (used for ambulatory care), and Meditech (used in the Emergency Department). These systems had been in place for many years).

While use of Allscripts enabled Primary Care Physicians (PCPs) electronic access to patient information, it limited their ability to access data from other HC System-wide data residing on different technologies and systems. For example, because Allscripts was not integrated with in-patient and Emergency Department systems, PCPs only received delayed information about these visits, including from patients themselves. Delayed information consisted of results of laboratory tests, imaging studies, notes from specialty care physicians, information from hospitalization, transitions of care information, data from Emergency Department visits, and pharmacy data. The introduction of Epic organization-wide provided a wealth of information to PCPs. EHR capabilities such as visibility to the patient chart, access to medication records, and other data were now easily accessible.

The HC System made the decision to simultaneously implement the Epic system throughout its hospitals, physician groups, imaging centers, and other clinical settings in 2015, replacing the existing hybrid infrastructure. Implementation began in 2016 with extensive planning. The Epic system was launched across the entire HC system in October 2017. Since that time, the HC System added a 5th hospital system and is also affiliated with a psychiatric hospital and a specialty pharmacy. The current EHR system also supports communication with other HC systems that use Epic through Care Everywhere.

In the fall of 2022, the HC System achieved "Epic Gold Stars Level 10" status in recognition of their adoption of the many functions that Epic offers to improve patient care and patient engagement. Epic Gold Stars 10 is the highest recognition level that can be achieved and means that the HC System is among the top four percent of Epic organizations (Personal Communication, , 2023).

3.2 Data Collection Round I

Our interest was in understanding the effects that moving from siloed health care technology to a system-wide EHR system had on clinical integration from a primary care perspective. Data collection involved interviewing PCPs affiliated with the research site, following the research protocol outlined in Figure 3-1. All physicians spoke with us under an approved IRB from the HC System and Worcester Polytechnic Institute (WPI).

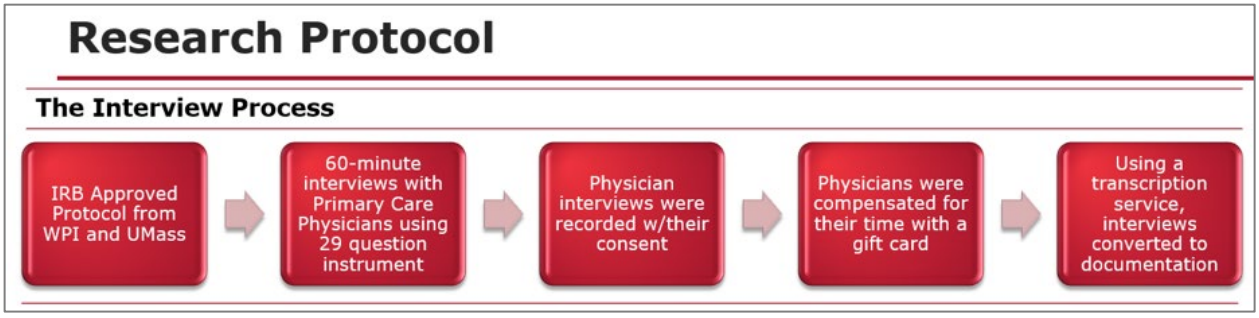

Figure 3-1: Research Protocol, Interview Process Round I using a Grounded Theory Approach

Following the IRB Protocol, physicians were identified and invited to participate with the assistance of senior management. They were invited to take part in the research study because they were physicians in a HC System primary care office or clinic that had recently implemented Epic. They were selected to provide diverse responses in terms of gender, number of years in clinical practice, and type of primary care practice. Physicians were invited by distributing two email invitations. Approximately 200 invitations were distributed with 10 acceptances overall, an acceptance rate of around 5%.

Sixty-minute (60), in-person interviews were conducted using a 29-question protocol over a one-year period from January 2019 – January 2020. Physicians were compensated with a gift card for their time. Interviews were led by the WPI faculty Primary Investigator and supported by the author of this dissertation, a Ph.D. Candidate.

Physician interviews were recorded with the consent of the Physician interviewed. Physicians were informed that at any time during the interview, they could elect to not respond to a question or terminate the interview.

Informed consent was discussed with prospective subjects by the WPI faculty investigator, the PhD student investigator, or both. A copy of the IRB-approved consent form was provided to subjects with their email invitation and reviewed with them at the start of the scheduled interview. The discussion took place in a private room. Interviewees were assigned a study ID and the audio files from interviews were transcribed using an external service with any identifying information (such as specific names or locations) removed by WPI research personnel. The study ID was referenced in electronic notes, tapes, and transcripts. The WPI PI maintained a copy of the key linking the study ID with identifiers.

The interview protocol is provided in Appendix B. Interview questions focused in several areas including changes made within their practices over the past two years, physician background, effect of the integrated EHR system on their work as physicians and the EHR impact on the overall system and primary care offices, on provider-to provider communication, on communication with patients, and on long term benefits. Physicians were also given the opportunity to ask questions of the interviewers.

3.3 Round 1 Physicians Interviewed

A description of the physician population interviewed in Round I data collection is provided in Figure 3-2. Eight physicians interviewed were male, two were female. Seven were Internal Medicine practitioners, three practiced Family Medicine. Internal Medicine physicians generally see patients 18 years and older. Family Medicine Physicians generally see patients of all ages, including obstetrics, from pre-natal to Gerontology.

Physician Characteristics – RI Interviews

Characteristic	Description of Results
Number of physicians interviewed	N=10
Gender	Male = 8 Female = 2
Type of Primary Care Practice	Internal Medicine = 7 Family Medicine = 3
Years Practicing Medicine	Range = 5.5 – 40 years; Average =23 years
Years Working at Current Healthcare System	Range = 2.5 – 40 years; Average = 20 years
Self Scored Epic Capability & Skill Level	Most physicians ranked their skill in using Epic electronic health record system in the range of 5-9 compared with their peers (1 = low; 10 = highest)

Figure 3-2: Characteristics of Physicians Interviewed

Primary Care Physicians (PCPs) worked for the medical group affiliated with the HC System and work in clinics on hospital campuses and in private practice-like community settings. Years of medical practice ranged from 5.5 – 40 years, with an overall average of 23 years. The range of working within the HC System ranged from 2.5 – 40 years, with an average of 20 years. When asked about proficiency using Epic EHR, most physicians noted their skill in the range of 5-9 compared with their peers (1 – low; 10 – high).

3.4 Data Analysis – Round I

3.4.1 Using Grounded Theory in this Research

We used grounded theory to analyze interview data. We started with a subjective understanding of the physician interviews, however our primary interest was not in the stories they told, although they were interesting and insightful, but to elicit information on the social situation under examination.

Grounded theory was developed by Glaser and Strauss (Corbin and Strauss, 2015, referencing Glaser and Strass, 1967). Grounded theory methodology supports qualitative research, the purpose of which is to construct theory grounded in data (Corbin and Strauss, 2015). It is based on techniques and procedures for gathering and analyzing data (Corbin and Strauss, 2015). Grounded theory differs from a traditional interview process in which one might begin by reading the literature and formulating a hypothesis. The hypothesis would direct the data collection and

be assessed using the data collected. Using Grounded Theory the data guides the insights obtained through qualitative data collection, as illustrated in Figure 3-3 (Wang et al., 2018, p. 62).

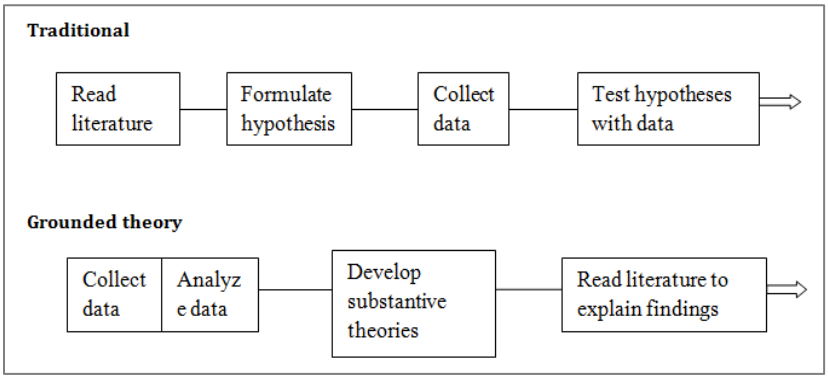

Figure 3-3: Comparison of Traditional and Grounded Theory Analysis

Using a grounded theory approach, we first collected data, analyzed the data, and developed substantive theories from the data collected. We read literature to explain our findings. Using open, axial, and selective coding in an iterative process, we developed propositions and models grounded in the qualitative data.

In open coding, we broke down the data and identified concepts that help interpret and provide insight into the raw data collected. Open coding was applied through the development of a "coding scheme" specific to data collected from the physician interviews (Corbin and Strauss, 2015, p. 239). The coding scheme is described in the following section and allowed us to categorize information from the physician interviews by major category of code and by sub-codes (https://delvetool.com).

We then used axial coding, to understand the meaning of data identified through open coding and to collect and aggregate results of interview data based on our coding scheme that were related to the same codes and sub-codes (https://delvetool.com).

Using selective coding, we were able to develop themes that identified common thoughts from the physician interview data, performing a cross-walk of the identified codes and sub-codes. This work took place over a series of many months, revealing substantive insight as we reviewed, revisited, and continued to analyze the physician interview data.

3.4.2 Open and Axial Coding

The process of analyzing interviews and the development of codes and sub-codes is shown in Figure 3-4. To develop a coding scheme for the physician interviews we used open and axial

coding. We used open coding on our first read through each interview. This resulted in a markup of areas that could help us develop a coding scheme. Using axial coding as a second step, we drew connections between the ideas in our research. At this point, using grounded theory, we focused on moving the qualitative interview transcript data into a framework from which we began to label and organize our interview notes into a series of qualitative identifiers.

Figure 3-4: Research Protocol – The Coding Process Used in Analysis of Data

With the extensive data from interviews (over 400 transcribed pages), we defined a primary series of codes, refining the codes as we continued analysis of interviews. A small research team including the Ph.D. Advisor, Ph.D. Candidate, and a graduate student pursuing an MS degree in Information Technology refined the coding scheme. Using grounded theory methods, we coded interview data manually and used NVivo to digitize the coding. We held weekly coding discussion sessions, updated our codes, summarized data in memos, and compared our analysis of coding results, and categorized interview data based on code. We developed a coding dictionary to describe each code and sub-code to support our work.

The final coding scheme included nine (9) codes and 38 subcodes, as shown in Figure 3-5. Subcodes provided further detail on specific elements within the major codes. For example, for Code #3 – Epic Impact on the Healthcare System, the subcodes included 3a - Adoption of Epic, 3b – Skill in using Epic, 3c – Benefits of Using Epic, 3d – Coordination of Care, 3e – Impact on Healthcare system, and 3f – Epic tools. These sub-codes sought to identify any area that impacted the implementation and use of the EHR Epic on the health care system. We used this process to parse out content for a series of sub-codes related to each major coding category.

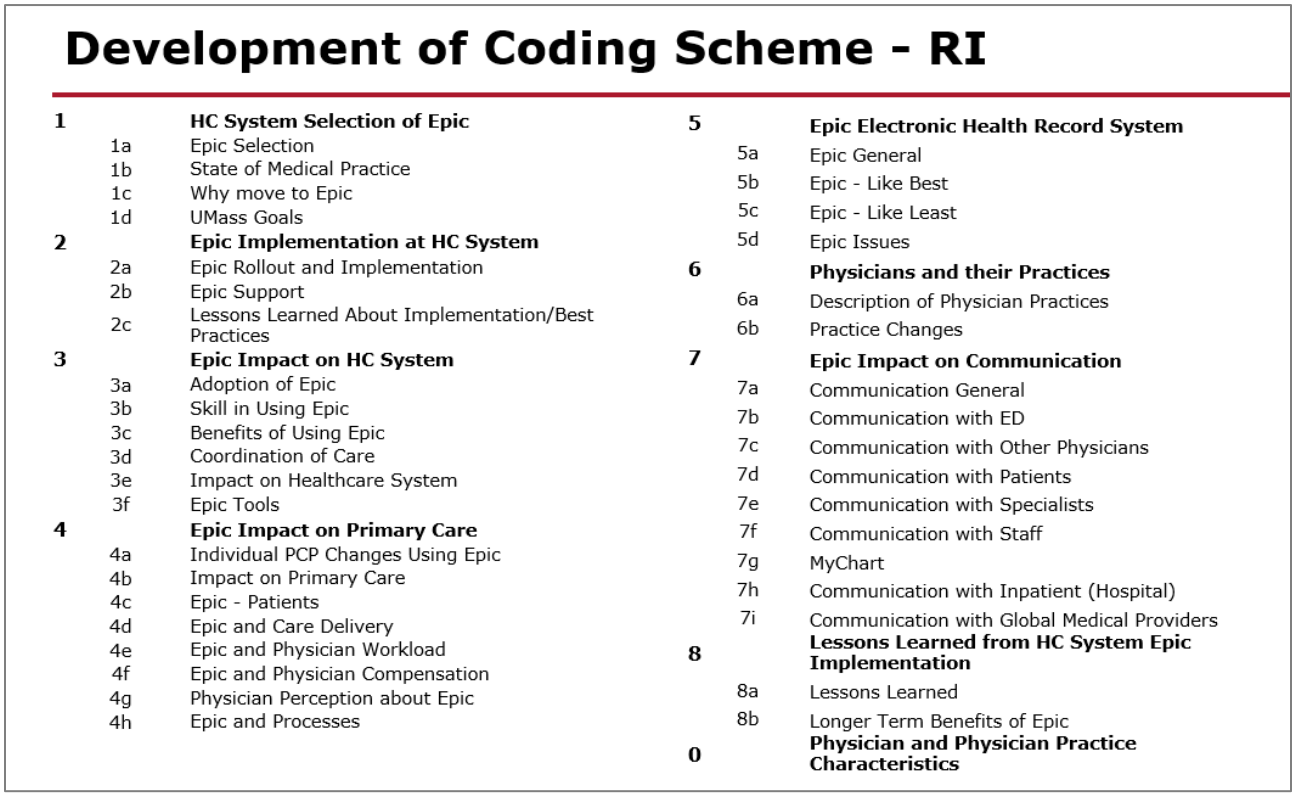

Figure 3-5: Round I Codes and Subcodes

3.4.3 Selective Coding: Defining Themes and Additional Research Questions

Selective coding first led us to explore themes that might cut across codes, providing different perspectives for viewing the data. From our analysis of physician interviews as well as a literature review, we developed an initial list of 16 themes. We refined these to 6 themes by grouping codes and sub-codes by theme. The process and themes are summarized in Figure 3-6. Table 3-1 lists the criteria used to link coded interview comments to themes. These themes were used throughout the analysis to support the development of results related to research questions.

The extensive coding work, aligned with identification of six new themes, led us to refine the initial research question, "What is the impact of an organization wide EHR on clinically integrated primary care," to focus on the impact of an organization wide EHR on primary care inter-practice communication and primary care coordination of care.

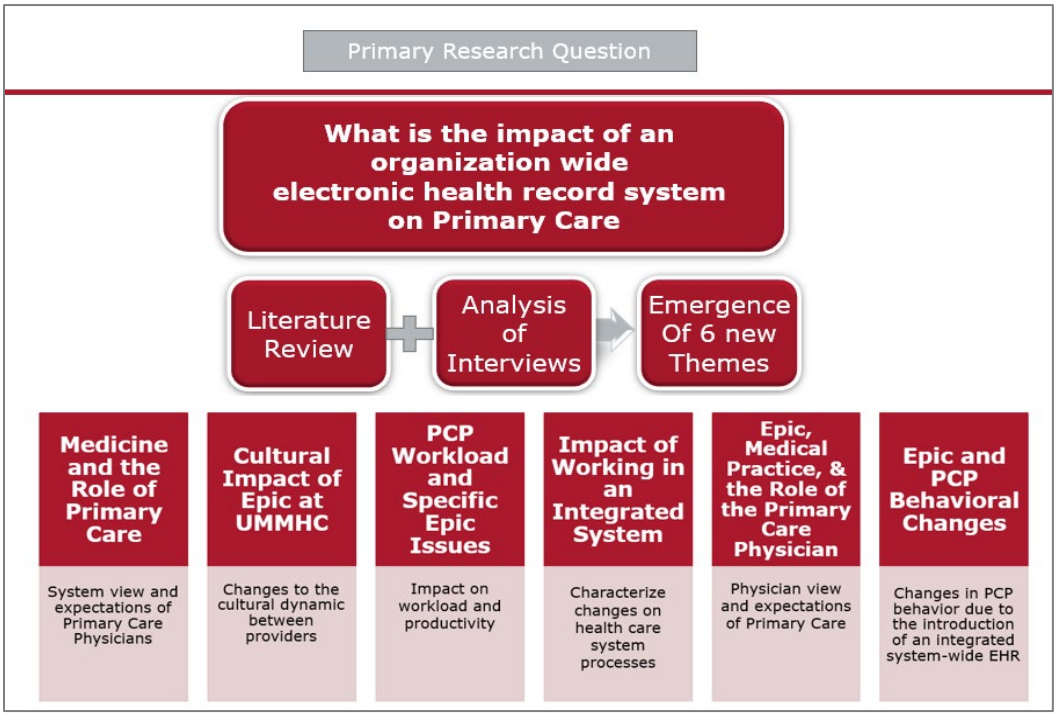

Figure 3-6: Six Cross-Cutting Themes

We noted from the physician interviews the topic of communication arose in numerous interviews and was described as a continuing problem through numerous stories relayed to us by physicians we spoke with. A critical component of health care provision, implementation of EHR systems is expected to enable improved communication and collaboration among providers resulting in higher quality patient care, better coordination, improved patient health, higher patient satisfaction, reduced costs and improvement of quality and safety of care (Bates and Britton, 2010, p. 1).

Yet a growing body of research does not support these expectations (Manojilovich et al., 2015, p.1, 7). Results of various studies report mixed results in provider communication. This may be partially due to capabilities inherent in current health information and communication technologies that may not facilitate the knowledge building that is required to solve complex patient care problems (Dixon, et al, 2018, p. 522). From the interview data and literature review, it became important to further explore and understand the impact of an organization-wide EHR system on Primary Care inter-practice communication; this became the second major research question.

Table 3-1: Criteria for Physician Comments Applied to Theme

Theme	Criteria Applied
Medicine and the Role of Primary Care	• The changing role of the PCP • Increasing responsibilities for the practice of primary care • The impact of health care system changes • Information overflow from multiple provider sources • Expectations for primary care have increased or changed • Expectations that Primary Care will cover health maintenance • Expectations that Primary Care covers preventive medicine • Ways in which Primary Care can improve care coordination and patient care • System thinking about Primary Care compensation, in line with the way Primary Care is currently practiced or should there be broader discussions on change in this area
Cultural Impact of Epic at HC System	• The need for cultural shift within the HC System • Need to think more broadly than just primary care or the ED, etc. • The impact of Epic in system wide integration • References to patient care in other organizations outside HC System • PCP provision of EHR patient data for other providers treating PCP patients
PCP Workload & Specific Epic Issues	• Issues with use of Epic tools that increase the PCP workload • PCP competence with computers and technology overall • Time management and/or lack of time to learn how to use Epic tools • Complexity of the Epic User Interface • Changes in Epic software versions requiring learning or relearning • Usability of the Epic system – clicking, customization, tool issues • Tool issues beyond usability such that PCPs do not know they exist • Data and information flow • Time to write notes, pre-chart, and other process related issues • Anything that increases or decreases PCP time in Epic related to Epic
Impact of Working in an Integrated System	• Applicability and suitability of one system for all areas of the HC System • Issues related to applicability and ease of use for outpatient/Primary Care • What the PCPs report as positive and negative aspects of working in an integrated EHR system • Mention of issues related to working in an integrated electronic health record system • Recommendations to fixing existing Epic issues to make it equitable for all areas of the system • Areas with greatest positive results; areas with greatest negative impact and why
Epic Medical Practice, & the Role of Primary Care Physician	• Changing role of the PCP • Increasing responsibilities for the practice of primary care • Impact of health care system changes • How Epic has changed their role working with patients • Information overflow from multiple provider sources • Expectations for primary care have increased or changed • Expectations that Primary Care will cover health maintenance • Expectations that Primary Care covers preventive medicine • Increasing workload for the Primary Care Physician
Epic & PCP Behavioral Changes	• Changes in the way PCPs conduct visits with their patients • Changes in the way PCPs enter data into the system (notes, etc.), thinking about use of notes • PCP structuring their pre-visit work, during visit work, and after visit work • Differences in the way PCPs think about working with office staff, specialists, ED physicians, and others • Differences in the way PCPs communicate with patients, patient families • Any other behavioral change PCPs mention in interviews

Another area that evolved from our primary research question was related to Primary Care's role in care coordination. In an integrated health care system, effectively coordinating patient care across the triad of patient, primary care provider, and specialty provider can create the potential for substantially improved performance, better quality of care, reduced hospital admission and readmission rates, and less waste and financial burden due to uncoordinated care provision (Kim et al., 2015, p. 47). Care coordination became the focus of a third research question.

3.5 Round II Interviews and Research Methodology

Given the findings and additional research questions resulting from the first set of physician interviews, as well as the changes in health care resulting from the COVID-19 pandemic, we conducted a second round of physician interviews using a Grounded Theory approach in May and June 2022.

The goal for Round II interviews focused on how Epic may have enabled inter-practice communication and care coordination capabilities for Primary Care Physicians. In the second round of interviews, we focused on what their current work was like, how it had changed over the past months and how they might expect it to change in the future.

3.5.1 Round II Data Collection – Addendum to Research Protocol and Interview Process

Following the interview process shown in Figure 3-1 for Round I, we received approval from the IRB to perform a second round of interviews with the same physicians interviewed in Round I. For those who agreed to participate, a 60-minute interview was conducted via videoconference using IRB-approved procedures, then transcribed and de-identified.

The IRB-approved interview protocol is shown in Appendix D. We focused our questions on two major areas based on Round I interview findings. These included inter-practice communication and care coordination. Our goal was to explore in depth the impact of the Epic EHR system on these two important areas considering the time that had passed since Round I interviews and changes in the global health care situation and environment.

3.5.3 Round II - Physician Characteristics

Of the initial 10 Primary Care Physicians we interviewed, 7 agreed to a second 60-minute interview. Table 3-2 summarizes the characteristics of the physicians interviewed. Five of the

physicians interviewed for Round II were male and two were female. Five were Internal Medicine practitioners, and two practiced Family Medicine.

Table 3-2: Physician Characteristics RII

Physician Characteristics – RII Interviews

Characteristic	Description of Results
Number of physicians interviewed	N =7
Gender	Male = 5 Female = 2
Type of Primary Care Practice	Internal Medicine = 5 Family Medicine = 2
Years Practicing Medicine	Range = 7.5 – 40 years; Average = 21.5 years
Years Working at Current Healthcare System	Range = 3.5 – 40 years; Average 18.6 years
Self Scored Epic Capability & Skill Level	Physicians ranked their skill using Epic EHR in RII similar to their skill in RI; range of 6-11 compared with their peers (1 = low; 10 = highest)

Primary Care Physicians work for the medical group affiliated with the HC System and work in clinics on hospital campuses and in private practice-like community settings. Years of medical practice ranged from 7.5 – 40 years, with an overall average of 21.5 years. The average number of years working in the Health Care System was 18.6 years with a range of 3.5 – 40 years.

In Round II, we asked physicians about their self-scored proficiency using Epic Electronic Health Record System. We found that their responses were similar to responses from Round I in a range of 5-11 (1 = low; 10 = highest).

3.5.4 Round 2 Data Analysis

Using the Grounded Theory Approach, and open coding, we expanded the RI coding scheme by developing coding specifically for the questions asked in R II as shown in Figure 3-7. Using axial and selective coding, we identified key findings as described in Chapters 5 and 6.

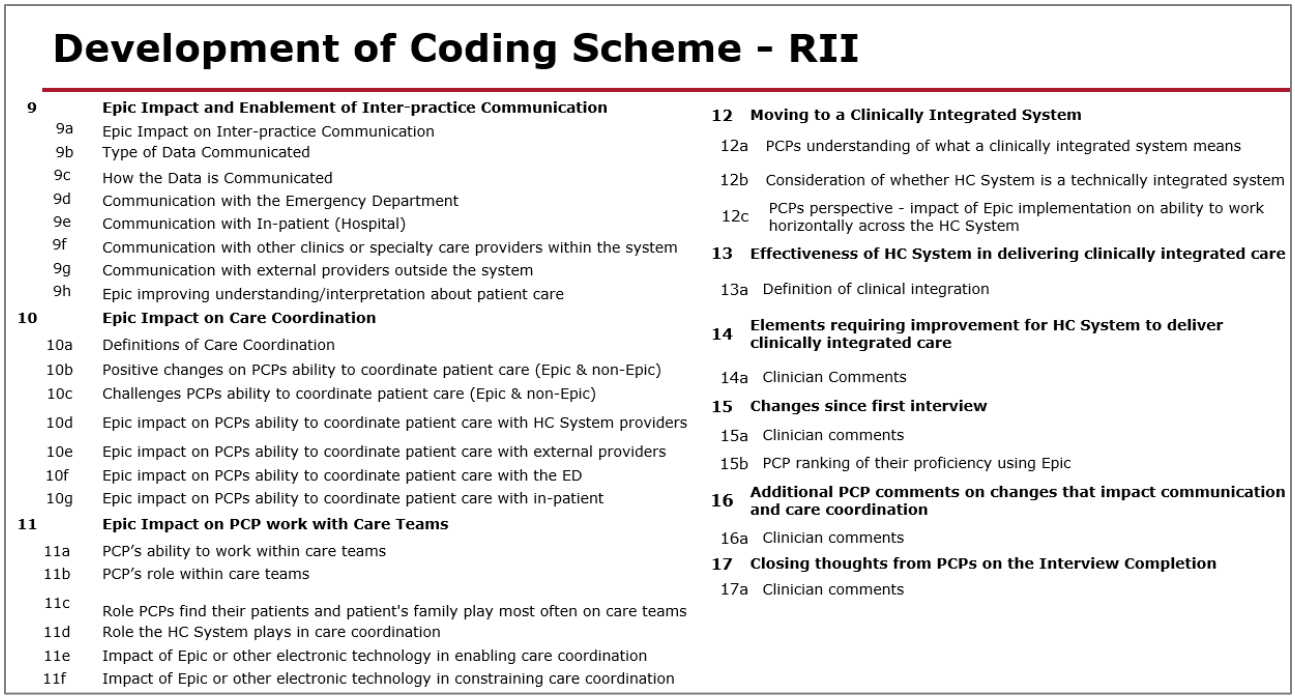

Figure 3-7: Results of interview Analysis, Coding Scheme Development Round II

The Round II analysis also generated a fourth research question, focused on the impact of an organization wide EHR system on Primary Care Physician engagement. In both interview rounds, PCPs spoke with great passion regarding areas related to physician engagement. The PCPs interviewed discussed the Epic EHR system's ability to enhance and facilitate inter-practice communication and care coordination. They noted that the process, technologies, and tools had the potential to facilitate PCPs primary function, a patient centric mind-set for delivery of the highest quality patient care possible. To accomplish this goal, they needed to build relationships, trust, to have access to knowledge, data, and information, and to be heard and visible to advocate for their patients on each individuals' health care journey whether for acute or chronic care. They also, on various levels, needed to continually be engaged in the Health Care System.

3.6 Emergence of New Themes from Round II Interviews

In our Round II interviews, two new themes were developed focusing on improvements made to the environment by the Health Care System. These improvements affected PCP communication and care coordination capability and resulted in additional findings as to how, over time, PCPs viewed the Epic EHR. Round II findings and themes led us to investigate more deeply the role of the PCP as the Health Care System became more technologically integrated through the implementation of the Epic EHR.

The first of two new themes emerging from Round II interviews was focused on health care system level improvement. As the Epic implementation evolved, the Health Care System identified changes and additions that were required to resource utilization, processes, and technology to increase efficiency and productivity. Primary Care contributed by sharing improvements needed and several requirements led to the addition of HC System level improvements.

The second theme added from Round II interviews focused on the PCPs' view of the EHR. Recognizing many positive aspects of moving to a technologically integrated health care system, there were also continuing concerns raised regarding areas yet to be addressed and areas that had been addressed but required still more focus.

Aggregating PCP comments led us to group all themes from Round I and Round II interviews into two major categories related to environment and individual PCPs. The "Environment" category reflects a system viewpoint, the actions and context of the HC system, and the "Individual PCP" reflects the overall impact of the EHR on their work as PCPs. This organization of themes is reflected in Figure 3-8.

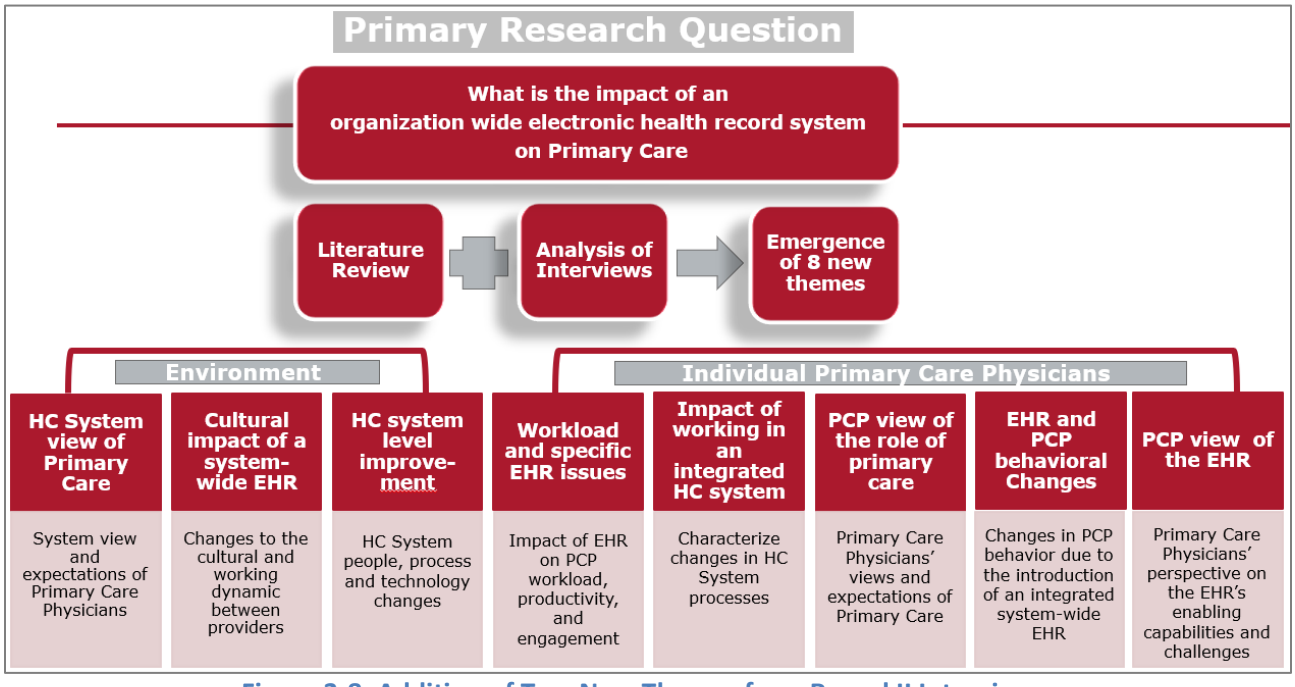

Figure 3-8: Addition of Two New Themes from Round II Interviews

3.7 Theory Development and Broader Impacts

Building from the research methodology and analysis of interviews at the research site, summarized in Figure 3-9, we sought to generalize findings and key insights to contribute to theory and practice. We framed this analysis around the overall goal of clinical integration, considering how technical integration in the form of an organization-wide EHR system enables or constrains this goal from the perspective of PCPs. Table 3-3 describes the process for Round I and Round II interview data analysis.

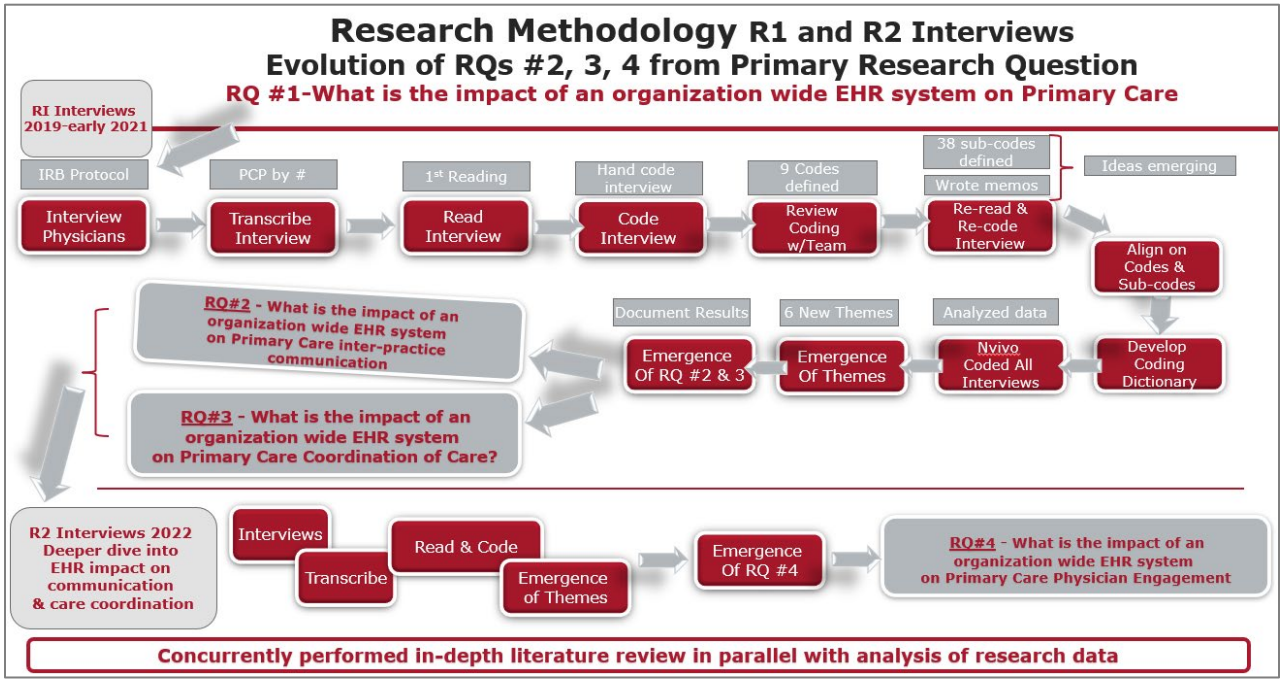

Figure 3-9: Research Methodology RI and RII Interviews and Evolution of Research Questions

Table 3-3: Summary of Steps for RI and RII Interview Data Analysis

Step	Description
Explored cross-cutting themes	From interview data analysis and coded results, we reviewed and identified themes that cut across the coding scheme
Using Affordance-Actualization theory	Used affordance-actualization theory to explore the potential of such systems to effect organizational change, identifying affordances.
Explored Actualization	Explored actualization by identifying drivers that supported or hindered clinical integration

4.0 RQ #1: Impact of an Organization Wide EHR on Primary Care

The focus of this work is to investigate the effects of implementing an electronic health record system, integrated throughout the HC System, from the perspective of Primary Care Physicians (PCPs). While published research on EHR systems provides some insight, significant limitations exist in the specific application to Primary Care. In this chapter we present findings from our interviews with PCPs at a large health care system, capturing their perspectives of the EHR effects using a recently implemented, integrated EHR system.

The physicians interviewed saw positive aspects of working within an integrated organization wide EHR system. They also saw areas of opportunity for improvement. They were realistic in terms of what it meant to them, their practices, the health care system, and of course to their patients. They felt it was important for the entire health care organization to be on a single medical record system. Two physicians' perspectives, which were shared by others interviewed, were that,

> *We have our entire organization, except for a couple of small areas radiation oncology and transfusion medicine I believe are the only two that are not on Epic, but 98% of the institution is on Epic, and there's a lot to be gained by that. (RI).*
>
> *Epic has done a couple of really, really great things for our system. A, because it's a system wide EHR, all of a sudden, we had to think like a system. It wasn't just the doctors at one hospital in the HC System, it wasn't just the doctors at another hospital in the HC System, or the doctors at other hospitals in the HC System, all of a sudden, you know, orthopedics had to think about orthopedics across the board, neurology had to think about neurology across the board. Everybody had to think across the board. (RI)*

Conversely, they also expressed that the benefit depended on how the Health Care System made use of the EHR as one physician noted:

> (The system) *Can do almost anything and the fact that it can do almost anything means that out of the box, it does almost nothing (RI)*

This quote serves as a harbinger of the work required by the entire Health Care Organization to implement and integrate the Epic EHR system not only technologically, but from a process perspective as well. This chapter presents findings that capture broad reactions to the EHR; the following chapters focus on more specific dimensions.

4.1 Literature Review: EHR and Primary Care Implications

Deployment of health information technology has introduced major changes in global health care systems (Raymond et al., 2019). With the introduction of EHR systems, the EHR became the

primary method of record for PCP activities and those of other health care professionals, replacing paper-based systems (Raymond et al., 2019).

The impact of the EHR on health care systems has been the subject of investigation for many years. Studies cover a variety of areas from different perspectives, focusing for example on the value of the return-on-investment to organizations that implement these systems and the overall impact they make on quality (Gatiti, 2021), efficiency (Nguyen, 2021), value (Uslu, 2021), workflow (Fleming, 2014), workload (Bae and Encinosa, 2016; Fogg et al, 2023; Tai-Seale et al., 2019), and professional behavior and value erosion (Skeff, 2022). While there is some literature addressing the impact of EHR systems on medical specialties and primary care, there is less focus on the impact of an organization wide EHR on primary care directly or primary care use of the EHR in an integrated healthcare system.

EHR systems are designed to assist in delivery of patient-centered care, communication, and care coordination (Raymond et al., 2019). While there is noted benefit from use of EHR systems, published literature suggests difficulty with these systems attaining the best use possible by PCPs (Raymond et. al., 2019). Gaps noted include awareness and adoption (Tsai et al., 2020), information overload from example areas such as billing, quality improvement, compliance, visit history, physical exam information, in-basket overload (Fogg et al., 2023; Tai-Seale et al., 2019) and alert fatigue leading to potential patient safety issues (Nijor et al., 2022), and PCP awareness of EHR functionality including need for training (Raymond et al., 2019). Nguyen et al. (2021) reviewed PCP EHR proficiency and efficacy behaviors and time interacting with the EHR. Their findings showed that while there were multiple areas highlighted for intervention associated with physician well-being engaging with the EHR, including the total amount of time spent in the EHR, time spent by physician's after-hours in working in the EHR, provision of on-site support, physician perception of ease of useability of the EHR, in basket workload, and the need for documentation were key areas where interventions should be targeted (Nguyen et al., 2021).

Rotenstein et al. (2022) found that while physicians across the US spent a great deal of time working in the EHR, PCPs spent the most time. Investigating the association between time in the EHR and quality of care in Primary Care, the study found that while increased time working in the EHR is associated with burnout, greater time working in the EHR may represent completeness and

communication resulting in better outcome for patient measures such as hemoglobin $A_{1c,}$ hypertension control, and breast cancer screening (Rotenstein et al., 2022).

Jannett and Yeracaris (2019), two primary care physicians, address challenges and lessons of working with an EHR in the United States. They cite the importance and usefulness of using the EHR in primary care because "primary care is the locus of most care coordination activities that occur in health systems (Janett and Yeracaris, 2019, p. 1294)." They cite a major reform needed is the integration of primary care into the health system and a comprehensive care model that includes provider teams, team-based multidisciplinary care, the sharing of responsibility across teams, information sharing, and coordination of care, with the EHR system as a key component of this evolving model (Janett and Yeracaris, 2019).

4.2 Key Findings for Research Q1

From our PCP interviews, we identified four key findings on the broad effects of an organization-wide EHR system on primary care. These areas covered the views interviewees on technical integration, capability to use the EHR and goals in using an EHR system, the opportunity to improve patient care, and the visibility of primary care within the system.

4.2.1 The Value of Technical Integration

The PCPs interviewed expressed the belief that the technical integration enabled by implementing an organization-wide EHR system would benefit the entire health care system, including primary care. A significant benefit derived from broader data availability, a view that was widely shared. One physician noted:

> *Epic helps us get all the information that we need. That's very useful with specialists like we said before or with labs or imaging and things like that. So I think that's really helpful…way easier than a place where I have not had that integrated. So that's useful." (RI)*

A physician in Round II saw similar promise but noted that integration was not yet complete:

> *… it comes down to data, data, data. You know, helping to get that information in one place so that you can really begin to understand it. I think that the struggle that we have right now is, not all health records are connected. And I think that that's something that is being actively worked on. But I think it will be a number of years before we are where we want to be. (RII, PCP 60)*

Another benefit of technical integration was that it forced the organization to take a system view. As one physician expressed:

> *We had to think like a system. It wasn't just doctors at (Location 1), it wasn't just doctors at (Location 2), or the doctors at (Location 3), or the doctors at (Location 4), or the doctors at (Location 5), all of the sudden, you know, orthopedics had to think about orthopedics across the board, neurology had to think about neurology across the board. Everybody had to think across the board. This guy (Epic) worked for everybody…it's got to work for everybody. So that was a tremendous amount of just breaking down barriers that had existed. (RI)*

Having a view of the entire system also provided physicians with information that helped them in directing patients to care. One physician noted:

> *"So, it's a system-wide, if I decide, if someone doesn't have a real serious problem, but they need an emergency department, I said go to (Location 5). That's one of our EDs. That's a simple, simpler place to get in and out of for what you have, or (Location 3), and you're not going to come to the emergency department here and wait forever. So, that ability to direct people around the system" (RI)*

4.2.2 Individual EHR Capability Goals

In both rounds of interviews we asked physicians to rate their capability using the Epic EHR. We also reviewed PCP characteristics, reported in Chapter 3, to understand more about the background of physicians in our study. PCPs interviewed had been practicing medicine on average of 23 years with a range of 5.5 – 40 years. The average number of years working in the current health care system was 2.5 – 40 years, with an average of 20 years. For the first round of interviews, physicians had been using Epic for 1.5-2 years. In the second round, Epic had been in place about 4 years.

Most physicians interviewed felt they had proficiency utilizing Epic and they expected their proficiency to improve over time. When asked to rate their proficiency, most PCPs rated their skills in using the Epic electronic health record system in the range of 5-9 compared with their peers (1 = low; 10 = highest). Self-reported capability centered around 6-7 in both rounds of interviews, but their comments reveal an evolution in their view of Epic.

In the first year of HC System's transformation there was a profound impact. The first year using Epic resulted in a drop in productivity overall for the system. Physicians, including PCPs reported a significant drop in productivity as they learned to navigate Epic, understand more about the features and functionality, and how to best incorporate it into their overall workload. One physician noted in the Round I interviews that while improving, there were still productivity challenges:

(There was) a significant drop in our billing. It's rebounding and we're doing better than we did the year before we went live…still not where the institution was among academic health centers for billing in our billing metrics… (RI)

Transition, transformation, and change management were major areas touched on by PCPs interviewed. They were initially concerned about the implementation and managing the enormous change they, their office practice, and their staff experienced, and the potential effect on their personal lives. They were also concerned about their skill in using the system and how they would progress to greater facility using the EHR over time. They felt like they could use the EHR system, but initially even though they had training were not using it as effectively as it could be used. The implementation affected the PCPs interviewed in different ways as exemplified by the following comments including use of Epic improving with time:

"So, we're now about 16 months into it, and it's, it's getting better. It was challenging at first, particularly for ambulatory primary care. I think the adoption inpatient-wise and in the emergency room was excellent. Adoption in ambulatory areas, particularly primary care, has been slower because data entry can be challenging. However, at this point, we've clearly made a lot of progress. We had an upgrade that we took four months ago that has been viewed positively, and people are learning to get through their day and, and, and in as an efficient way as they possibly can." (RI)

I think there was conflict in the beginning. Yeah, I had to bend to Epic, and that's the way it is. Epic is, you know, is it the master. But as the Epic experts tell you, there's like phases of Epic where it's your master, but then you get Epic, when you get to a level, which I know I have a ways to go, where Epic is really working for you now. But it takes times cause it's like no different than a carpenter is with a skill saw, and a planer, and making nice things. It takes a while to become good with those tools. (RI)

Another concern expressed by the PCPs, and challenge of using Epic, related to attrition of some physicians due to the implementation of the HC System wide EHR. One interviewee noted:

"There are people in the system who left medicine because of Epic, there are people in the system who are trying hard not to leave medicine because of Epic, and then there are people who have embraced it. And it's interesting for me, because I think I see the potential power of the tool, but I'm still day to day trying to figure out how I can use it well." (RI)

Over time, PCPs became more comfortable using Epic, additional training became available, sessions of extended in-office training took place, various groups organized additional best practices and other knowledge sharing activities, and PCPs learned on their own ways of navigating through their work in the EHR. One physician described their proficiency as follows:

"I feel like I understand the power of the system. I understand how to organize some of the parts of the system to better work for our team. I am by no means a builder. Meaning like I can't create things that are new within Epic, but I can use many of the tools that make it more efficient. I sat on our Epic task force for a year, which I'm really happy we have now. We did not have that when we met last time." (RII, PCP 10)

They began to see greater benefit working in the EHR compared with the previous ways of working to communicate and deliver patient care. One physician noted:

"I think it's been the single most important change in patient care in my career, which is 43 years, it's truly revolutionized the way we take care of patients. Some of that might have been lost because of COVID and the drain that that put-on people, but I can't imagine how it would have been if we didn't have Epic. It would have been so much worse." (RII, PCP 20)

As the PCPs used the EHR, they voiced areas where they felt additional change was needed. They identified areas where the EHR could be made more efficient and responsive, and voiced their requests to the HC System to focus more deeply into how Primary Care needed to use the system to gain the most out of using it.

"My big request would be, make the system more efficient. Be responsive. Expand the people who give you (HC System) feedback about Epic and don't just make it a select task force. Start to really look at the things that give people problems…You know, Epic has the potential to do great things. It's done some very, very good things. But it's so cumbersome to have to fish for things, to not have communication, to have incomplete information, inaccurate information, repopulate, that's the big problem, I think." (RII, PCP 80)

While most physicians felt they had an acceptable level of proficiency they did not aspire to be a "10." It is also important to note that there was no expectation on the part of the health care system itself that every PCP could be or should be a "10." PCPs did tell us that they were comfortable with their level of proficiency and were not necessarily interested in spending their time optimizing usage. Both time to devote to improving system knowledge and their role were a factor, as one PCP described:

"I think the limitation with that comes down to time. And I think there are some things that we could do, and some of it comes down to role. Right? Like I think like, do I have the capability of learning how to build? Yes. If the department wanted to invest in me and have me learn that, could I do that? Probably. Is that the best use of my time as a physician? I don't know." (RII, PCP 10)

Another physician stated the challenge this way:

I would say that probably I will (need) a minimum of one hour a week, if I can do that, to learn more about Epic, that will be excellent. It probably will be better if I can do more. But it's difficult to find that hour in a week with, because I'm running behind in a lot of things most of the time. (RI, PCP 50)

As a consequence, once a physician found a way to accomplish a task, they might continue to use that approach without looking for alternatives, as one interviewee noted:

> *… people know how to do something, and another way can be staring at them right there, and they just don't even think to click the button or to explore what other options they may have. They find a way to do it and they just stick with it. And they don't want to do anything else. They're not willing to change (RI, PCP 60)*

As with any technology, there are constant upgrades, updates, and new capabilities that need to be added, changed, removed, or retired over time. As users of the EHR system, PCPs learned what would make their experience utilizing the EHR more amenable to their needs and expressed their requirements. However, technology is constantly evolving and so as one PCP remarked,

> *"You're never done. It's like … a project that never has an end date. It's always in optimization. And that's true, because now all of a sudden people realize, hey we can do all this cool stuff. And so they want more, and more, and more (RI)*

Interviewees also described the challenge that IT professionals and physicians speak in different languages so developing effective support was difficult.

4.2.3 Primary Care Becomes Visible

Another key theme that emerged from our physician interviews focused on primary care becoming more visible within the organization. Some PCPs felt that the new EHR was enabling them to be connected to the inpatient world, the Emergency Department, to global institutions that provide care for their patients, to specialty care providers, and to a world of providers they had little or no visibility to previously.

A major reason for bringing in a system like Epic was to unify all the departments, hospitals, inpatient, outpatient, the ED, and global healthcare providers allowing for communication of information and knowledge sharing that was never possible before. The expectation was that Epic would help transform the system, with everyone on one platform, allowing for population management and health maintenance/preventive medicine to be practiced. Some PCPs felt that,

> *Epic was brought into the 'healthcare system' to enable system wide transformation (RI)*

Visibility for PCPs enabled them to see what was happening with their patients when they had to visit the Emergency Department, were admitted to the hospital as an in-patient, were transitioned to home or another location, or were seen by other physicians within the HC System. As one interviewee expressed,

It's easier for me to see what's going on, and the records in the emergency department, so definitely that's a significant improvement from before. And I, if I can, if I want, I can communicate with that doctor, identify that doctor, and on a few occasions, I have received messages from ER provider to me, as we saw this patient, not only the discharge summary or, or the note, it's an extra message to me. We saw this patient for this reason, this is pending, or we recommend to follow up on this. (RI)

It was very important for the PCPs to "have a voice," and to be recognized as part of the patient care continuum for their patients. The EHR enabled PCPs to begin to see patterns with treatments, to understand more about their patients' health care journey, to see a broader picture of their patients. They also appreciated that their notes were now shared with other HC Providers and that they had visibility to notes and patient information from other providers caring for their patients. This was framed by interviewees having a voice but also awareness of all the work expected to them, as the following quotes illustrate:

***Primary Care Having a Voice**: I'll see a patient in the office. And I have to send them to the emergency room. I make it my duty to have a note that's prepared with the information, the concerns I have. On occasion, I'll communicate with the ER, and I'll say, I don't know if you saw the report. I hope it's helpful. And they say, absolutely. (RII, PCP 80)*

***Centralization creates awareness:** Then, you know, to do a simple visit is like, 10%, you know, the patient interaction is 10% but there's like 90% of other things to it. You know? And it's not necessarily a bad thing, it's just now Epic has made us realize that. It made us realize what, because like, you know, it happened to be parsed out or, like, you didn't know you had to do all these things but Epic centralizes it and now I realize, or we realize what a primary care physician does, you know, because they get to, they see all these things. You know? It's all centralized so that picture became clear and it's not a very good picture. (RI)*

While PCPs felt that their work was becoming more visible within the health care system due to the EHR, they also felt that the work of primary care did not really change. PCPs were responsible for their patients in the same way they had always been. They were the hub connecting the spokes in patient-centered care. The difference now was that they had greater visibility into the care pathways their patients were taking, and other HC Providers shared findings from visits with PCP patients expecting PCP to follow up. One PCP framed the challenge as follows:

I think I would say for the primary care physician, it feels like everyone has a say, wants something out of it and it puts the burden on the, on us to, like, appease every single, you know, billing and coding and all this and other things. (RI)

While greater visibility within the HC System has advantages, Primary Care Physicians also felt as though their work was more difficult. Challenges arose in the area of communication when specialists, for example, saw PCP patients and confusion arose related to follow up. Having

visibility to the information related to specialist visits was appreciated by the PCPs, however the lack of clarity around who was responsible for what aspect of follow-up belonged to whom was confusing. Written communication in the EHR needed to be clear in terms of ownership about who was doing what to ensure patient follow up. Initially, volume and lack of clarity were overwhelming as described by one PCP:

> *… at first, I was getting results from specialists that were ordering tests on my patients that I never would have been the person interpreting, and it was very unclear who was responsible and what I was supposed to do with that, especially if it was abnormal. And that felt very much like a dump. That felt like we want to make sure that somebody has some responsibility for it, and it was, it was way too much volume. That has gotten better, because I think there was going to be a revolt if it wasn't fixed. (RI)*

4.2.4 The EHR as a Platform to Improve Care

The PCPs interviewed also viewed the Epic system as a platform that would improve patient care. Even physicians who found Epic cumbersome identified this value, as illustrated in the following quotes:

> *Integration is the functionality of Epic that helps the most in delivering patient care. Collaborative care using Epic and working together (RI)*
>
> *The only thing I like in Epic is in the past (Healthcare System) had different electronic systems for every different unit, so now it's one. So that really has helped in patient care. (RI)*

The EHR implementation had a significant impact on PCPs ability to improve patient care. The improvement in communication, collaborating with colleagues, and care coordination was fostered by information exchange, available to a much lesser extent prior to the EHR implementation. Through Epic, HC System Primary Care Physicians were able to view patient data they had little or no access to previously. They were able to work together with their colleagues to provide insight into patient care history, personal situations, and other areas that might be impactful for treating their patients in other settings. They were also able to communicate and drive coordination of care as their role as PCPs. Comments from PCPs illustrate these benefits:

> ***Treating Complex Patients - ...*** *for example, for a complex patient, the liver specialist, the cardiologist, the nephrologist are all involved, and everybody can be on the same conversation and follow the same conversation. And I think that, that also translates to better, better delivery of the healthcare … (RI)*
>
> ***Improved Communication and Information Access*** *- Improved communication, improved access to each other's notes, and particularly inpatient to outpatient, where there were gaps, big gaps before. Now we can see their notes, they can see our notes, so no, certainly communication across the system is much, much better. (RI)*

Improved Care Coordination *- …care coordination with others has improved considerably. I mean I think to try to get them on the same page as us, say again regarding medications or getting them updated on patient's treatment plan is easier. And you know that it will be received and hopefully they'll act on them, or you act on them and let them know. So yeah, I think that aspect really is great.* (*RII, PCP 100*)

4.3 Discussion of RQ#1 Findings

The primary question of this research was to understand the impact of implementing an organization-wide EHR system on primary care delivery of patient care. This chapter provides results of our conversations with PCPs at one HC System implementing an organization-wide EHR, in two rounds of interviews taking place approximately 2 years apart. Key findings in our initial round of interviews focused on understanding the changes the EHR brought about, the areas enabled and challenges engendered. Key areas discussed included the EHR impact on communication and care coordination and the effect it had on Primary Care delivery of care. Out of these interviews we developed themes discussed in subsequent chapters of this document.

A key difference between this research and that of published literature is the focus on Primary Care. The role of Primary Care is different from that of other health care professionals. Primary Care must by design, focus on the whole patient, all organ systems and disease states. Working in tandem and coordination with specialists and all areas of a HC System is different by design from specialization of a given functional area and must be recognized when reading literature referencing "physicians" instead of a specific focus on a given medical specialty.

In comparing published literature to the results of our interviews, we find similarities and differences. First, while there are many articles available on the impact of an EHR implementation integrated through a HC System, there are fewer studies examining the impact on Primary Care. Similarities between existing literature and our findings include considerations of overall cultural impact on HC Systems functioning as more integrated entities, rather than working in a siloed structure, the importance of cross-divisional, cross-system communication, and the need for coordinated efforts focused on care coordination for patients. Findings from the literature are not necessarily applicable to individual HC Systems. It is important to recognize that while there are similarities, differences between systems exist. For example, the extent to which communication and coordination were issues prior to implementation of an organization-wide EHR system and may currently be remediated, will vary depending on internal and external variables specific to each HC system.

We review results of our research through two lenses: One related to the environment and the other focused on PCPs. In the environment of the HC System where the PCPs we interviewed worked, there were expectations for PCPs that, in some cases, did not take into consideration the existing processes, procedures, and protocols that needed to be addressed to facilitate the breakdown of siloed systems moving them toward integrated, cross organizational functions.

PCPs interviewed in our study were generally supportive of the organization-wide implementation of an EHR. They were enthusiastic about having access to patient care information regardless of where their patients were treated within the HC System. They were encouraged to receive information on their patients' care when they visited HC Providers outside the system. They felt that moving to a more technically integrated system was a significant change that brought about greater visibility both for their own work with patients and for the work other HC Providers were doing with their patients. They appreciated information on transitions of care for their patients, and the ability to communicate through the EHR in a collaborative manner with other HC Providers to enable smoother care coordination.

They found challenges in the "how" of communication, not necessarily in the means through use of the EHR. They pointed out that clarity of communication by other HC Providers would improve efficiency of communication and looked for ways to try to resolve EHR technical, procedural, and process issues. They recognized that the EHR was an incredible improvement for the entire HC System and for the most part, took time to learn more about the EHR system, increasing their proficiency with practice and over time.

The PCPs in our study recognized limitations with the existing EHR implementation, and wanted to see improvements made to design elements, but were not looking for another system to be implemented. We also found that cultural integration was closely tied to the health care system and that it was important that the EHR become integrated with the culture as well as technically.

PCPs in our study achieved a level of visibility within the HC System with the implementation of a system wide integrated EHR. The EHR needed to work for everyone in the system, across different sites and specialties. In addition, the focus on patient care highlighted the need for improved communication across the HC System and for better care coordination, topics covered in Chapters 5 and 6 of this document. The connection between patient care and culture provided a foundation for considering PCP engagement explored in Chapter 7.

5.0 RQ #2: Impact of an Organization-Wide EHR on Inter-Practice Communication

In this chapter we present our findings on the impact of an organization-wide electronic health record (EHR) system on Primary Care inter-practice communication between physicians. First, inter-practice communication is defined specific to our work and framed by a literature review. Key findings from our interviews with PCPs are presented, followed by a discussion.

Communication is critical to the practice of medicine, described as one of the most important tools available for providing great patient care and improving patient satisfaction (Fiscella and McDaniel, 2018; Hashim, 2017). While there are a wealth of studies published on physician to patient communication, fewer focus on physician-to-physician communication and ways in which exchange of information can be improved (Doty, et al., 2020; Fiscella and McDaniel, 2018). Given increased specialization in medicine today, and the changing organizational structures within institutions, rarely can a single health care provider deliver the type of care that a team of care givers can provide (Doty et al, 2020; Fiscella and McDaniel, 2018). Therefore, it is incumbent on the physicians caring for a patient to communicate with each other to provide the highest quality care possible.

The definition of inter-practice communication is considered in context and has been defined differently depending on circumstances. The World Health Organization states that the continuity component of primary care should develop relationships that last for extended periods of time between people, health care professionals, and teams of health care providers (WHO, online, Primary Care). Doty et al. (2020), find that while primary care practices in a few countries inclusive of the U.S. do not "routinely" share patient information via electronic means outside of their practices, primary care does communicate with other sites of care in high performing countries (Doty, 2020). Fox et al. (2019) report that inter-professional communication is a major component of patient-centered, comprehensive care, and a key component of effective interprofessional collaboration in primary care. McCutcheon et al. (2020) report finding greater positive clinical outcomes when inter-professional collaboration took place, rather than when it did not. For primary care, ongoing communication with other health care providers is an important component of the Primary Care Physicians' role in delivering patient care.

For our research, we define "Inter-Practice Communication" to mean communication between physicians (or clinicians) in a primary care practice with physicians (or clinicians) who practice in

another setting external to this practice. This includes settings within the health system, such as other primary care practices, ambulatory specialty clinics, and inpatient and emergency departments within hospitals. Communication may also occur with physicians in similar settings that are not part of the HC System

More broadly, communication is defined as an exchange of information, with the following dimensions:

- **Who is communicating:** including Primary Care Physicians and other physicians, other caregivers, care coordinators, nursing staff, HC administrative professionals, auditors, insurance providers, and patients. We are focused on communication between physicians. To care for their patients, PCPs may need to communicate with specialists, in-patient hospital providers caring for PCP patients, the Emergency Department assessing a PCP patient, Pharmacy, Imaging, Laboratory, nursing services, and many other areas within a health care system. Externally, PCPs may communicate with other HC Providers outside the HC System treating their patients anywhere in the world.
- **What is being communicated:** including patient data and recommendations for and questions about patient care. Each patient and each encounter generates data and information that needs to be captured. All data related to a patient for each encounter, seen anywhere for any reason internal to the health care system or externally, must be recorded and kept for the patients' record. Data may also be entered for financial, audit, compliance, regulatory, research, quality, and other purposes.
- **How communication is occurring:** Paper-based means of communication such as distribution of faxed information, regular mail, or printed documentation passed from one HC Provider to another as well as in person communication via person-to-person or face-to-face meeting, are now often occurring through other means such as the EHR system, email, telephone, chat, or other technology providing virtual connectivity either directly or indirectly.

Communication occurs at a point in time. The timeliness of communication and whether the message communicated is sent clearly and understood in the same way the sender meant it to be understood are also key elements.

5.1 Literature Review for Understanding the Impact on Communication

Multiple articles highlight the need for and importance of communication between physicians and other health care providers to support better care. There is some published literature related to provider-to-provider communication for transitioning patients from acute inpatient care to outpatient, however a review found that there has been less focus on transitioning patients from outpatient to acute care (Luu et al., 2016). Two of the six essential relationships in health care are between physician to physician and between physician, inpatient facility, and patient (Selinger, 2013). EHR systems and electronic information exchange are seen as central to improving

communication between primary care in an integrated healthcare system, “to ensure primary care is integrated into health care delivery itself” (HHS Blog, April 2016).

EHR systems allow for dynamic sharing of information to augment continuity of care (Burton et al., 2004). The electronic exchange of information may allow for a smoother pathway to exchange updated patient information, as visibility to data entered the system by one physician can become quickly available to other physicians who need access to it. The process of information sharing has the potential to improve overall provider-to-provider communication. Respondents in one study reported that, “improved access to patient data is a significant perceived benefit of EHR use, as well as consequent improvement among practitioners and enhanced efficiency (Yoon-Flannery et al., 2008, p. 279).” In addition, “consultation between health care providers facilitates access to specialist care and prevents acute care use (Tian et al., 2021, Abstract).” However, current health information and communication technologies do not necessarily facilitate knowledge building required to solve complex patient problems (Bernsten et al., 2018; Door, 2018).

The benefits of EHR use depend on physicians in all areas of the system entering data and ensuring that data is comprehensive and accurate when entered (Lorenzetti et al., 2018; Winner, 2020). Inter-practice communication relies on clear physician-to-physician communication and institutions implementing an EHR customize their implementations to meet provider needs (Yoon-Flannery et al., 2008). This helps to ensure that information communicated through an EHR is as complete as possible, including patient notes, useful information for other providers treating or reviewing patient test and imaging studies, patient questions, or inquiries, alerts that patients have had or need imaging studies, lab work, and reference notes. Strategies exist to improve physician documentation efforts that include use of templates, smart phrases, efficient ways to use the problem list, medication list, use of dictation software, writing clearer succinct notes, among other areas (Winner, 2020). Additionally, standardization of practices, further training on best practices for use of the EHR, and the use of trained Medical Scribes entering information on behalf of the Primary Care Provider or other HC Professional may be useful means to ensure accurate, timely, clear, and concise information is available in the EHR for others to read and utilize (Lorenzetti et al., 2018; Winner, 2020).

Based on literature review, our expectation was that use of the Epic system should facilitate inter-practice sharing of information via system integration across the HC System, removing communication barriers, lack of awareness, and guesswork in delivering patient care.

5.2 Key Findings of Related to Inter-Practice Communication

In Round I, interview questions related to inter-practice communication largely focused on who was communicating and the value of that communication. Based on our analysis of these interviews, Round II questions probed more deeply to understand what was communicated and the means used for communication (the how). Interviewees described the importance of the EHR in enabling inter-practice communication as well as barriers. Overall, PCPs felt that Epic did not constrain inter-practice communication and in fact enhanced the ability to make it happen. One physician noted:

> *Epic …helps us with getting all the information that we need. That's very useful with specialists…or labs, or imaging, and things like that. So, I think that's really helpful…way easier than a place where I have not had that integration. So that's useful (RI)*

While recognizing benefit, they also identified concerns, for example:

> *…communication system-wide probably has improved. But I think the demands of primary care have also increased (RI)*

They also noted ongoing barriers, for example:

> *I think that the struggle that we have right now is, not all health records are connected (RII, PCP 60)*

Interestingly, while the PCPs interviewed described common elements, no clear definition of inter-practice communication was derived from our discussions.

A common element among the findings was the need for both indirect and direct communication specific to the patient's needs and the need for responsiveness. Information entered into the Epic system by one physician could be accessed indirectly by others, resulting in the sharing of information more widely than had been possible previously. Communicating directly with other physicians could be problematic via telephone/in-person or email; tools such as Epic Secure Chat facilitated efficient communication. .

In the following sections, these findings are explored in greater detail. First, we describe findings related to the experience of PCPs communicating with different groups in the HC system,

then discuss facits that support and constrain communication. The impact of Epic on communication is also presented by findings related to indirect and direct communication.

5.2.1 Integration Supported Improved Improved Communication

This section first explores interviewees perspectives on who they communicate with, including the Emergency Department (ED), specialty practices, and inpatient settings. General observations about communication across the system are then described. Having all areas within a health care system accessing information from a single electronic health information system is expected to yield improved communication and therefore result in improved patient care. However, structured communication between physicians can be very individual in terms of what is written, when it is written, and how information is described. We asked physicians interviewed what communication occurs when their patients visit other physicians within the same health care system and learned that for them, it is not just the system that carries the information along that is key – it is the assessment of who is writing what, for whom, and the urgency of the communique.

Communication with the Emergency Department

The Emergency Department (ED) plays a significant role in the care and treatment of patients. The PCPs interviewed were candid in sharing their comments about inter-practice communication with the ED. Overall, the physicians interviewed reported that they saw value in the use of Epic in communicating with the ED, however significant challenges remained. While this finding was important, it was equally important to understand the reasons why this was occurring. Figure 5-1 summarizes the variety of topics interviewees raised when discussing the ED.

A common theme among PCPs interviewed was the lack of communication with the Emergency Department. In some ways this is completely understandable given the pace of the ED, the urgency of care provision needed, and multiple other variables. Each area of medicine works at its own pace and while there is integration in terms of information, there is need for different working models for physicians to interact in ways that are perhaps more meaningful for care coordination and quality of care. In the following discussion, positive changes associated with ED communication are presented followed by a discussion of challenges.

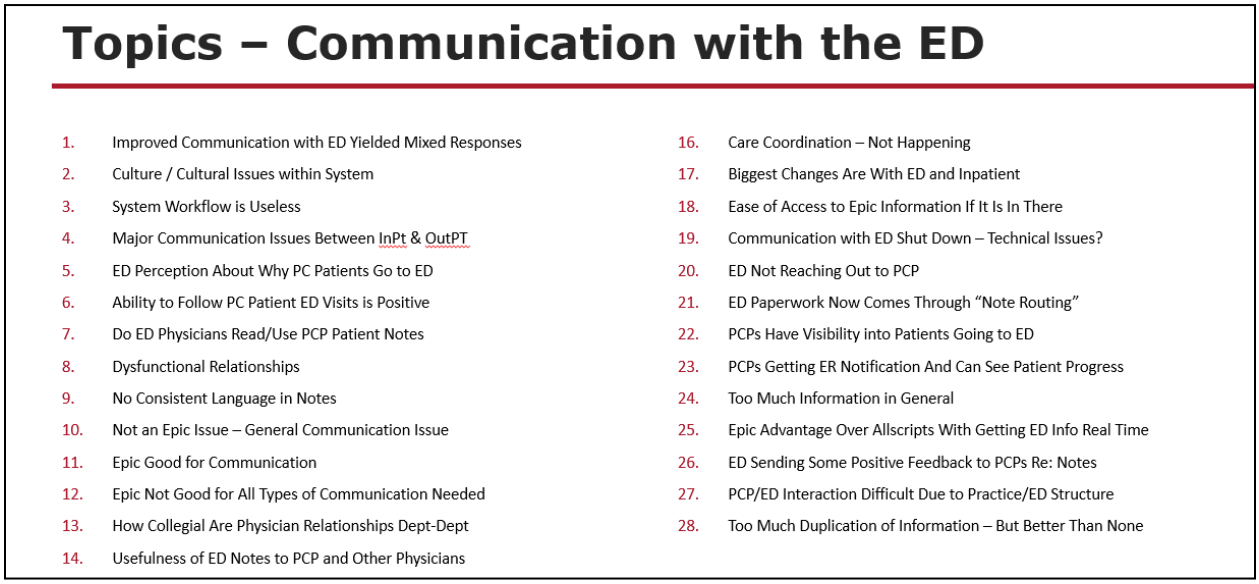

Figure 5-1: Topics Extracted from Physician Interviews on Communication with the ED

Implementation of Epic, with both primary care and the ED on the same system, was generally viewed as beneficial. This is a major difference from the previous siloed systems where departments and hospitals within the system were on disparate systems with no integration. One physician commented:

Communication or interaction with the emergency department is infinitely better (RI)

Another noted the benefit of having a single system, commenting on the challenge to get information prior to the Epic implementation:

> *Definitely, communication without Epic was harder. I want to say that is the least of my communication with other providers, the emergency department, but again, the record is there, and I can access it easily if I need it. Before, because the system wasn't the same system, I had to go to a different system to get information for the emergency department, and even the documentation on that different system wasn't the best. It was not the best and was not clear. So having it on Epic in a single system, and again, the timeline also on the emergency department, following a, when this test was done, what was the rationale of the physician there, is clear on, and I think it's better than the prior system. (RII, PCP 50)*

Table 5-1 highlights key benefits identified by the PCPs interviewed related to ED communication, including greater information availability, the timeliness of the information, and direct communication from the ED about their patients. PCPs could now receive ED notes and follow along what is happening in real time. This enabled the PCP to schedule follow up appointments with discharged patients, and to follow up on lab work, imaging studies, and more.

Table 5-1: PCP Noted Positive Changes Associated with ED Communication

Topics	Supporting Quotes from PCPs
Information Availability	*I can see the information (coming from the ED) very easily. They used to be on their own…so they couldn't see mine. Now they can see it. (RI)* *Maybe it made it easier (Epic) because you know, it's in the same system…so it's easier I would say to know who is in the emergency room now. (RI)* *It's easier for me to see what's going on, and the records in the emergency department, so definitely that's a significant improvement from before (RI)*
Timeliness of Information	*So there was none before (communication with the ED), unless somebody picked up the phone and called me. Or I waited three or four days for the faxed report…Now it's immediate. So that's one place where it's been particularly good (RI)* *Speed of which you find out about a patient's ED visit, yeah…quickly, quickly (RI)*
ED Engaging Primary Care	*…so the other day I got a message from an emergency room person that said FYI, this CT needs follow-up. I appreciate they send it, I think that, that's great (RI)* *…I can communicate with that doctor, identify that doctor, and on a few occasions, I have received messages from ER provider to me…it's an extra message to me. We saw this patient for this reason, so this is pending, or we recommend to follow up on this (RI)*

One physician noted:

> *Often in the past (I) had to piece together what happened without really knowing. I could see some of the tests that were ordered, and maybe piece together what the doctor was thinking, but now I know. Now I have a note (RI)*

Another physician described the improvement as follows:

> *So I get notified, if they go to a (HC System) ER, I get a notification as soon as they register, if they're there. And then in my in basket, I am able to basically see what's done. I can see the notes as they're being written. I can see the lab results as they come in. If they get admitted, I will know that. I can then hop in and look at the admission note, etc. So it's very smooth communication. (RII, PCP 60)*

PCPs also described using Epic features to harness the information, such as in the following quote:

> *And it's in the same system. So, and I can then, I could also just filter his chart and say show me just the emergency department visits. Don't show me anything else. That kind of stuff is just the ability of the chart, of the system, to filter and sort, is I think has great promise. A lot of people still aren't necessarily using those tools. (RI)*

Communication also occurred in the other direction as well. A physician explained:

> *I think this has been an excellent development, too. So a good example is, I'll see a patient in the office. And I have to send them to the emergency room. I make it my duty to have a note that's prepared with the information, the concerns I have. On occasion, I'll communicate with the ER, and I'll say, I don't know if you saw the report. I hope it's helpful. And they said, absolutely. (RII, PCP 80)*

This increased visibility included all the Emergency Departments within the HC system that were integrated to use the Epic system.

Although a "rare" occurrence – PCPs were absolutely delighted when they received communication from the ED – as an example, in response to a question about consultation with the ED, one PCP reported,

> *Sometimes the hospital will still tell me…we saw your notes, this is very helpful. That's a win. That's a great thing (RI)*

Another physician commented:

> *And I, if I can, if I want, I can communicate with that doctor, identify that doctor, and on a few occasions, I have received messages from ER provider to me, as we saw this patient, not only the discharge summary or, or the note, it's an extra message to me. We saw this patient for this reason, this is pending, or we recommend to follow up on this." (RI)*

PCPs also noted challenges in communication with the ED, as summarized in Table 5-2. They had difficulty connecting with the ED. They felt there were dysfunctional relationships, and their interactions were minimal. Differences between the specialties, Primary Care and the ED were notable, including different operating schedules, different working models. Generally Primary Care sees patients on a regular schedule, often during weekdays during specific hours, with on call handling off hours, weekends, and holidays. The ED on the other hand, is open 24x7, 365 days a year. Thus, system workflow and structural differences make it difficult for HC Providers taking care of patients to communicate. PCPs calling into the ED must wait until ED Physicians or someone is available to answer. Physicians calling into Primary Care have in other studies reported time waiting for PCPs to come to the phone. The general structure of the institution and culture in which Physicians work, is therefore not conducive to inter-practice verbal collaboration on an ongoing basis.

They were also concerned with the amount of interaction that took place between Primary Care and the ED. This concern was raised by a PCP who noted,

> *While there is a system to communicate, I don't think we communicate or ask questions of each other…(RI)*

Table 5-2: PCP Identified Challenges with ED Communication

Topics	Supporting Quotes from PCPs
Difficulty Connecting with the ED	*So the emergency department, you're on a sore topic. Communicating with the emergency department is almost useless, calling them, first of all, there's no central place for me to send something to them. The good news is that by the time the patient gets there, my note will be done, and they can look at my note and see what I was worried about (RI)* *I've tried calling…or having my staff call triage. But the message doesn't ever get…you know, flow through to where it needs to flow. So that continues to be a struggle (RI)*
Little or no improvement in communication	*The PCP needed to call a social worker to identify why a patient who went to the ED for a visit, "every other day for three weeks, to "interrupt the cycle." (RI)*
Process issues sending patients to the ED	*I would say that we (primary care) are just as guilty as folks who practice in the emergency department…the system workflow is useless for that. I mean, you sort of have to call this care, you know, this whatever, triage and then they say, okay your patient can go to the ER. The patient shows up in the ER and usually they're waiting for hours, and that call is sort of lost and it really doesn't have any value. And, and the folks seeing the patient sort of start on their own (RI)*

Another noted:

> *Dysfunctional relationships between the specialties…that they operate in different streams of thought…there is just a lack of communication between, at least in our outpatient medicine, and the emergency department (RI)*

There were also process related issues such as a patient who had gone to the ED multiple times and the patient's PCP had never been consulted by the ED. The PCP expected communication from the ED to consult on why this was happening and what could be done about it, noting

> *This is not an Epic issue, or just send a note through Epic (RI)*

Another physician described process challenges as follows:

> *So, the emergency department, you're on a sore topic. So, communicating with the emergency department is almost useless because, you know, calling them, first of all, there's no like central place for me to like send something to them. The good news is by the time the patient gets there my note will be done and they can look at my note and see what I was worried about. So, that can happen. (RI)*

Communication with Specialists

PCP communication with specialists is important for many reasons related to patient care and delivery of quality patient care. This includes sharing of information about a patient, saving patients duplicate tests, and avoiding interactions between drugs. Considering PCPs as the coordinator of the patient's care team is a responsibility that requires sharing of information about a patient on an ongoing basis. Data shared electronically is essential to this overall effort. Use of Epic facilitates the process, however where there is no available electronic information sharing, the need for continuous information sharing falls on others including the patient and patients' family (Selinger, 2013).

Table 5-3 highlights key topics related to the positive effect Epic had on communication with Specialists, including the shared record, responsiveness, and the mode of communication. Table 5-4 summarizes challenges PCPs had communicating with Specialists using Epic; shared records can also be overwhelming and there was variation in responsiveness. The tables provide quotes illustrating these topics; the following discussion also considers these effects.

Shared records and notes can be valuable but also overwhelming. PCPs interviewed spoke positively about having patient information in one shared, integrated system, as one PCP found:

> *Every institution that is on Epic shares records…It's extraordinary. I saw a patient who visited Dubai and was seen in the Cleveland Clinic in Dubai, and I could see their records. (RI)*

On the other hand, PCPs found that a portion of information was duplicated entries, with no easy way to search for information needed. Although recorded information was sometimes clearly written and sometimes challenging to understand, it was the visibility into patient records regardless of where patients were seen that was of great value to PCPs.

Communication requires parties involved to send clear messages and to receive responses, regardless of the communication modality. PCPs interviewed were concerned about responsiveness with any outreach, especially when the integrated EHR system allowed for electronic communication in real time. They felt that in some cases Specialists were responsive and in other cases they felt that there was little or no response. The integrated nature of Epic led to mixed PCP opinions on responsiveness reflecting part of a longer-term process and need for continuous learning pathway, as one PCP noted,

"learning curve" that the HC System is going through with change in processes and the way people work to make significant changes to actually realize the benefit of the technology itself (RI)

Another topic area included comments about whether Epic was a better modality for communicating with Specialists. One PCP found that it really had not changed,

Before they were doing it one way, now they are doing it by another…Different means to get to the same end result (RI)

While another PCP commented,

But has it changed? It has also changed in a way that say that I say, I tell my patient, okay, so I'll check you back in a couple of weeks later, I can put my own reminder. But having said that in Allscripts I also did it. So, I don't think it's really made a big difference (RI)

Table 5-3: Epic Positive Impact on Communication with Specialists

Topics	Supporting Quotes from PCPs
Shared Records and Notes are Valuable	*I think because the documentation is everything on the same place, I think that's the big plus ... to give you a specific example, hematology/oncology was, before Epic, one of the departments that was still not on the electronic medical record. So, we were missing that, we were still handwritten notes, or another type of system. So, now that is there. And that's a huge difference. Because you, you definitely know, what was the reason they were, and the documentation, the plan, and the follow-up, and that translates to better coordination, so that's a specific case (RI)*
Responsiveness	*…the majority, I would say 99%, do respond in some time. So I think coordination helps. Sometimes you don't need to make decisions then and there. I can wait for, so I can work with somebody an, and then make joint decisions about what to do things (RI)* *So I think it's facilitated care so that if I have something concerning, I can get access to specialists much faster, in a way that's least intrusive. I don't have to leave the room. I don't have to call a physician. The physician gets the report, the chart right there. They see my concerns. My staff gets that. This has been the best …. And I've done with GI, orthopedics, cardiology, continuously. It's been very helpful in that realm. (RII, PCP 80)*
Better Mode for Communicating with Specialists	*…in Allscripts if I want to send a message I would send by email. So, now I do by Epic. … I don't think I have changed a lot with the patient care, it's just a mode of communication that's easier. (RI)* *So, so, the mode of communication has changed… I would say it improved the care a bit, because now I know who are all the physicians who like some residency, so I can one staff put everything in message (RI)*

Table 5-4: Epic Challenges on of Communication with Specialists

Topics	Supporting Quotes from PCPs
Shared Records and Notes can be Overwhelming	*So, almost, right, there's always been a complaint about that, but they built in the default, is that when they do their note, there's an automatic, automatic forwarding of their notes to the PCP. (RI)*
Variation in Responsiveness	*You know what, there is some, there is some variance in how people respond, perhaps, like, you know, some specialists I've seen, I question whether they check their messages or not. You know? And so I do not know if they've read it or if they're too busy and they just haven't responded yet or they do not know. So it's, you have to have this trust to be, like, they read it and they will respond. But for the most part, people usually respond pretty quickly (RI)*

Physician interviews on the topic of inter-practice communication between PCPs and Specialty Physicians brought to light some of the limitations that are not necessarily Epic related. There is recognition among PCPs that the operating model of outpatient primary care is very different from the operating models of specialists, who may work in ambulatory but also hospital settings. This is reflected in the comment of one PCP, who told us,

> *I mean, at the individual level, you know, they, I'm sure they, I mean, they read some, you know, I'm hoping some of those do. And we do read their notes, I mean, we just need it to, to work up. So yeah, it has made, you know, but there's still some dysfunctional relationships, I'll say, between different specialties," (RI)*

While Epic has enabled communication as a technological bridge, process and cultural changes are also needed to support the actual interactions PCPs need to have with colleagues and peers in other medical specialties and the desire to be included, to be part of the continuum of their patients' care, even when seen by other physicians or health care providers anywhere.

Communication with Inpatient (Hospital)

Communication between PCPs in outpatient or clinic settings and inpatient hospital-based physicians is critical for the transition of patients from the hospital acute care setting back to the community. Returning to the community could mean home, or to an outpatient transition setting such as a rehabilitation hospital. The goal is to ensure that hospitalized patients "complete the circle from health to sickness and back to health again" (Selinger, 2013, p. 1) and to reduce the possibility of patient readmission.

Before the days of Hospitalists, most PCPs were responsible for patient care in the ambulatory setting and in the hospital setting. Today, Hospitalists are generally Board-Certified Internal

Medicine or Family Medicine Physicians who have undergone the same training as other internal or family medicine physicians including medical school, residency training, and board certification examinations, care for hospitalized patients (American Board of Physician Specialties, 2023).

In our interviews we found that Primary Care Physicians who do not see their hospitalized patients find that communication with Hospitalists is a ***"two-edged sword (RI)."*** While the PCP may not attend patient rounds, they do get Hospitalist notes and can see their patients' progress and they do get notified of patient admissions. One PCP interviewed remarked that,

> *If your patients get to the ICU, some of the residents will call and let you know and tell you if they have questions (RI).*

If patients of PCPs are not moved to the ICU, but are hospitalized, then most likely you will not get a call. As one PCP mentioned,

> *They (Hospitalists) know that you're seeing the notes (RI)*

An important communication related to transition of patient care from hospital at discharge is the discharge summary. Overall, hospital communication in terms of discharge summaries was highly regarded by the PCPs we interviewed. One PCP mentioned,

> *…And my sort of tendency is to not focus on the day-to-day grind, but I really go through the discharge summary and look at things that happened and anything, particularly if I need to do (anything) in follow-up or they (patient) need to be seen sooner (RI)*

Related to discharge summaries, another PCP stated,

> *I think that's much improved, you know, you can see the discharge summary, you can see exactly what's needed, if I need to do a follow-up x-ray. I can go ahead and track things that happened. So, I think these are much more informed visits than before (RI)*

The speed was more actionable, as one physician explained:

> *And for me it's helpful when I can see information. Now there's the charge to really see that there's a nice handoff that when a patient's in the hospital discharge, I can see what's transpired. And I find this extremely valuable. Before the electronic record, it would take a while. It was almost like the Pony Express. You'd have to get a report sent by fax. Now you can see it in real time. So this has been extremely helpful to, I think, reduce some of the concerns. People can see exactly what my concern is. (RII, PCP 80)*

There is recognition among PCPs that the operating model of outpatient ambulatory medicine is very different from the operating model of the inpatient hospital world. Differences between ambulatory patient care and in-patient hospital care are well recognized. Primary Care Physicians are the first line of care for most patients in the United States (Fadlon, 2020) and

provide patient care in non-emergency situations (Farnen, 2017; Vorvick, 2021). They are responsible for preventive care, acute and chronic care, assessment of medical issues with triage to the best place for care if needed, and referrals to medical specialty care, among other responsibilities (Vorvick, 2021). Physicians, such as Hospitalists, practice within the in-patient setting in hospitals. Hospitalists practice within the hospital setting and their primary role is clinical management (Greenwood, 2017; Kokemuller, 2017).

Outpatient, ambulatory care, usually involves examination, and may involve lab work, imaging studies, same day procedures (Sullivan, 2023). Inpatient procedures usually involve an overnight hospital stay for procedures or conditions such as orthopedic surgeries, cardiac surgeries, and other conditions. Although PCPs may see patients in both outpatient and hospital settings, hospitalists work in the in-patient setting. A significant difference between Hospitalists and many PCPs is the length of the relationship between the physician and the patient. For example, a PCP (Internist, Family Medicine Physician, Geriatrician, Pediatrician, and others), may take care of a patient from a young age to old age (Greenwood, 2017).

Due to differences in specialties and practice settings, practice styles may be different. There is generally no standardization of protocols within the HC system for interaction or collaboration between physicians – it is up to experienced health care professionals to make determinations as to when consults are needed, criteria for determining a consult is generally the responsibility of the PCP, an experienced licensed professional with years of training (Farnen, 2017; Greenwood, 2017; Kokemuller, 2017; Vorvick, 2021); what would or could help sort this out are more, stronger, guidelines for care coordination with people intervening to ensure the right care providers are added to the patient's care team as soon as possible for coordination of care. One PCP noted the lack of outreach on their patients from HC Providers in the inpatient area requesting a consult with the PCP on the patient(s) they are treating:

> *…I don't think I've ever had anybody (in) inpatient reach out to me and say hey, what do you think? Or this is what we're doing. I haven't had any increased communication the other way, except when I'm initiating (RI)*

5.2.2 PCP Perspectives on Inter-Practice Communication within the HC System

Inter-practice communication between physicians is critical for quality patient care. PCP communication with other physicians taking care of their patients for any reason is important, as their communication may assist patients "avoiding duplicate medications and tests, drug

interactions, and a whole host of other problems" (Selinger, 2013, p 1). Current thinking views the PCP as the central figure in a patient's care, supported by specialists, hospitalists, ED physicians, and other health care providers. Data exchanged electronically assists in the process of informing physicians caring for patients, however there are limitations even electronically to inter-practice electronic communication.

Communication with other physicians proved to be an interesting area during our interviews. As noted in the previous sections, considering interactions with the ED, specialists, and inpatient areas, the PCPs identified information availability and timeliness as adding significant value. They had a positive view of inter-practice communication, as one physician commented:

> *Communication with other physicians, trying to understand what they are thinking about is also great (RI)*

Physicians also remarked that interaction with other physicians could be beneficial for the physicians involved in patient care, and most importantly for the patient:

> *For example, you know, if I'm seeing somebody with hypertension and they're going to cardiology two weeks from now, or diabetes, and I want to make a change to their medication that I'm not sure, should I do it or, so, or I see that they're going to be seen, like, six months from now and I want them to be seen earlier, so I'll just write a note and say, hey you're seeing my patient in six months' time and can you, you know, I feel that this needs to be seen earlier. And most of the time they'll do it. There are some physicians who are notorious for not responding so, but the majority, I would say 99%, do respond in some time. So, I think coordination helps (RI)*

Communication requires senders and receivers. In the electronic world senders expect responses from others, similar to communication via other modalities. Physicians appreciated when they received responses or learned their communication was helpful, as illustrated by the following quotes:

> *…when I initiate (a communication), I am getting better responses. So I think that my message to someone is linked to a person in a chart is actually really helpful (RI)*
>
> *Communicating with some colleagues when they have the information, that's extremely, to hear in the emergency room when I call them and I say, was my note helpful, extremely, because then you don't have to get things repeated. That's wonderful (RI)*

Yet sometimes, when waiting for information or responses, physicians interviewed felt that their communication was not considered or that information sent to them was not helpful. As one PCP shared,

And so I think that my feeling as a PCP is, just copying your notes to me is not helpful, unless you have a specific question or input for me. Because I can go get your note. When I see the patient a month from now, and all you did was change the medication that you're managing in a way that does not impact what I'm doing, I can read that when I'm seeing the patient. Don't send it to me just because I am the PCP (RII, PCP 10)

A case described by a physician in Figure 5-2 provides an example of the opportunity perceived by physicians. It reflects positive ways in which PCPs are reaching out and widening the circle of how communication is critical to patient care. To resolve a patient's medical issue identified by a cardiologist, this PCP identified a potential solution, reached out to the specialist and together they worked out a way to resolve the patient's problem.

Case Report – Positive Collaboration Effort Between Two Physicians Treating Same Patient

So, you can always route a copy of your note to whomever, including outside the system, so that is pretty easy to do. Primary care doesn't tend to send many notes out, we just get, we oftentimes get the note sent, we're like the black hole of notes, they'll come in, very little gets out, cause most of the specialists don't really care.

So, unless, I mean, I had a situation actually this week, where patient is followed with a cardiologist for a particular problem, and I saw the patient, he had just seen the cardiologist last week, and I had an insight that she hadn't thought of.

And I was like, hmm, gee, I wonder if it could be one of these two meds that is actually causing, she was having problems with lightheadedness. And I was like these two meds, I looked it up and sure enough, the two meds in combination, 20% of patients will have lightheadedness. So, I was like stop one of these medicines, let's see what happens.

And so, I sent her an instant message, said, by the way, had a flash of insight, trying this, and she sent me back, that's a plan. So, she knows what's going on, and you know, she can read the note if she wants, but I mean, I, it was very easy for me to just let her know that's what's happening.

I could have just sent her my note, just said FYI, would have been another way to handle it. (RI)

Figure 5-2: A Positive Communication Experience in Care Coordination

Table 5-5 identifies three topics that physicians discussed related to limitations regarding inter-practice communication. These include information overload, both related to care from other physicians and system requirements, cultural and care practice differences between different areas, and opportunities for improvement.

Table 5-5: Epic Impact on Inter-practice Communication with other Physicians

Topic Area	Supporting Quotes from PCPs
Different Cultures and Practice Models	*(provider-to-provider communication) has not really been great either…I think that this is some(thing) cultural, it had nothing to do with Epic, I think this is just cultural (RI)* *I just think it's a culture. I mean, they can send a message through Epic and just find out or call us. I mean, I don't think that's happening, at least with me. I don't know about other people. I bet if you interview 25 folks, then you will find out, but I bet it's along the same lines (RI)*
On Information Overload	*"Yeah, so it's different for different people. The ability to send information is pretty limitless. And so, there's a lot of information. The bad side of that is there's information overload now. So, I can get like seven emergency room notes on one patient, the resident note, the second resident note when he finishes, the attending note, the second attending note, the shift change. So, it just keeps coming. You don't even know what to look at. So, there really is if you looked at my in-basket it's just filled with junk. You have too much information. So, the ability to communicate much more easily has come with a downside of how do you filter it, how do you take out the noise, and that's been very, very difficult" (RI)* *"…now it's easier to place demands through these care gaps, emails, and what not…policeman type activities have improved (RI)*
Improvements Needed	*…(PCP on receiving message from the ED)… emergency room person that said FYI, this CT needs follow up. I appreciate I appreciate they send it, I think that that's great, I think in the collegial world where we're both taking ownership, there would probably (be) a conversation about that, and I think that has also been true with some of the consultant notes (RI)* *It bothers me, and it's not a fault of them, it bothers me when someone is at another hospital system, the specialist doesn't communicate and I now wonder, was this test done, do I have to hunt that? We have insurance plans that will say, doctor, you have deficiency because they didn't see the eye doctor, but they did. How come that report doesn't come in? It shouldn't be my duty to be bounty hunter or my staff to hunt these things. If you want a system that works, you have to facilitate things. That's the, that's the way I look at it (RI)*

5.2.3 PCP Perspectives on Using the EHR for Indirect Communication

Primary Care Physicians recognizing the need for indirect communication shared the following findings in Table 5-6. They identified four topics or areas affected by the Epic implementation on indirect communication.

Table 5-6: Using the EHR for Indirect Communication

Topics	Primary Care Physician Comments
Value created through information availability and timeliness	*Now with an electronic record, that information is there for people to see. And I think people are more responsive to it. (RII, PCP 80)* *It's quicker and overall better. We used to get paper reports a week or two or a month later and I had already seen the patient and followed up and I didn't know what had happened. Now, I can see the patient the next day and I usually know what happened. (RII, PCP 20)*
Improving the Value of Information	*I mean, there are pieces that are not as integrated as we would like. So there are, I'll just give an example, but these are things that are being addressed. So getting an EKG. OK? That goes into what's called the MUCE system. You have Epic, but then you have all the things that Epic doesn't do that have to feed into it. And some of these things don't feed in as smoothly as we would like. Or bone density is another example. We can get the text blurb in. That's easy. But getting discrete data in that then can be used to help drive care, not so easy. So it's that piece that, as we, and it's a system-by-system slog. The system has to be able to do it. The outside system. And then you need to be able to bring it in in a discrete way. So those kinds of things are, I would say that we are probably 90-95% there. (RII, PCP 60)* *But we're still siloed that like each place is choosing what they do, but just because we're doing that way doesn't mean that my practice is doing that, but it doesn't mean that cardiology would know to look there. So I think there's still a lot of opportunities to optimize what is expected from the different ways that you can communicate in Epic. Because there's still a lot of dysfunction in that. (RII, PCP 10)*
Appropriate timing for Direct Communication	*For some reason it's probably a little less. I think it could be done the same way and occasionally is. I see their discharge summary. Occasionally the discharge summary will be forwarded to me with a note saying please be sure to look at this or that. Probably not as often as it should be. And that's just human behavior. The electronic medical record allows for that. It doesn't happen as often as maybe it should. (RII, PCP 20)*
Limitations to Care Everywhere and External Communication	*I feel handicapped when people go outside of the institution and get bloodwork done, and I can't see that. And I think that, you know, I see things that I hear meaningful use, and I think, that's not so meaningful those things. What's meaningful is for me to have all that information so I can best equip and advocate for my patient with all the information that's there. And when the information is out there in other programs, it should streamline in. (RII, PCP 80)* *Sometimes it takes more time, because there's a lot of data, because there's a lot of data there to analyze, even though I'd say Care Everywhere is helpful. It's not like simple click. Because it will just tell us like line by line what happened. So you have to go and see what you want. … And then you have to go and search. So when you are short of time, it's difficult. But I mean, it's better than nothing. (RII, PCP 40)*

PCPs found value in the availability of information and data provided through the EHR and that input of that data came from across the HC System. Information availability was important as well as the access the EHR afforded from HC Systems outside of their own organization. They felt that having access to information from HC Providers seeing their patients in other settings, and the immediacy of the information availability, from Epic and other integrated information sources was invaluable. As one PCP told us,

> *Health information exchange is amazing. So, we are, we have access to more data from more places than we ever did. So, we have nearly immediate access to any other institution that's on Epic, and we have pretty good access to others that are connected through health information exchanges, such as Carequality, SureScripts, or some others. There's a third at least. So, with that we get urgent care documents, we get documents from people who are traveling or spending time in Florida, and it's very valuable. So, that is definitely better (RI)*

While PCPs found improvement in accessing patient care data and communicating inter-practice information availability, they identified a need for increasing the value of the information itself. Indirect information requires that the message sent be clearly and understandably to the receiver. The construct of information by the creator may not be the understanding of the receiver. Thus, misunderstanding of the message intended, may not be what is understood. Two potential results of this inter-practice communication may be generation of additional steps requiring clarity such as more indirect communication, or a need for direct communication. As one PCP stated,

> *And for example, specialists consult notes can vary from very succinct to so long, you don't read them. And our key physician developer has done some great work in building different templates for these people so that you can put the assessment and plan at the beginning rather than have to wait until the end. Or you can filter out some of the superfluous information that's just there to enhance billing. So we're, yes that is a problem and yes, we're working on it. (RII, PCP 20B)*

Another PCP cited the need for improved capability to find information needed. If the information is available in the EHR, it is equally important to have that information easily accessible. If the information cannot be found without great effort, it becomes a more complex inter-practice method of communication, necessitating in some circumstances the need for direct communication. One PCP interviewed commented on the importance of the information easy to access and to understand without major effort saying,

> *What's meaningful is for me to have all that information so I can best equip and advocate for my patient with all the information that's there. And when the information is out there*

> *in other programs, it should streamline in. And I'll give you this funny example, too. I remember many years ago I went to a funeral in Haiti for an uncle of mine. I was able to communicate in live time with family while I was there, with the primitive Internet that they had, and you can't do that with other institutions. You still have to fish. I call it forensics when I look at files. I have to carefully tease out information. The scribe is able to do that, but this is something that software should facilitate. And it's an embarrassment, quite frankly. (RII, PCP 80)*

PCPs found that while direct communication was important, it could be time consuming and more labor intensive. The ability to pick up the phone and reach a colleague for a consultation or to answer questions was often a challenge. Physicians work in different business models and the opportunity to make a call and actually get in contact with another colleague may require a great deal of back and forth before the direct connection is made. However, PCPs recognized there were times when in an acute or emergent patient care situation, there was a need for direct communication as one PCP noted,

> *And so, you know, Epic in some ways is good for communication but other times, you know, some of these traditional, almost like a phone call is, you know, if it's an emergent issue (RI)*

The use of Care Everywhere enables PCPs greater visibility to information coming from providers from national and international locations. Epic, as one of the most, if not the most widely used EHR system in the United States, supports secure patient data flow and reportedly Epic's, "standards-based interfaces support billions of data transactions every year with other vendor systems, medical devices, and private, national, and state-led registries and research groups (Epic Interoperability Fact Sheet, 2014).

In our physician interviews, we found that Epic's Care Everywhere capabilities received mixed reviews. Some of the physicians interviewed let us know they were not using it and considered it a front desk function. It is possible that some physicians misunderstood its capabilities. One PCP found Care Everywhere to be, ,

> *…tedious because you've got somebody who's been to three or four places…you may have the meds listed three or four times. And to clean up the med list takes five minutes or more (RI)*

Other physicians found that Epic's Care Everywhere enabled global communication on a level that they had not previously had access to.

> *…now you can see everything across the* system, and even more you can see things outside the system really, really easily. And now, if the stuff has come in from outside the system, in your search box, it will include that stuff that stuff in the search box (RI)

5.2.4 Direct Communication

Primary Care Physicians recognizing the need for direct communication shared the following findings, with additional comments found in Table 5-7. Three topics were identified related to the effect that Epic implementation had on inter-practice communication, specifically focused on secure chat, managing urgent issues, and the promise of future technology improvements.

Table 5-7: Topics Identified as Elements of Direct Communication

Topics	Primary Care Physician Comments
Secure Chat is Effective	*Well, so, it's much easier. I mean, it used to be email, letting them know things. Now I'm sending them messages through Epic, which means that when they look at the message, the patient is in context, and they can look at their chart, so that that makes, that really facilitates it. It also means that they could save that message, and then when the patient comes in, they would have that information like right at their fingertips. So I think that those kinds of things have really been facilitated. (RII, PCP 60)*
Managing Urgent Issues	*The most significant outreach that I get from the ED directly, other than just getting copied on notes, is there is a nurse who reviews abnormal results after the patient has left the emergency room, and they send those to us and say, please follow up on this. The challenge with that is, often it is a patient who is not engaging with care with us, and so then we're stuck having it then handed to us without being able to take action on it. (RII, PCP 10)* *.. the other big thing that's now happening is, let's say they get an imaging study, and there's a so-called incidental finding. There's a team now that basically makes sure that that information is known by me, and that it gets followed up. So that kind of stuff is happening. (RII, PCP 60)*
Future Technology Improvements	*So there are technological things that are happening within (HC System) that I think will improve communication, particularly for the things that are like timely, urgent. You know, a radiology finding that is really urgent that needs to be dealt with, or a lab finding that's urgent and needs to be dealt with, how do you get in touch with the right person quickly? At night that's really hard. Or over the weekend, it's not so easy. This makes it easier to get to the right person. (RII, PCP 60)*

First, Epic enhanced the ability for direct communication through the instant messaging capability of Epic Secure Chat, with the benefit of access to patient chart information providing more "in context" messaging. PCPs expressed their enthusiasm for using Secure Chat and the benefits it provided enabling direct communication. A limitation noted by PCPs was the need to cut and paste messages into the patient record through the embedded use of Secure Chat where PCPs felt that should be a capability of the Epic system. Although Secure Chat has limitations, PCPs found it to be a very useful capability in Epic, as one PCP noted,

So Epic has Secure Chat, which I don't think we had when I talked to you last time two years ago. So Secure Chat is kind of like an instant messaging, if you will, inside Epic. And it's quite nice, because you can see if they saw, there's some technological things that I wish it did better, like getting that information into the actual record is not as smooth as it could be. You have to literally copy and paste. So there are things that I wish it did better. (RII, PCP 60)

Second, Secure Chat enhanced the ability to respond to urgent concerns. PCPs found that while direct communication can also be through notes, Secure Chat enabled a rapid direct communication link that offered a two-way send/receive actionable message, often receiving more immediate attention than other methods. As one PCP remarked,

…so, when there's definitely the need to communicate something, it's way better. Number one, again, going to the information being in the same place, and the staff messages and the chat, sometimes I get direct messages saying, just FYI, this patient was discharged. This result is pending. We did this. And actually, after the discharge, for example, I follow up the patient, and there is a question why it's not clear on the note, or I have a question of why certain medication was started, or why a specific dose, and even though the patient is not under the care of that doctor, I send the message. They respond right away, and improve that, definitely. So I use it that way, too. (RII, PCP 50)

Third, PCPs were excited about the addition of other technologies that would also enhance direct communication such as Halo, Doximity, transcription capability, Haiku, and other technology enhancements to address inefficiencies in direct communication that also support more effective responses to urgent issues. An example provided by one PCP is representative of others in saying,

… I think that there are things even beyond Epic that (HC System) is implementing … As part of that, they're going to be implementing this thing called Halo, which will be another instant messaging app outside of Epic, but also be kind of like how we get paged for calls. And it also will allow people to have like your coverage, so that if somebody calls, wants to contact the doctor covering for you, they just have to send a message to you, and it will get routed to the person who's covering, so that a lot of those kinds of things become much more efficient. (RII, PCP 60)

As with all communication, a message can be sent and it can be received; however, it is important that the sender make the message as clear as possible, and that the receiver understand the message and use or respond to the information as requested. For example, as one PCP commented,

… until all of us, including me, I mean, change our, our practice styles to, to take advantage of what, so you know, there's that messaging system and, and we can use, and I've only just started to use it and I've gotten some messages from nurses, my nurses, other providers but I don't know if I sent the message to someone who will really use it. (RI)

5.3 Discussion of Epic's Impact on Inter-practice Communication

The impact of inter-practice communication on the practice of primary care gained increasing importance in our research as it related care coordination and clinical integration. Silos within healthcare are a result of organizational structure and different care objectives, with different departments focused on various functions (Alves and Meneses, 2018; Sperling, 2020). As a consequence, there may be "insufficient communication channels," resulting in less efficient organizations, conflicts, yielding duplication of effort, cost overruns, and waste in the system overall (Alves and Meneses, 2018, p. 64). Because different medical teams may "manage particular aspects of a patient's health in isolation" (Sperling, 2020, p. 3), the ability to communicate and coordinate patient care becomes essential for quality of life and long-term health (Fiscella and McDaniel, 2018; McCutcheon et al., 2020). The situation where PCPs must refer their patients to specialists is also critical. As Sperling (2020, p. 3) writes, if they do not have time to "time to integrate and analyze all the results, functional silo syndrome is almost guaranteed to be endemic."

From our Round I interviews we recognized, perhaps even more so than we initially thought, the critical importance of inter-personal communication between PCPs, specialists, inpatient physicians, and Emergency Room physicians, external to the health care system, as well as how and what was communicated. Our Round II interviews focused on a deeper dive into the impact of the Epic EHR on inter-professional communication to learn more about the positive impact it had and the barriers that it created. The first round of interviews took place during the 2019 – early 2020 time period, a little over a year after Epic implementation. The system change was profound and both physicians and the organization were actively adapting. Round II interviews occurred about 2 years later and reflect improvements and updates to EPIC, as well as broad environmental effects of the COVID pandemic which impact but are not the focus of this work.

One significant update between Round I and Round II included the roll-out of secure chat, an instant messaging with capability for use "inside Epic," which means for example that messages can link directly to patient charts.

A discussion of findings in the following paragraphs explores these ideas:

- Use of the EHR for communication added value (improved timeliness and greater availability) but had workload impacts.

- Inter-practice communication was limited by different cultural and practice norms across settings.
- The need to balance direct communication versus electronic interaction (indirect communication).
- Secure chat improved direct communication.

Most physicians interviewed found that the Epic EHR added value. They were now able to access patient data and information as never before, and this capability was of benefit, as the following quotes demonstrate:

> *So, one of the other great, there are two huge things about Epic. One is, now you can see everything across the system, and even more you can see things outside the system really, really easily. And now, if the stuff has come in from outside the system, in your search box, it will include that stuff in the search box (RI).*
>
> *And it's in the same system. So, and I can then, I could also filter his chart and say show me just the emergency department visits. Don't show me anything else. That kind of stuff is just, the ability of the chart, of the system, to filter and sort, is I think has great promise (RI)*

Physicians found that through the use of Epic they were able to access information they had not been aware of previously or that they could not get access to without a great deal of effort. Our physician interviews revealed physicians' thoughts on improvements of access to patient data:

> *…and you can see anything from endoscopies, surgeries, labs, notes, everything there, and you don't have to jump around systems (to get access to the data) (RI)*

It was also important for the PCPs that notes written were available in a timely manner. For example, PCPs noted that having real-time visibility to the ED records made a difference in their ability to provide timely care, as the following quote from one PCP illustrates:

> *Yes. And again, at different levels, because (I) can see what is happening in real time. That's number one. (RII, PCP 50)*

Another aspect of timeliness was pointed out by PCPs related to the implementation of ancillary, important technologies enabling communication. The implementation of Halo was another means of communicating across the HC System as needed to inform HC Providers of how to contact PCPs when needed in situations where rapid contact was needed. One PCP noted,

> *As part of that, they're going to be implementing this thing called Halo, which will be another instant messaging app outside of Epic, but also be kind of like how we get paged for calls. And it also will allow people to have like your coverage, so that if somebody calls, wants to contact the doctor covering for you, they just have to send a message to you, and it will get routed to the person who's covering, so that a lot of those kinds of things become much more efficient. So there are technological things that are happening within (HC*

System) that I think will improve communication, particularly for the things that are like timely, urgent. (RII, PCP 60)

PCPs found that while the communication system-wide improved there were concurrent demands on primary care that increased. The availability of more information and patient data meant that Primary Care Physicians have the responsibility to access their patients' data and to incorporate it into the care they provide. More information meant more responsibility and accountability as they gained additional knowledge, along with a broader and deeper knowledge of their patients' overall care. Some of their comments are provided below along with their thinking about this increase in demand:

…communication system-wide probably has improved. But I think the demands of primary care have also increased (RI)

Definitely affects it because you want to, even though that is, if it's a simple or complex question, you want to follow up in a timeline manner, and sometimes you have to balance that with the daily workload, the lab results follow up, paperwork. So it adds up to the daily work (RII, PCP 50)

Additionally, PCPs found that frequent updates to the EHR came through emails. Balancing working in the EHR and also emails, led to concern over prioritization of work as one PCP commented,

So I think there's lots of positive allotments, you know, the institute, I (am) forgetting the name of the metrics institute does provide us some practice metrics to suggest OK, the practice should be doing more in obesity or tobacco, or depression. But that also has a dark side, but again, this issue of burden and I don't think interlocking these things, because you, primary care physicians always get asked to do more without taking away anything, or without providing support. I can't do one more thing in Epic because I still have to do those other 10 things that are done. (RII, PCP 100)

Epic integrated areas of the system that operate using very different models and with different goals. This structure and culture has not changed with EPIC implementation, but the different areas within the HC System are 'closer' and thus have the opportunity to be more closely involved. Taking advantage of this can require some cultural and organizational change, for example in using direct messaging and reviewing notes, as well as process changes (such as being able to easily find a point of contact).

Introducing any new technology into a system requires a balance between use of the technology and its impact on the current state of processes and systems within an organization. Physicians interviewed found that while there was benefit to having Epic integrated system wide,

there were also issues within the overall system wide culture that needed to be simultaneously addressed. Some quotes reflected the need for cultural change from the PCPs interviewed addressing issues with other departments related to communication and the need for clarification roles and responsibilities system wide for specific areas. For example,

> *Provider-to-provider communication…has not really been great either…I think that this is some(thing) cultural, it has nothing to do with Epic, I think this is just cultural (RI)*

In the following quote, the PCP references interaction with the Emergency Department. Here there is a need for a potential culture change to ensure all areas of the system understand the role and responsibilities of each area. This work that needs to be done system wide could help to foster a growing sense of team consideration in caring for patients across the organization.

> *I think it's a cultural issue between them, they feel that, you know, we're just, like when we can't handle them (patients) we ship them to the ER (Emergency Department). The ER feels that their job is, okay you shifted it to us, we're going to take care of this either by admitting them (to the hospital) or by sending them home (RI)*

Another general comment from PCPs included the sense that communication had shifted through the system wide integration of Epic. Recognizing this, PCPs continued to work to build personal relationships with colleagues through both direct and indirect communication. The importance of building relationships with other HC Providers was recognized as key for patient care, referrals, and for team-based care. As one PCP commented,

> *Communication shifted from interpersonal interaction to the EHR or more electronic based interaction (RI)*

It became clear as we proceeded with our interviews and analysis that PCPs felt that while they had more patient information and data available to them, they also were experiencing mixed feelings about the implementation of Epic. While the introduction of technology to "solve" a problem is an important step, it is often preceded by organizational change. This change can include organizational, structural, financial, cultural, sociological, process, and/or other forms of change that need to occur in parallel to the implementation of any technology (Singer et al., 2011; Singer et al., 2020).

Technology is often expected to resolve problems and it often does. However concurrent forces within any organization such as those described need to be addressed for technology to provide the most benefit to any organization. Often technological implementation brings to light hidden issues within an organization and by raising them, raises awareness and the need for

transformative action. In the case of communication within the HC System, PCPs recognized that different areas of the HC System work differently, and one way utilization of the EHR could improve the efficiency of inter-personal communication would be to think about the differences through a cultural lens,

> *I think the few (of the ED Physicians) who want to connect with us can do so more easily that before because there is a system. They can put in a name and say, RR something. They send out a patient and they want him to be seen within 24 hours and they can, but that is few and far between. And again, I don't know the reason for that, but my sense is that it's the culture of ER work. The people just like to work quickly, make it efficient. It's all about disposition. Can the patient go home or does the patient need to be admitted? That's the bottom line in the ER. (RII, PCP 100)*

Communication with the Emergency Department (ED) represented a key area of concern for the PCPs we interviewed. While they acknowledged the importance of the ED's role in the care and treatment of patients, they reported that communication between Primary Care and the ED was not very good but considered it to be a cultural issue, not an Epic issue.

Some physicians were impressed and pleased with the improvement in getting any information from the ED and being able to have a basis of understanding about their patients, whereas before the Epic implementation, they felt they were for the most part, in the dark about their patients' visits to the ED. An example of the comments we received regarding inter-practice communication with the ED is as follows.

> *Communicating with the emergency department is almost useless, call them, first of all, there's no central place for me to send something to them (RI)*

Primary Care Physicians utilized both indirect and direct methods of communication with other HC Providers. Determination was often based on whether the question, concern, or issue was of an acute or emergent nature, or if it was something that was not urgent and could wait. Urgency was generally around patient need with the HC System focused on solutions to improved communication for different types of patient care situations. In these situations often direct communication was necessary and facilitated through the use of Secure Chat.

Indirect communication was often through the EHR with response times varying. If an indirect communication was sent, and the PCP felt elapsed time was sufficient with no response, the PCP might decide to utilize direct communication, most likely through Secure Chat, via telephone call, or paging. The HC System also introduced enabling technology such as HALO for use in situations where there was a need to contact on-call providers. Epic was used for indirect communication in

transitions of care situations where patients were leaving the ED and transferring to outpatient PCP care, or when patients were leaving the hospital and transitioning to other facilities or outpatient care. Direct communication and/or indirect communication were also used for communication of supplemental findings, dependent on the urgency to communicate results.

As a means of direct communication, Secure Chat was mentioned by almost all PCPs we interviewed during Round II. Alam et al. (2022) found that reaching out to physicians via Epic Chat (Secure Chat) resulted in a greater response when compared with Epic Letter, in part because it is embedded in the overall Epic workflow, with the capability of immediate response and stimulating communication exchanges between parties. A secure chat can also include everyone involved in a patient's care.

The significance of Epic Secure Chat was recognized by PCPs interviewed in Round II. Secure Chat opened a world of possibilities for faster, more efficient, direct communication than previously available. Although not a perfect solution, it allowed inter-practice communication to move to a new level. Inter-practice communication using Secure Chat allowed for a more direct connection one-to-one and one-to-many that resulted in faster connections, responses, and solutions to patient care issues that most likely would have taken much longer, and potentially impacted the outcome of a patient's care.

PCPs interviewed in Round II were excited by the possibilities of Epic to enhance inter-personal communication through use of existing technology such as Epic, Secure Chat, Telehealth, Halo, Doximity, Haiku and other new possible solutions. All of these tools enabled communication that was previously laborious, making it faster, easier, more efficient, and leading to greater productivity and problem solving in the care of their patients.

The impact of Epic and integrated technology solutions also offered the opportunity for PCPs to coordinate care in ways that were not available prior to its implementation. Care coordination came to the forefront repeatedly in our conversations with the PCPs interviewed. Communication was often cited as a critical element of care coordination. Given specialization in medicine today, and the multiple areas of clinical practice that may be involved in caring for a single patient, as well as the different locations where a patient may receive needed care, there is greater need for communication to coordinate patient care now perhaps more than ever. The effects of the Epic implementation on care coordination is the topic of the next chapter.

6.0 RQ #3: Impact of an Organization-Wide EHR on Care Coordination

In this chapter we present our findings on the effects of an organization-wide EHR system on care coordination from a primary care perspective. There are many definitions of care coordination dependent on the setting and organization. According to McDonald et. al (2007), over 40 definitions have been identified. In the context of our work, we define care coordination as a set of activities or plan for a patient's care that physicians and other healthcare providers are aligned to and work together to provide. Care is dependent on patient need, and coordination differs specifically for preventive, acute, and chronic needs. Coordination requires ongoing communication over a period of time. Mechanisms, such as the role of care coordinator and processes such as referrals, play a role in care coordination. This definition is summarized in Figure 6-1. As defined in Chapter 5, communication is an interchange of information between healthcare providers, the patient, the patient's family, and others. Communication is a foundational element of coordination occurring at a point in time.

We first present a literature review then share the findings of our interviews with PCPs. We provide an analysis and discussion of the interview data and literature review revealing new themes related to primary care coordination of care and gaps requiring additional intervention beyond what an electronic health record system can provide currently.

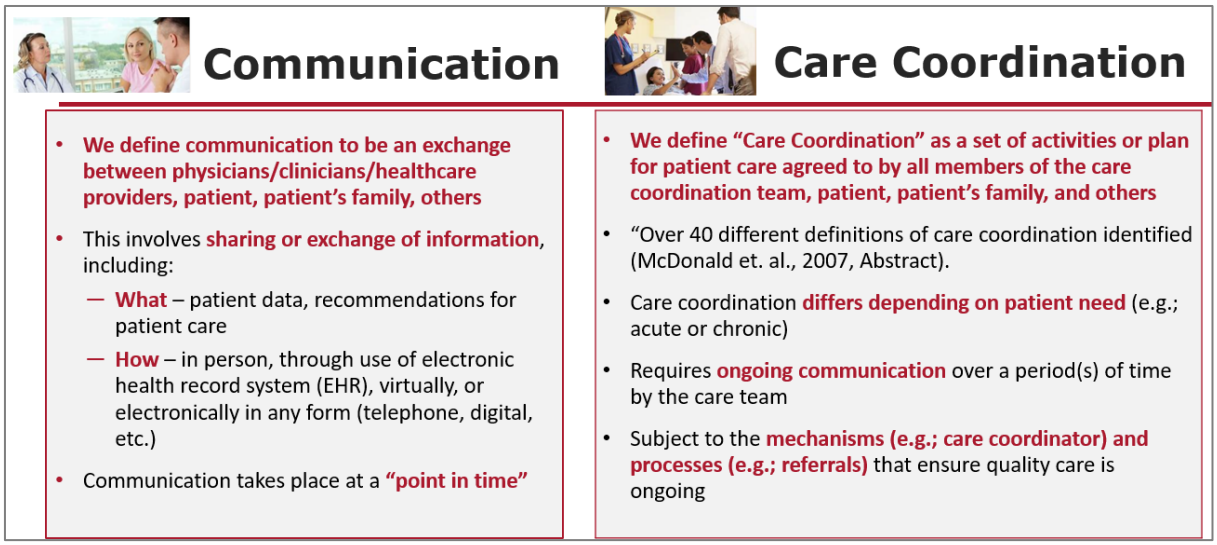

Figure 6-1: Definition of Communication and Care Coordination Used in Our Work

6.1 Literature Review

In reviewing the literature, we find there are four major areas to consider regarding the impact of an organization-wide EHR implementation on Primary Care coordination of care and gaps that need to be filled. These include the need in the United States and motivation for care coordination, understanding the key elements of care coordination, the role of the PCP in care coordination, and the role the EHR plays in coordination of patient care.

Motivation for Care Coordination in the United States

There is a great need for care coordination wherever patients live in the world (Doty et al., 2020; WHO online). Care coordination is a critical component in the delivery of quality patient care. It is a foundational part of integrated care serving as the basis for preventive medicine, health maintenance, effective transitions of care, and overall management of ongoing patient health care (Bates and Britton, 2010; Door, 2018). The United States scores above average in prevention, safety, and patient engagement, but the U.S. scores low in areas such as care coordination, hospitalization that may be unnecessary, and exchange of information between HC Providers and areas such as social services (Gibbings and Wickramasinghe, 2021).

The ability to coordinate and optimize care delivery at all stages of patient care is important. It is especially important when transitioning from one care setting to another and is a key factor in a patient's overall health care journey. The transitions of care literature focuses on the movement of patients from outpatient, ambulatory settings to inpatient (hospital, in-patient), from inpatient to acute settings, from inpatient in one location transfer to another inpatient setting. Patients may also move from one outpatient setting to another outpatient setting, for example a rehabilitation hospital or home (Luu et al., 2016). However, there is a gap in literature focusing on patient care transition from outpatient to acute care (Luu et al., 2016).

The cost of poor transitions of care can be high both from a monetary cost perspective, as well as impacting the care patients receive during and after transitions (Doty et al., 2020). In all health care systems, transitions of patients from one setting to another, requires careful coordination and communication ensuring that the site from which the patient is being transferred to the site where the patient will reside next has been designed with thorough knowledge of the patient's current state and the expectations for care in the future state. "Coordination of care in the United States has often been characterized as 'poor,' with negative consequences for patient outcomes

and for provider satisfaction (O'Malley et al., 2009, p. 1)." The absence of primary care coordination may result in higher health care cost from duplicative testing, imaging, additional types of medication, and other treatments (O'Malley and Rich, 2015).

A key part of care coordination is building relationships and communicating with patients and with other health care providers to ensure safe, effective continuity of care. Yet in a recently published article on primary care in high-income countries, U.S. adults were less likely to have a physician they regularly see, a place of care, or an ongoing relationship with a PCP (Fitzgerald et al., 2022). This is especially important as U.S. primary care providers are most likely to check on a patient's situation with social service's needs (Fitzgerald et al., 2022). Fitzgerald et al. (2022, p. 2) note that "Half of U.S. primary care physicians report adequate coordination with specialists and hospitals – around average for the 11 countries studies."

Most of the U.S. population, "has at least 1 health care encounter annually and at least one quarter of these people experience 4 to 9 encounters annually (Rosen, 2018, p. 1)." There is growing need to understand if physicians seeing the same patients for different reasons connect with each other to manage and coordinate patient care. Visits with physicians require the interconnection of clinicians, administrative staff, patients, families, and others. The need for teamwork and coordination of care is necessary at all levels (Rosen, 2018).

Between 1999-2009, United States patient referrals doubled from 41 million to 105 million (Vimalananda et al., 2018). Referrals increase the "fragmentation" of care across providers potentially resulting in patients' missing needed care or patient unmet needs (Vimalananda et al., 2018). Fragmentation results in duplication of testing, potential medication errors, and confusion on the patients' part (Vimalananda et al., 2018). With the number of referrals increasing, resources and staffing become a major area of concern for health care systems and may result in long wait times for patients to see specialists, have imaging studies, among other delays for diagnosis and treatment, potentially putting patients at risk (Vimalananda et al., 2018).

Key Elements of Care Coordination

Organizations and institutions define care coordination differently, but the basic elements are constant. Gibbings and Wickramasinghe (2019) define care coordination as a process ensuring requirements for patient health services and sharing of information are met as effectively as possible. Janett and Yeracaris (2019) shed light on the strong interdependence between

communication and care coordination aligned with standardized work processes, accountability ensuring clear roles and responsibilities, and training to work as a team. Lockhart et al. (2019) identify the need for PCPs to access information and connect with resources in care coordination of patients with complex medical conditions. The Agency for Healthcare Research and Quality (AHRQ) considers care coordination a focused organization of patient care activities along with exchange and sharing of information with all involved parties in a patient's care for the purpose of a better, safer, effective outcome (AHRQ, 2018, online).

Standardized processes and workflows are an important element of coordinated patient care (AHRQ, 2018, online; Alami et al., 2020; Docherty et al., 2020; Janett and Yeracaris, 2019. Health care system organization and practice models including workflows, means for interprofessional collaboration, and expanded teams need to be developed or adapted to use technology (Alami, et al., 2020). Approaches to care coordination include teamwork, care management, management of medication, health information technology, and Patient-centered Medical Home (AHRQ, 2018, online). Key prerequisite elements or activities that need to be in place for care coordination include accountability, alignment on roles and responsibilities, communication and knowledge sharing, assistance with transitions of care, assessing what patients need and their care goals, working to a proactive care plan, monitoring and following up, supporting patient self-management goals, working with community resources, and ensuring patients have needed resources and alignment with population needs (AHRQ, 2018, online).

Health Information Technology (HIT) is an important element of care coordination. It has been reported that implementation of an EHR within Primary Care resulted in improved structural and process components, however there is less evidence of its effectiveness on outcomes (Janett and Yeracaris, 2019). Elements such as technology standardization, issues with interoperability of EHR systems, standardization of interfaces, have resulted in issues with the exchange of information when caring for complex patients (Janett and Yeracaris, 2019; Mathews and Pronovost). Appropriate implementation of HIT, including the EHR, and its impact on clinical workflows are important elements to consider for the coordination of patient care.

Role of the Primary Care Physician in Care Coordination

Primary Care Providers are often considered responsible for care coordination, however for care coordination to be successful, the patient, the PCP, and Specialty Physicians need to work in

concert to coordinate patient care (Vimalananda et al., 2018). In integrated health care systems, the PCP may be at the center of care coordination and must effectively work with other care givers enabling the potential for substantial improvement in performance, improving quality of care, reducing hospital admission and readmission rates, and promoting less waste and financial burden due to uncoordinated care provision (Vimalananda et al., 2018).

The role of Primary Care in care coordination is foundational and fundamental. Consideration of the PCPs as the "linchpin of health integration efforts across the care continuum as they coordinate patient treatment among multiple clinicians and practice settings, deliver preventative medicine, and monitor patient wellness (Apker et al., 2020, p. 1320)," is a significant recognition of the role Primary Care is expected to play in coordinating patient care. A recent study found that PCPs engagement in integrated care should be an ongoing and continuous cycle (Everall et al., 2022). Clinicians will need to work together, rather than focusing on what has been their 'traditional turf' (Zimlichman et al., 2021, p. 7). Primary Care Physicians may be considered integral to care coordination however it may not be clear to everyone on a care coordination team. The PCP's role in coordination of care requires clear role definition generally, and within the system(s) in which they practice and externally.

There is also a need for accountability among physicians and other health care providers coordinating patient care. Care coordination processes help manage patient care and ensure health services and information sharing requirements are met in the most effective manner. Care givers are key to the continuity of care and accountability is required on the part of caregivers. (Janett and Yeracaris, 2019; O'Malley and Rich, 2015), . "Teamwork will become even more essential to ensure optimal outcomes from a plan of care. Clinicians will need to work together, rather than focusing on what has been their 'traditional turf' (Zimlichman et al., 2021, p. 7)." The expectation is that physicians will, "coordinate patient care effectively with other providers in care teams (Raj et al., 2020, p. 23)." Care teams may include "a mix of other physicians, nurses, trainees, technicians, or physician assistants – with different combinations of these other providers when comanaging the care of patients with different needs (Raj et al., 2020, p. 23)." Given that "Effective team-based care requires trust" (Raj et al., 2020, p. 23), and the importance of the PCPs' role in care coordination, it is important to understand more about their perceptions of their place in care coordination within an integrated healthcare system.

When health care providers work together, similar to other "team-based relationships," there is a requirement, stated or unstated, of the need for trust among the team. "Effective team-based care requires trust, yet we know relatively little about how physicians build and maintain trust with their fellow providers, and further, how HIT (health information technology) affects trust among provider team members (Raj, 2020, p. 23)."

Role of the Electronic Health Record System (EHR) in Care Coordination

The importance and role of the EHR in care coordination has been documented throughout literature for many years (Janett and Yeracaris, 2019). The EHR can help PCPs improve patient care in numerous ways including organization of work processes and assist with improved quality and reliability in delivering health care services depending on how it is implemented (Janett and Yeracaris, 2019). Janett and Yeracaris (2019) find that "there is no better tool than an EMR to integrate patient care among members of the care team at a specific facility (horizontal integration) and among providers and various facilities at the primary, secondary, and tertiary level of care (vertical integration (Janett and Yeracaris, 2019, p. 1294)."

The use of technology has been reported to remedy known issues with patient care coordination (Gibbings and Wickramasinghe, 2019). EHR systems provide the capability for physicians and other health care providers to share information as a patient moves from one care setting to another. Many organizations incentivize physicians to use health information technology to facilitate team-based care (Raj et al., 2020).

Through changes in governmental and technology policy, high expectations have been set for the use of EHR systems to aid in coordination of care resulting in widespread benefits to patient and to systems. Many questions remain related to adoption, use, capability, and other areas in realizing expected benefits from use of electronic health care records in primary care and integrated health care systems.

Recognition that EHRs offer potential solutions for improving care coordination has led to awareness and a deeper focus on patient-centered care (Bates and Britton, 2010; Door, 2018). All care givers involved in a patient's care must work together not just to share information, but to share their knowledge of their patient. Active information exchange involves discussion on what to do with the information. Actionable information, and clear roles in terms of who on the patients' care team is expected to do what is a gap that exists today.

The literature reports a gap between "policy-makers' expectations of, and clinical practitioner's experience with, current EHR abilities to support coordination of care (O'Malley et al., 2009). Incentivizing physicians, through payment reform and other means, to use health information technology to facilitate care coordination, could "encourage the evolution of EMR technology to include capabilities that support coordination" (O'Malley et al., 2009).

6.2 Key Findings on the Effects of an Organization-Wide EHR on Care Coordination

In this section we share the ideas that the interviewed PCP expressed about care coordination, related to the Epic implementation. The PCPs described care coordination as actions related to care, which involved the work of different physicians with Epic often a key enabler. As an example, one physician noted:

> *…care coordination with others has improved considerably. I mean I think to try to get them on the same page as us, say again regarding medications or getting them updated on patient's treatment plan is easier. And you know that it will be received and hopefully they'll act on them, or you act on them and let them know. So yeah, I think that aspect really is great. (RII, PCP 100)*

Shared knowledge about patient care is a key component, as well as ensuring that the right care is scheduled (through referrals, for example) and followed through. One physician described using Epic to support this continuity of care as follows:

> *I see on encounters, on the Epic tap encounters, I can see which appointments are coordinated already. And if I see that a particular appointment is missing for a follow up with the cardiologist or nephrologist, or I see that the patient missed a particular appointment, I can communicate with that clinic or that provider and say, this patient was a no-show up and just send the message or referral to try to coordinate the care. So making sure that the continuation of care. (RII, PCP 50)*

We organized the effects on care coordination from the PCPs' perspective in three categories: people, process, and technology. Multiple topic areas were defined within each category, with a key finding that overall, care coordination must be patient-centric. Care coordination depends on the circumstances of the patient, the urgency and complexity of need as well as whether issues were acute or chronic in nature. Care coordination required different levels of involvement and intensity. One physician describes this as follows:

> *So, care coordination means a lot of things. Sometimes it's just a referral to a specialist. Other times it involves other agencies, home healthcare, skilled nursing facilities. And then I'll be a little different. So, I suppose acutely, I can definitely do it through Epic. Chronically, it can require multiple means of communication. Most of the home agencies still communicate through fax and paper unfortunately. Even our preferred vendors. (RII, PCP 20)*

As a consequence, when asked about their role when multiple physicians were involved in patient care (which the interviewers termed a care team), the same physician noted:

> *…I don't use that term (care team) but, I suppose you would. That would certainly be a fine way to use that term, but I think of it more in a patient centric way, rather than a thing that's surrounding the patient. (RII, 20)*

For a PCP, care coordination involves interactions with many physicians, who might be stable over time for a particular patient but vary across patients.

6.2.1 People - Roles and Reponsibilities

People, their ability, availability, capacity, and capability to communicate and work together with others are a key component of care coordination. Clarity of roles in care coordination requires thought processes and consideration beyond the presenting clinical situation. Clinicians need to think on a broader scale about who else needs to know and be involved in care, and how quickly information should be shared, and a response expected.

Key topics arising from interviews related to different roles and responsibilities from a PCP perspective are explored in this section with additional PCP comments in Table 6-1. These topics consider the PCPs view of their own role in care coordination, the need to define roles and support patient-centric care teams, and the role of the patient in care coordination.

Primary Care Physicians saw their role in care coordination as central and important for care coordination to be successful. They were concerned that unless Primary Care functioned as the central figure in care coordination, the patient-centricity focus might not be as strong as it might be otherwise. When addressing this concern, one PCP noted how important it is for PCPs to play this central role ensuring the focus of care coordination was patient-centric saying,

> *It's important. So when patients are seeing multiple specialists, the patient as a whole is sometimes lost and that's my role. (RII, PCP 20)*

Another PCP considered Primary Care as the foundation for patient care coordination. The PCP begins the process for their patients in need of care coordination, and describes their role as requiring their oversight to ensure coordination occurs, as the following quote describes:

> *So most of the time I'm the one starting the care coordination because I'm seeing the patient on primary care. And it's often a referral. So that's number one. Number two, making sure that a particular patient with different medical conditions and different doctors have their proper follow-up. (RII, PCP 50)*

Table 6-1: Care Coordination Roles and Responsibilities

Topics	Supporting Quotes from Primary Care Physicians
PCP as Grand Coordinator	*Again, you know, if it is acute, sometimes we sent to the ER, and we get a report to the ER that a patient is coming. Or if they need like an urgent CAT scan or something, we arrange for the CAT scan for the same day. That is for acute and chronic. We make the appointments. (RII, PCP 40)*
Role Definition **(Who is Doing What)**	*Yeah, I think getting rid of some of this noise by you know, making a much more sort of streamline experience where we focus on sort of the core issues of a visit, or core issues with the patient, much clearer delineation of labor in terms of who's doing what. Like even sometimes a problem list, it's not clear who is managing that. Like somebody's getting treatment for cancer, am I going to be updating their problem list and adding all the chemo, or is it like, it's just part of the note? But it's not on the problem list. So, you see there's all these, I mean if somebody has myeloma and it's a big part of the treatment, you can see like oncology knows to keep going about that and it will be seen. But the problem is this will not be updated. So whose task is that? It's not clear. I mean is it my task to do all of that? I don't know. Nobody, there is no standard ways. There should be some standardization …. (RII, PCP 100)* *That can still happen, but it happens less. Like sure, that can still happen. So for example, I just had a patient with pancreatic cancer who sought care at Dana Farber and along with the cancer, developed diabetes. It isn't uncommon. But I noticed that really nobody was treating that, so I did. (RII, PCP 20)*
Supporting 'Care' Teams	*I think that the inpatient care team is much easier to conceptualize and communicate with. So like when I sent that message out to the inpatient team for my patient, I sent it to the person who is indicated as the primary contact for that patient. And then that person, my attending wants to talk directly to you, and then I'll be able to talk to the attending.* *I think outpatient care teams are a lot harder for several reasons. I think that I have, I don't know of, and I haven't really seen a good mechanism in Epic that kind of lists who this patient's care team is. Like, the best way for me to know who the cardiologist is, is to look and see who the appointment was with. It would be super cool, there's something called Story Board, and that's where that general PCP field is. It would be really, really cool if someone had a cardiologist, and had an endocrinologist, and had an oncologist, if those could be there, too. And that there could be a way of saying, hey, care team, which is what I can do on the inpatient one. I can message all. I don't know if that capability exists. I don't think it's being used if it does. That's the teams that are external to my practice, which is where I work. I would say within our health center there are care teams. (RII, PCP 10)*

Topics	Supporting Quotes from Primary Care Physicians
Patient Expectations	*I think it has been challenging to manage realistic expectations for both patients and teams about what to do about that. Right? So, and again, this is not just electronic records.* *This is kind of regulation and governmental, but like patient having immediate access to their information means that they know their test result usually before I do. And if I have, and it's not a bad thing, except that if it's anxiety provoking to them, or it happens to be something that Epic flags that's not really clinically significant, now they're on the phone, or they're My Chart messaging, and they're trying to get in touch with me because it's their emergency, but I'm also trying to see 22 patients that day. So like, I think the immediacy of access to information for patients gives, has somehow given them perception that like we know it at the same time, too, and we just can't with what we're asking people to do and what we're asking them to manage. (RII, PCP 10)*

Not only did PCPs see their role central to appropriate care coordination, but they also felt that a major part of that role was to ensure that their patients' experience with coordination of their care was facilitated and administered in as efficient manner possible. To that end, one PCP commented on the PCP role of ensuring all HC Professionals involved in coordinating care for a patient were aligned, saying,

> *And one's doing one thing. One's doing the other. How do you, you know, when you see that kind of like dissonance, it's my job to kind of fix the dissonance and figure out, OK, let's get on the same page and kind of figure out what we need to do for this patient. (RII, PCP 60)*

As the central figure in care coordination for their patients, PCPs found that they needed to ensure professionals caring for their patients were supportive of their patients and the care team. The key message of care coordination involving people had to do with the role PCPs see themselves playing in the overall care coordination end-to-end pathway. As one physician described it,

> *Most of the time I'm the primary care physician and grand coordinator. When I have patients who are going to four or five different specialists, you know, often times they're coming to me to, and I tell them, look, when you're going to this many people, you're probably going to have questions, and if you have questions like, what is going on with all this? Is this person talking to this person? You know, you have the cardiologist and pulmonologist who may not be talking to each other. Or necessarily paying as close attention… (RII, PCP 60)*

PCPs saw their role as different depending on the specific patient, the patients' condition whether acute or chronic, whether they felt it was necessary to be proactive or reactive, the timing and urgency of the patients' situation, and how they assessed the need to take next steps. They also felt they were the interpreter of the information for patients. PCPs also considered their role in care coordination as the gatekeeper and the central repository of information. Their role included oversight of the patient as a whole person and supporting this role by gathering information from multiple sources. One PCP noted one impact of this broad view of the patient,

> *Time consuming. And you know, like depends upon how you want to chart. It takes a lot of time. Especially for primary care. You know, if it is like a specialist, they only see one organ. So we see so many organs and so many things to catch up before, after, it's time consuming. (RII, PCP 40)*

PCPs interact with many different physicians in different combinations. In support of patient-centric care coordination, an area PCPs stressed, was the need for the EHR to identify a place where they could find a complete list of health care providers their patients were seeing. Knowing who their patients' doctors were would enable faster access and ability to communicate with those providers instead of the PCP having to search to identify the correct provider.

There is also recognition that given the overriding principle is patients' need, at any given time in their care journey, may not require a "structured" care team so that care teams, and coordination of care take place in both unstructured or structured ways, point in time, based on timely, urgent, acute, or chronic patient care needs. The need for consideration of circumstances under which requests were taken included the need for prioritization, often challenging when there were competing urgent demands. As one physician commented on learning how to focus attention and prioritize patient care related communication,

> *I mean, I think they have, and I'm looking directly here, they have a pretty good separation of information. For example, I know when I look directly in this view, if I have a new patient message, if I have a new staff message, or a patient call, an emergency department visit, so looking at that, I know I can ignore certain things early in the morning, because I know that it's not a priority. The big thing for me is making sure I don't miss an urgent result. And there is a way, and they flag it when it's really urgent, it's not perfect, but it's there. So maybe improving on that. But it's a matter of, I guess, in how you use the tool. If you know where to look and how to do it, you get the benefit of it. But they flag other things as urgent. For example, if a staff message was flagged as urgent, and I know where to look, I can get that done. The other thing that I learned recently was, if another doctor, for example, I refer a patient, or a specialty doctor saw the patient, and they send me the note*

with a particular communication, now I learned how I can see that, and I can point attention to that between hundreds of notes. So that's useful. (RII, PCP 50)

Patients had expectations of responsiveness from their communication with their PCP. This resulted in the PCP working to respond to patient questions and reported problems, along with working to balance all other demands on their time. One PCP commented:

> *And so right now, we are having a very difficult time managing the influx of information electronically from patients, and by phone. And our teams are short staffed, so we're not as good at answering the phone, and then people are calling multiple times and messaging multiple times. So then not only are we short-staffed, now instead of one call, we're dealing with four calls and eight messages. (RII, PCP 10)*

6.2.2 Process - Care Delivery Improvements and Challenges

Care coordination requires that PCPs work with other providers in the best interests of their patients to ensure quality care and outcomes. In our interviews, PCPs shared their comments about their own work in coordinating care as well as system level changes that impacted care.

Table 6-2 highlights topics that PCPs raised while discussing their own work in care coordination. While they noted progress on care coordination, they also identified needed improvements. As noted in Chapter 5, patient transitions from one site to another, such as in-patient to home, were highlighted with positive changes in terms of data availability through direct and indirect communication. PCPs noted an improvement in accessibility, visibility, and timeliness of data on their patients in various care settings. They felt as though they were included more often and had real time visibility into their patients' journey. In terms of process, they found it led in many cases to more effective judgement in patient care and faster resolution of patient issues. In particular, they felt that they were better able to respond to a variety of urgent issues and follow up on incidental findings, as highlighted by the quotes in Table 6-2. One physician relayed the following story:

> *…I was able to send a secure chat to her palliative doctor to say that, and if they do have any time tomorrow to meet, and then we actually were on a Zoom call the next day together talking about that patient. So there's, I think, some, in the same ways that I think it is really difficult for sustainability for primary care providers, there is some improvement in the immediacy of being able to access other people on the team if you're trying to do something real time or next day. The side of me that really wants primary care doctors not to burn out has concerns about that, like breadth of availability at all times, but from like an individual patient coordination of care, can we do something now, I think has made it better. (RII, PCP10)*

In terms of process regarding care coordination and their own work, a key challenge that was raised related to 'noise' and the impact on their own work and patient care, identified as a topic in Table 6-2. As noted in Chapter 5, one source of noise was indirect communication, the volume of notes and duplicative notes they would receive regarding their patients moving from one care setting to another. They also found that reminders for care, often related to quality metrics, were disruptive. As one physician noted:

> *There's so much noise going on to find out the real. So it's like a lot of times what we're doing in Epic is, I don't think it's the most efficient use of our time, clicking onto things. Saying OK, I don't want to acknowledge this HCC. I mean, why's it even there? So, I think there's a lot of noise there. Physicians have to deal with a lot of noise. They are just inserted as a part of workflow that are disruptive. (RII, PCP 100)*

Table 6-2: Care Coordination Process Changes at the PCP Level

Topics	Supporting Quotes from PCPs
Improved Ability to Manage Urgent Patient Needs	*…on those patients that there's certain urgency for the care coordination, mainly appointments, procedures, imaging, referrals, things like that. I can send a referral, and exactly at the same time, next minute, I'm sending a chat to the specific provider for a care coordinator or patient coordinator of that office, and then appointments are made within, in some cases, within 24 hours (RII, PCP 50)* *So I think the ability to quickly ask questions and get responses back. I just had somebody last night who got discharged from the hospital, going on hospice. We're trying to figure out her meds. One of the meds she's on is Warfarin, and getting, and she can't come off it. But that involves getting blood tests on a regular basis, and the family's like, is there anything we can do? But I wasn't sure if some of the newer anticoagulants would be appropriate for the indication that she is using it for. So I was able to send a message last night to the vascular surgeon and say, here's the situation. Can we switch her to Eliquis? And you know, she sent me back a message that I got this morning and said, yes, and now I can let the family know, and we can work out the insurance issues and kind of move from there. So that's about as sweet as it gets. (RII, PCP 60)* *So they'll contact and say, you know, we have a concern about this patient. What do you think? Sometimes it can really help to facilitate an admission when a patient is resistant to hospital admissions. So sometimes the ER will call me and say, you know, this patient is really eager to go home. And I said, well, this is some of the insight I'd like to offer. This is my concern. Can I actually talk to them? And I have been successful in persuading people to stay, and it's had a better outcome, I think, in that regard.* *So that's helpful. the other big thing that's now happening is, let's say they get an imaging study, and there's a so-called incidental finding. There's a team now that basically makes sure that that information is known by me, and that it gets followed up. So that kind of stuff is happening. (RII, PCP 60)*

Topics	Supporting Quotes from PCPs
Increased 'Noise' – Prioritization of Actionable Information	*So, our anticoagulation, so that, so there's all these automatic things that are popping up. It doesn't matter what they're here for. They could be here for a rash. So there's a lot of, I call that you know, work is like music. You have got to create like music, but then there's all this noise that separate to create, like a real concerto. You don't want all this noise. (RII, PCP100)* *So I think there's a lot of noise in the electronic record to PCPs where, unless you need my input, or there's something that has to change what I'm doing, or it was a major change in the patient's kind of status of decision making, to copy me on every single individual note from their specialist is too much. And so I think that my feeling as a PCP is, just copying your notes to me is not helpful, unless you have a specific question or input for me. Because I can go get your note. (RII, PCP 10)* *So, I think A, prioritize the actionable information, get actionable information upfront rather than pushing everything in our face from whatever this form, that form. I think that what is actionable. And there may be some, you know, there's always a tension between, what are the systems priorities, and what are our priorities and so, I'm not sure they're all aligned. They may be prioritizing, well you know, we need to get all these quality indicators aligned. And I think they're important for us, but that might not be a top priority for my visits. So, systems and our priorities are not necessarily all aligned. (RII, PCP 100)*
Challenges working with external entities	*And simple things with insurance, you know. Why can't we know that that's not covered? That shouldn't be a secret? We should demand these things. It's a contract with the insurer. They don't play with the rules. We've had to subject ourselves to so much. And the incorrect data has consequences on patient care. It has effects on your payment. And it has effects on morale. Many of us feel like we don't want to do this. If this is the way this is done, here, it's no wonder they can't recruit physicians. … But I love what I do, but I find that sometimes the software really drains me. And I know what I need to do. (RII, PCP 80)*

They noted that built-in reminders reflected HC system priorities that could create tension with their priorities for a patient's care, sometimes to patient care also expressed sometimes questioning whether the suggested care really led to improvements in patient health. As one physician expressed:

> *Cause you don't want everybody to see it, cause if you get all these alerts, you know, in your face, you, you don't pay any attention to them ... I basically have been like Attila the Hun in terms of allowing, you know, alerts to fire. Because my feeling is if too many alerts fire, then you'll pay attention to none. If you have four or five and they mean something, then you'll pay attention to them, and you'll learn that when these fire you should be paying attention to them. So, I've really tried to run hard on not having too many alerts. (RI)*

The PCPs also raised the challenge and impact on process and workload caused by working with organizations that were not part of the system. This included less data availability for their patients from health care providers and outside of the HC System. In addition, their view included entities such as insurance companies, which can influence care choices. As one PCP noted,

> *And when people are seeing someone outside of the (HC System), it's really terrible, I think. You can't really discern who's there, who's not. (RII, PCP 80)*

The interviews with PCPs also emphasize organization-level actions that impacted care coordination, often not tied directly to Epic. These are described in Table 6-3, including areas where the HC System enabled and added challenges to care coordination. System level improvements included population health programs and communication strategies. The goal to work as an integrated system also led to structures to create standard processes, as noted by one interviewee:

> *"…basically, people think system. It's really just, I mean, we now have a system policy committee, and most policies, you know, that exist up there, we're trying to make system level policies. The procedures may vary slightly between institutions, just because of personnel and/or whether or not something's available. But the basic over-pinning policy is, or overarching policy is, it needs to be systemwide. So people are really thinking system, system, system. So it's gotten much more horizontal in that kind of, in that manner." (RII, PCP 60)*

Care coordination at the HC System level was affected by the availability of services and appointments. This was found to be challenging and a barrier for PCPs, with resource constraints and access making it difficult to coordinate care in a timely manner. Referrals were often found to be problematic. Access to and HC System capacity to oversee and manage need for resources considered a barrier to timely coordination and continuity of care. These included access issues to appointments, resources, shortages of personnel, and lengthy wait times for the first available.

New technologies anticipated to improve productivity and efficiency were added or are in the process of being added to the HC Systems portfolio. These included advancements in chat (Epic Secure Chat), remote clinical and medical support systems (Telehealth), ability to communicate remotely (Doximity), capabilities for enhanced transcription, easier access to PCP on call coverage (Halo), and others. With each technology addition, there is recognition of that the digital age in medicine for HC Systems offers both promise and challenge and with it potentially additional integration between all areas of an integrated HC System. These technologies intended for

communication, also advance the capabilities of the HC System to provide improved care coordination, with the PCP as the Grand Coordinator of patient-centric health care.

Table 6-3: Care Coordination Process Changes at the Organization Level

Topics	Supporting Quotes from PCPs
Organization-level care coordination improvements	*We were talking about the system level resources or teams that are there that the population health management, I see when the coordinator call the patient and have the interaction, the telephone call follow up with the patient. And I receive messages from that team also. And they communicate directly also with the nurse who is coordinating the follow up appointment here. And I can see all those interactions there in Epic. So yeah, definitely. Definitely improvement there. (RII, PCP 50)* *… there's definitely an improvement of information and data flow from all levels, but it's used through emails and outside of Epic. For example, I will define like memos or information from the system. This has happened, for example, with the COVID cases. We were informed how many cases were in the system every week and so on. But that happened outside Epic. (RII, PCP 50)*
Need for HC System-level changes	*So what makes it difficult, the care coordination, is how available are the services. So it doesn't have to do with Epic itself, but if a particular clinic or provider doesn't have appointments for several months, or some clinics and some providers are more responsive than others, so that is like a change from clinic to clinic and provider to provider, so that will be mainly is how available are the services needed for a particular patient?* *Acute issues are usually harder unless a particular clinic has dedicated appointments or save time for urgent needs. And certain chronic conditions, again, it depends on every specific department and specific provider. (RII, PCP 50)*

6.2.3 Technology: Organization-Level Resources and Patient Care Enhancements

In our interviews, PCPs identified areas where technology enabled and where it added challenges to care coordination. As reported in Chapter 5, they highlighted the many benefits of using Epic including ease of access to information when it was shared in the system, visibility to their patients' records when seen by other providers, and in some cases real-time access to information from patient visits to the ED or in-patient. Epic was viewed by many as a critical element to breaking down the siloed HC System, and by doing so, enabling care coordination – the patient centric support mechanisms that need to work everywhere enabling system thinking. As section 6.2.2 describes the capability to connect directly and easily to other physicians by Secure Chat had significant value in terms of enabling their work and care coordination.

Table 6-4 highlights several additional topics that were identified in terms of technology and care coordination. First, PCPs commented on a several organization-level technology factors the impacted their work. They also identified key technologies that had been or were being added to directly support patient care.

Table 6-4: Technology Improvements and Challenges in Care Coordination

Topics	Supporting Quotes from PCPs
Organization Level Technology Issues	***Infrastructure*** *… the other thing is, the infrastructure, they've really made improvements with infrastructure, because it was really painful in the past. You'd have things knock you out. You couldn't get in. Or you didn't have a satisfying connection, or things were slow. That's been better. (RII, PCP 80)* ***Integrating new sites*** *… So for instance we just acquired (Hospital X) and they're not on Epic. So it seems like a black hole for information. So it reminds us of how bad it used to be. And it takes a while. It will take us two years to get them on Epic because we first have to improve their infrastructure, their networking which all wouldn't support Epic. As we need here. It's a two year plus project to get anything new up on Epic. But once you do the communication is good. (RII, PCP 20)* ***Involving Users*** *…But I think, I'm not entirely sure that this issue of what are the downstream consequences of any additional changes, and some of them are hard to predict. But involving end users earlier on rather than OK. You know we'd have loved this tested and see how you all feel about this. Seems a great idea. …but it's end users who spend the majority of their time in practice. Because they're the ones who are going to be using…so I mean people who spend their time in practice, bring them up front before implementing changes and then try to get actionable information up for us at the top of the list. (RII, PCP 100)*
Technology improvements impacting care delivery	***Telehealth……*** *new laws that have allowed us to do telehealth have been wonderful. This is something that many medical organizations I belong to have felt, we need this to make access to care easier for patients. People don't have to take time out of work, babysitting and all this. And that's been wonderful. (RII, PCP 80)* ***Authorizations and Prescriptions……*** *just approved the purchase of some software that will help with prior authorizations which has been a real nagging problem for our offices. So it hasn't been implemented yet, but that's coming. (RII, PCP 20)* ***Cost of Prescriptions****: We've implemented something where we can tell patients the cost of their prescriptions. So that has been helpful. (RII, PCP 20)* ***Improved Communication:*** *voice transcription has really improved dramatically. So when I do voice to text, that has been very helpful.* *Another example is, I had someone that we were able to do the translation with them. The translator. So with that, it's been so much nicer. You can do that in point of care. So these have been great breakthroughs that when you can communicate with people in novel ways (RII, PCP 80)*

They were positive as to HC System options for integration with other technologies over time to continue improvements in care coordination. The ability to use Telehealth for care coordination in patient care was raised by a number of PCPs interviewed. For example, one PCP related the following,

> *So, and the new laws that have allowed us to do telehealth have been wonderful. This is something that many medical organizations I belong to have felt, we need this to make access to care easier for patients. People don't have to take time out of work, babysitting and all this. And that's been wonderful (RII, PCP 80)*

Given the global pandemic situation arising in the early 2020 timeframe, PCPs interviewed in Round II, remarked on the importance of using telehealth. For example, the addition of Doximity, a technology enabling face-to-face remote communication with patients, was found to enable PCPs to meet with patients virtually for continued patient care and care coordination. As one PCP remarked,

> *… telehealth was really a dramatic change. And we had to scramble. So the hospital introduced some type of new program, which was not really that helpful, and someone had told us about Doximity, which is a software that's been around for physicians for years, and they had a pilot project. And it then developed. And fortunately I've been able to take part in that, where I use Doximity as the primary tool to communicate with patients, as opposed to Zoom. And with Doximity, I could do, the nice thing about Doximity was, if, let's say, I had to communicate with a patient, we'd send them a link, and they would open up the message, and I could work with that and have Epic on the side. With Zoom, you could have it, but I found that those three things, the secure message being perhaps the most dramatic. (RII, PCP 80)*

PCPs found the use of telehealth to be an incredible means to continue care through the years of the pandemic enabling them to use the Doximity technology as a means to communicate with patients in new ways, as one PCP told us,

> *… I had someone that we were able to do the translation with them. The translator. So with that, it's been so much nicer. You can do that in point of care. So these have been great breakthroughs that when you can communicate with people in novel ways, or I had someone who was once in the office, and I was able to do the, with Doximity, the spouse, they gave permission for the spouse to be there, so he could do visual with them. And that was extremely helpful. (RII, PCP 80)*

The PCPs interviewed also noted areas of concern around technology, identifying technology barriers and challenges in care coordination such as access and referral issues, data, and information flow, limited or no search capabilities, the inability to easily access information from outside the HC system and other outside agencies. There is recognition that the HC System is

changing and that over time many areas that are problematic have the potential to be addressed and resolved.

PCPs shared their perspectives and expectations for the Health Care System to improve care coordination in additional areas. They recognized practice differences between PCPs and other providers within and external to the Health Care System. They noted differences in the way providers entered information into Epic and challenges understanding or interpreting Epic data from different providers.

Noted also, was the redundancy of information in Epic as they often received duplicative data with no indication of any update or notation of difference between current and previous entries. This was considered "noise" and impacted prioritization in the ability to differentiate substantive new information from preexisting information already in the chart. They described additional considerations in managing care teams.

PCPs interviewed found value in the use of Epic and held expectations for continued assistance from the Health Care System to enable capabilities not presently in the Epic or other HIT systems. These included requirements for ease of reporting on quality measures, insurance and patient billing, prescription tracking and pricing, and other patient care focused activities to enhance the coordination of care. Table 6-4 provides examples of some of these considerations noted by PCPs.

6.3 Discussion

The cost of failure of care coordination in an integrated health system is enormous. In an integrated medical system, shared organizational structure can facilitate efforts to improve inter-clinician relationships to coordinate care, include patients and other staff in conceptualizing specialty care coordination, assisting patients with specialty care coordination (Vimalananda, 2021). In this chapter, we reported our finding from interviewing PCPs on the use of Epic in care coordination. Physician comments predominantly focused on the benefits of working within a technologically integrated healthcare system in comparison to working in technology silos. Their appreciation for enhanced visibility to national and global information about their patients was highlighted by all physicians interviewed in this study.

When asked to think about a definition of care coordination, the PCPs interviewed gravitated towards the term patient-centricity, placing the patient and the patients' needs at the center for continuity of care provision. They thought of patient-centric interactions with their patients

needed at a point in time for acute situations and over the longer term for more chronic clinical situations. Care teams for each patient situation are most likely different and are structured and tailored with a patient-centric focus. The result is that care teams have less well-established connections with other physicians rather than formal team structures. Both indirect and direct communication support team care. Physicians rely on organizational routines and capabilities to make care teams work well. A key component of less structured care team collaboration is the need for effective clinical and medical notes and indirect communication. Effective notes in Epic can provide an indirect means of care team collaboration, while the addition of Secure Chat enabled direct communication often with greater responsiveness.

While PCPs were always focused on their patients' health and well-being, care coordination required patient-centric thinking in the mind of all HC Providers when working together for the care of any patient. They entered notes into Epic with a mind set of "who needs to know what about my patient" so that when read, their notes were clear, focused, and provided details that other physicians. They expected other providers seeing their patients to provide the same thoughtful information, without duplication if possible, so that they as the patients' PCP could easily follow up if there was need for further outpatient visits or services. In addition to indirect communication, they found secure chat and direct communication to be important toward ensuring effective, collaborative, means for responsiveness, and patient-centric care.

The PCPs interviewed spoke of their role as being the hub in the center of the care coordination for their patients. Their role was one of gatekeeper, overseer, coordinator for 360-degree view of their patients. They were the ones who, with input from other physicians and health care providers, oversaw and helped orchestrate their patient care needs. They felt that they were the drivers for care coordination, and that this was a major component of their role as Primary Care Physicians. With Epic, issues of Primary Care's role in the overall medical spectrum of care provision were of concern. While technically there was great benefit, it also brought to light a need for system-wide definition of the roles and responsibilities of Primary Care. As the HC System became more integrated technically, and as coordination of care focused more on patient-centricity, the PCP role in coordinating patient care became clearer to other HC Providers. As PCPs, coordinating patient care was a major component of their role, and that role clarity was a key component for patient-centric care.

Operationally, with an influx of information and data, the PCPs in our study found that their workload increased significantly, especially in thinking about patient care coordination (Nguyen et al., 2021; Funk et al., 2022). This resulted in the need to change years old ways of practicing for some, while others were able to integrate the new electronic burden with greater ease as discussed in Chapter 7 on the behavioral changes physicians needed to make working in a newly, technically integrated HC System. Our results support findings in published literature regarding the advent of an integrated healthcare system regarding physician workload (Fleming et al., 2014). Increased data quantity, but not necessarily data quality, caused many PCPs to work longer hours sorting out and sorting through information related to their patients. Aspects of this work included cleaning up problem and medication lists, reviewing duplicate and triplicate records, and ensuring that they had a more complete record of their patients' care. Additionally, many PCPs interviewed spent hours ensuring the information entered into the EHR was as clear and thorough as possible so that other Physicians had as complete a record as possible on their patients. They sometimes wondered however, if their work was utilized by others in the care of their patients due to all the noise, they identified in the EHR. They found that actionable information should be placed in more visible, clearly identifiable locations within the EHR to diminish the search time needed to find information and data PCPs looked for. This "noise" was caused by reminders, alerts, and duplication of information, and actionable, applicable information was what PCPs working under time constraints needed.

The PCPs found technology instrumental to the coordination of their patients' care, but also identified areas where technology needed to be added, or where existing technologies needed to be improved. They appreciated the ability to be part of the overall conversation on patient care and to be included through the visibility, accessibility, and timeliness of other care providers' information in the Epic system. This was considered a great improvement for HC Providers working within the same health care system. Concern was expressed when their patients saw providers outside the system. Although Epic's Care Everywhere was helpful in obtaining information on their patients' it was not the panacea for reliability in this area, with information often not arriving in a timely manner, or not arriving and available at all. The improvement of information and data sharing between different HC Organizations is important so that PCPs caring for patients in one HC System have knowledge and data, a full picture, of where their patients

have been treated, for what conditions, and any follow up that might be needed on their part to ensure their patients' health and well-being.

Overall PCPs found that things were better with Epic for use in care coordination from an information availability, accessibility, and visibility perspective and they would not want to return to the pre-Epic time period. They were hopeful and expectant that the future for care coordination efforts would be bolstered by the Health Care System working with them to improve overall patient care through improvement of processes, clarification of people's roles and functions, and continued technological advances. They expressed hope for the future use of technology in a number of areas and recognized the HC System as their advocate in care coordination, while also recognizing the HC System had its own priorities. Sometimes those priorities were in conflict, and PCPs wanted to be part of the solution not part of the problem. They asked to be seen and heard when changes to health information technology were being considered early, rather than hearing about changes and new technologies announced and implemented. The effects of the Epic implementation on Primary Care Physician engagement is the topic of the next chapter.

7.0 RQ #4: Impact of EHR on Primary Care Physician Engagement

Research Question #4 examines the impact of the electronic health record (EHR) system on physician engagement from the primary care physician (PCP) perspective. Physician engagement has been considered and defined multiple times, in multiple ways, using different criteria (Apker et al., 2021; Jung et al., 2023; Perreira et al., 2019) and on different levels within a HC System (Perreira et al., 2019). It may be defined differently depending on the institution, as well as the context and situation in which it is being considered (Ayre et al., 2019; Jung et al., 2023; Underdahl et al., 2018).

In this chapter we define physician engagement, reviewing factors that increase engagement and factors that work against engagement. Our work is based on a literature review of physician engagement and findings from our Round I and Round II physician interviews in view of the Epic system implementation. While our interview questions did not focus directly on physician engagement, interviewee responses reflected the idea that medicine is in many ways a deeply personal calling and how they felt about changes made within the HC System were as important as technical features and patient health care processes.

In our work, PCP engagement is considered at the environmental HC System level and at the individual PCP level. At the environmental or HC organization level, PCP engagement includes involvement in the activities supportive of the integrated HC organization's overall goals and objectives. These included participating as a part of the HC System by reporting metrics for population health management, collaborating as part of a team delivering interprofessional care, participating as part of HC System decision making processes, and building relationships with their colleagues in other divisions and functions within the HC System. Other areas where PCPs may be engaged include participating in HC System decision making regarding regulations of health structure such as licensing, reporting requirements, and payment models.

At a practice level, PCP engagement is reflected in the satisfaction of delivering a high level of patient care and the responsibility they have towards their patients. PCPs received satisfaction in hearing from colleagues that their time spent carefully crafting notes on their patients in the EHR was recognized as helpful to others caring for their patients. They were motivated by hearing from a specialist, an in-patient physician, or an ED physician that their EHR notes contributed to the care of their patients. They took pride when that work contributed to the ability of their

colleagues to have a more informed view of the PCPs' patients and enabled them to build relationships with other providers who care for their patients.

The PCPs interviewed were also motivated by a strong emotional connection to delivering better health care for their patients; their conversations with us were not just about the Epic system, but what it meant and could mean for them as professionals. They were motivated by contributing to improving patient care and the well-being of their patients. While present in our first round of interviews, engagement emerged as a research question as we analyzed the second round of interviews.

They also recognized factors that impeded their engagement including burnout and exclusion from decision-making that impacted their ability to deliver medical care as efficiently and productively as desired. As a result, PCPs may choose not to participate in committees determining clinical decision-making guidelines or technology recommendations, or to engage in process improvement or change management efforts.

7.1 Exploring Physician Engagement – A Literature Review

Over the years, literature reviews of the work physicians perform are often focused on the tangible, concrete, and measurable output of labor and activities in which physicians were engaged. Skillman, et al. (2016) defined physician engagement as, "active support for a project". This also includes such areas as quality metrics, patient panel size, and revenue generated per physician and the cost and consequences of disengagement such as burnout (Jung et al., 2023; Gardner et al., 2019; Nguyen et al., 2021; Underdahl, 2018; Vos et al., 2020;).

According to the literature, physician engagement is complex, not easily definable, and although important to high-performing health care organizations, poorly defined, and remains a vague concept (Perreira, et al. 2019). Example elements of physician engagement include building good relationships with colleagues (Funk et al., 2023; Perreira et al., 2019; Rosen et al., 2018; Song et al., 2017), job satisfaction (Perreira et al., 2023; Shanafelt and Noseworthy, 2017; Underdahl, 2018), having time to participate in design and implementation of technology systems such as the EHR (Ayre et al., 2019; Nguyen, O.T. et al., 2021), recognition of their importance as Primary Care Physicians (Apker, 2021; Jung et al., 2023; The Commonwealth Fund, 2022), having their concerns heard and addressed (Perreira et al., 2019; Scheepers et al., 2017), being visible to the

organization as a whole and to external providers and stakeholders who impact their practice (Scheepers et al., 2017; The Commonwealth Fund, 2022;), among others.

This work on engagement focuses on physicians' well-being, and as such, subject to levels of satisfaction and dissatisfaction as well as engagement and disengagement with their work environment (Gardner et al., 2019; Nguyen, O.T. et al., 2021), the work systems in which they work (Nguyen, O. T. et al., 2021; Sinnott et. al., 2020), the technology they work with (Rahal et al., 2021), and the institutional, compliance, and regulatory constraints that take time away from their primary focus in caring for patients (Rotenstein et al., 2022; Sinnott et al., 2020).

Elements promoting physician engagement have been defined in the literature with variation. Physician engagement, satisfaction, and retention is improved through good working collegial interaction (Underdahl et al., 2018), which is known to have a positive effect on patient care (Funk et al., 2022) while promoting team-based care and relationship building (Funk et al., 2022).

Underdahl et al. (2018) reported that physician "resilience is inversely related to burnout and physician engagement is 'the positive antithesis of burnout'." Primary Care clinician burnout and engagement were found to be associated with clinical quality and patient experience in a recently published study. Willard-Grace et al. (2021) challenge assumptions around burnout and engagement as different or opposite ends of the spectrum and did not find "a significant association between burnout, engagement, quality of care, and patient experience (Willard-Grace et al., 2021, p. 550). The authors did find that PCPs reporting high burnout and high engagement showed better patient experience when compared to other clinicians (Willard-Grace et al., 2021).

Recent studies exploring physician attitudes have found that many are unhappy. For example, a recent meta-analysis of 170 observational studies of 239,246 physicians found a major decrease in job satisfaction when compared to an increase in job satisfaction, and that physician burnout led to an increase in regretting their career choice, had some impact on productivity, and affected career development and well-being (Hodkinson et al., 2022). Underdahl et al. (2017) reported that from 2011 to 2014, there was an increase of 10% in physician burnout rates in the United States. Burnout as well as toxic work environments, job dissatisfaction, and emotional exhaustion have led to turnover and retention issues. Such attrition is costly to the institution, and can affect patient safety, and continuity of patient care (Underdahl et al., 2018). Skillman et al. (2016) examined PCP roles related to new health care delivery models and found that "compared with

other professionals, physicians, especially those providing primary and critical care, are more likely to suffer burnout, making it difficult to engage them in innovations". They found physicians reported major concerns about their jobs, uncertainty about administrative communication difficulties, time involved in using electronic health records (EHR) and meeting new regulatory requirements, and difficulty achieving work-life balance among other areas (Skillman, et al., 2016).

EHR systems can decrease clinical care efforts, enhance care team communication, and improve care coordination and patient safety (Sieck et al., 2021; Underdahl et al., 2018). In some cases, the EHR has been viewed as more of a system requirement with lower focus on its use to promote communication (Sieck et al., 2021). The EHR has been shown to improve the work lives of family physicians having a positive impact on workflow efficiency (Manca, et al., 2015), although another study reported that some physicians found the EHR to take their time away from meaningful work (Nguyen, O.T. et al., 2021). Vos et al. (2020) found that though the EHR provides a complete overview, it also resulted in information overload due to a number of factors including duplication of notes and asynchronous communication.

While the usefulness of technology can be of great benefit to an organization, it is imperative to engage physicians in implementation processes. Although these systems can be transformative, improving efficiency, and patient safety, when not implemented appropriately, they will not achieve expected outcomes (Hudson, 2022). The criticality of engaging physicians early in the process of implementing new technology is a key factor in its eventual success. Because physicians are highly skilled with years of medical training, they need to be brought into the process of system design, development, planning, implementation as early as possible. Physicians need to be "part of the overall process," as much as possible. By focusing on physician workflows and user-centered design, involving physicians early in the development cycle, and including them in the testing cycle will help generate interest and engagement in the overall project leading to physician engagement (Hudson, 2022).

7.2 Findings Related to Physician Engagement

Interview analysis revealed findings related to the EHR as supportive of physician engagement as well as inhibiting physician engagement. They noted specific areas where they found the EHR enhanced engagement through the ability to access patient information and communicate with greater facility. Along with these and other areas enhancing engagement came the challenges of

increased workload and gaps in technical capability within the EHR. While the information may be resident in the EHR, search capability, alerts, reminders, and duplication of information led to increased workload and contributed to potential burnout. PCPs recognized that the HC System was working to alleviate some of the inhibitors to use of the EHR. They also recognized that some of the issues were not specifically related to the EHR but were inhibiting to physician engagement.

7.2.1 Factors that Support Physician Engagement Enabled by the EHR

As described in the findings in Chapters 5 and 6, the PCPs interviewed found that the Epic implementation had a significant impact on their ability to deliver patient care, to coordinate population health metrics, and to be aware of their patients' overall health care journey when visiting other providers and settings. This allows the PCP to have visibility into their patients' health care pathway and to actively participate, to be aware of tasks needed to assist in their patients' care, and to be able to connect to colleagues directly to facilitate patient care.

Table 7-1 provides PCP comments on factors that supported physician engagement through use of the EHR. PCPs felt that the EHR enabled positive change revolutionizing the way they were able to deliver patient care. They highlighted the proactive use of the EHR to enhance outreach to other HC providers, and the connectedness that came from working with other HC professionals taking care of their patients. They appreciated participating in HC System-level change and understood there was recognition of additional changes needed to take place over time.

On the topic of enthusiasm about the EHR enabling changes, PCPs were enthusiastic about the enabling capabilities of the HC System wide implementation of the ERH. The EHR was highly regarded as a major step in transforming the HC System. As one PCP noted,

> *I think it's been the single most important change in patient care in my career, which is 43 years, it's truly revolutionized the way we take care of patients. (RII, PCP 20)*

PCPs were also proactive and engaged in utilizing the system in new and important ways. While pointed out in Chapter 6, the ability to rapidly send and receive information to coordinate care was critical, the EHR enabled engagement allowing for simultaneous real-time communication with other physicians in the organization as one PCP said,

> *I can send a referral, and exactly at the same time, next minute, I'm sending a chat to the specific provider for a care coordinator or patient coordinator of that office, and then appointments are made within, in some cases, within 24 hours. So definitely I think that that's the biggest change that I can think of. (RII, PCP 80)*

Table 7-1: EHR-Related Physician Engagement Supporting Factors

Topics	Supporting Quotes from PCPs
Enthusiasm about EHR-Enabled Changes	*So, and the new laws that have allowed us to do telehealth have been **wonderful**. This is something that many medical organizations I belong to have felt, we need this to make access to care easier for patients. People don't have to take time out of work, babysitting and all this. And that's been wonderful. (RII, PCP 80)*
Proactive Use of Epic	*So within Epic we have the ability to order labs. So I'll have a patient who might see an endocrinologist. I'll order labs. They go to the hospital. They'll get labs. And then they'll say, oh, my doctor said, well, I don't see the order…So what happens is, I strategically plan a visit, when I see a patient, I'll have them get labs beforehand, so I can review it, and I'll say, you know, these are what the results are. (RII, PCP 80)* *I have seen patients increasingly empowered to kind of reach out to different people on their teams. So like yesterday, I was talking to a patient who has a neurologist, hasn't seen that neurologist in two years, was trying to schedule an appointment through Epic, and didn't have that provider as an option anymore. And was able to articulate that to me. Like, I went to kind of schedule with a neurologist, and I couldn't find her. And so then I sent a message to the neurologist that said, hey, you fell of this patient's care team. She can't message you or get in touch with you. But she's looking to see you. And she said, I'll have my team reach out to her and get her scheduled. I don't feel like I've had the experience where I've necessarily had a patient articulate, like why aren't you guys are all taking? (RII, PCP 10)*
Connectedness	*… if I'm seeing somebody with hypertension and they're going to cardiology two weeks from now, or diabetes, and I want to make a change to their medication that I'm not sure, should I do it or, so, or I see that they're going to be seen, like, six months from now and I want them to be seen earlier, **so I'll just write a note and say, hey you're seeing my patient in six months' time and can you, you know, I feel that this needs to be seen earlier. And most of the time they'll do it.** (RI)* *… I saw a lady last week who has three other specialists. I finished my note, and I said sent copy to the rheumatologist, the nephrologist, and the, I forget who the third person was. But it was like boom, and it was all done. And then they can reply back to me in the chart. **And I've found that more and more people are now using that kind of communication to, to really do collaborative care.** (RI)*
Participating in System-Level Change	*When it's physicians outside of the Epic system, that's still a challenge. Mental health is still one of the most difficult … there was an obnoxious feature within Epic called Break Glass. Now Break Glass is a mechanism to protect confidentiality of records, so it would say, you know, what's your reason? It never made sense to me that I'm a primary care physician. I've referred them to a mental health specialist, and I would get something that says, you need to break glass. So you need to go to process. Put your password again, even though you've in the system. You have to put the reason why and that you're the primary. And I thought, completely foolish, and it would dissuade, really be a disincentive to get into that. So I remember, I really rallied on that. I even made a presentation. There was this risk. But a year later, it was resolved, and I thought, sensible things take a while. (RII, PCP 80)*

Topics	Supporting Quotes from PCPs
Challenges Being Addressed	*So, it is, at first, I was getting results from specialists that were ordering tests on my patients that I never would have been the person interpreting, and it was very unclear who was responsible and what I was supposed to do with that, especially if it was abnormal. And that felt very much like a dump. That felt like we want to make sure that somebody has some responsibility for it, and it was, it was way too much volume. That has gotten better, because I think there was going to be a revolt if it wasn't fixed. But I still feel like, so, so the other day I got a message from an emergency room person that said FYI, this CT needs follow-up. I appreciate they send it; I think that that's great, I think in the collegial world where we're both taking ownership, there would be probably a conversation about that, and I think that has also been true with some of the consult notes. (RI)* *We're also, just another thing in terms of coordination, we're also in the process of implementing what are called e-consults. So that's a, let's say I have a diabetic. It's kind of like the next test, next drug kind of thing. So let's say you come in. You're a diabetic. And you know, we're not where we want to be. Yeah, I could send you to a diabetologist, but another option would be for me to send an e-consult and say, here's the situation. Here are the drugs we've tried. Here's where we're at. What would you recommend as the next step? And you don't have to go. You may get a copay. But you don't have to go and spend your time there. I can get the message back and then say, OK, we're going to try this. And the e-consultant may say, try this, this, or this. And if these don't work, then they need to see me. But that means that it's much more convenient for the patient. The response time is much faster. It opens up slots for the specialist to potentially see sicker people who need to be seen sooner. So that's something we're beginning to implement. (RII, PCP 60)*

Another PCP was also very enthusiastic about the proactive engagement capability afforded by the EHR saying,

> *So like yesterday I had two medical assistants and a medical student. And I had a secure chat going with all four of us. This is where I'm going. Can you do this? Could you give this person a fit test? I'm running behind here. And that, I think, is incredibly helpful during a session in a way that we did not have before that I recall being as functional. (RII, PCP 10)*

On the third topic of connectedness, PCPs felt that connectedness was a crucial engagement aspect of the implementation and use of the EHR system wide. The ability to rapidly communicate with other HC Providers and to receive information in return virtually was a time saving feature along with adding to the efficiency with which PCPs were able to deliver primary care. As one PCP mentioned,

> *I mean, it's just easier because (HC System) is such a big system. There's no way I'm going to call them, paging them, you know, I mean, we're all busy so it's not, like, that's sort of difficult. You know? So yeah, I mean, we don't see them face-to-face. I've never met so*

many of these people face-to-face, but we definitely coordinate in care between each other for the patient. (RI)

Another PCP commented on improvements in connectedness saying,

So these have been great breakthroughs that when you can communicate with people in novel ways, or I had someone who was once in the office, and I was able to do the, with Doximity, the spouse, they gave permission for the spouse to be there, so he could do visual with them. And that was extremely helpful. (RII, PCP 80)

On the fourth topic of PCP participation in system-level changes, PCPs felt engaged when they were able to contribute their ideas and experiences using the EHR at the HC System level. They felt engaged when asked their opinion on what was going well, and areas for improvement. They felt they had been heard when their contributions in these areas were followed and implemented. Experiences of one PCP found that the ability to have input and be heard was very important saying,

I sat on our Epic task force for a year, which I'm really happy we have now. We did not have that when we met last time. But it means that family medicine was not at the table for the vision, and we didn't have a family physician that was able to build. And now we do, and we have representatives at each of the practices that are part of those conversations. (RII, PCP 10)

The fifth topic related to PCPs we interviewed recognizing that improvements in existing systems and processes were taking place over time. They have seen changes already made in Epic that facilitate some of their work. While technology is one factor, there are multiple processes that need to be addressed as well. New, innovative technologies will address only part of the issues.

The HC System has already addressed in part the issue of efficiency in patient visits through the use of scribes in some localities and PCP offices. They believe that future improvements in the EHR and addition of ancillary technology will address key technology issues and enhance engagement. As one PCP commented,

…I now (have) a scribe through a (HC System) project, and it's like, wow, the difference in terms of quality of life, both from the physician's standpoint and also the patient, you're more efficient. You can engage more……And quite frankly, we're seeing our satisfaction scores improve with the use of a scribe, because I'm less distracted by software. And we can also do more quality metrics, satisfy that. (RII, PCP 80)

Improvements were also being made by the HC System, leading to increased PCP engagement. From a technology perspective, PCPs found that new applications added to their ability to connect and keep in contact with other HC Providers caring for their patients. As one PCP noted,

> *…they're going to be implementing this thing called Halo, which will be another instant messaging app outside of Epic, but also be kind of how we get paged for calls. And it will also allow people to have like your coverage, so that if somebody calls, wants to contact the doctor covering for you, they just have to send a message to you, and it will get routed to the person who's covering, so that a lot of those kinds of things become much more efficient (RII, PCP 60)*

7.2.2 Challenges to Physician Engagement Linked to the EHR

In addition to the enabling physician engagement factors linked to the EHR, PCPs interviewed also identified challenges to physician engagement. Prior to the implementation of the HC System wide EHR, PCPs worked with siloed systems as described in Chapter 2. There were significant limitations in this infrastructure including lack of visibility and accessibility to information on their patients coming from visits with specialists, in-patient, ED, and visits patients' made to providers external to the HC System. With the organization wide implementation of Epic, PCPs now had access and visibility to much more information than they previously had.

Table 7-2 described three major challenges PCPs noted in our interviews related to physician engagement including information overload, additional workload, and frustrations with EHR functionality and usability. Information overload arose from the electronic influx of system level and patient data from multiple sources, not previously available to PCPs or available to PCPs through multiple other means such as email. Information overload came from many sources including alerts, reminders, HC system requirements, duplicated patient information coming from, and other sources. Information overload led to additional workload. Expectations around responsiveness, clarity of content in messages sent compared to what the receiver understood, meant that timely response required messages to diminish the 'back and forth" to ensure message sent, message received as intended. There were also frustrations expressed with ease of EHR use such as a lack of useful search capability increasing time spent in the EHR to identify, locate, determine level of need (urgent or non-urgent), and ensure the right information was present and clarity around any follow up needed and by whom the follow up was to be administered.

Table 7-2: EHR-Related Challenges Impacting Physician Engagement

Topics	Supporting Quotes from PCPs
The Challenge of Information Overload	*So I think while Epic in baskets were blowing up, so were emails. Right? So were like daily emails, and duplicate and triplicate. So I think that people have information overload and there are ways that people are really struggling to figure out how to recover. (RII, PCP 10)* *I have patients who are patients in the system who didn't get a timely response to their My Chart message, so then they email me. So there are more buckets now that people are trying to attend to, and all of those buckets have increased. And I think that has been challenging over the past two years. (RII, PCP 10)*
Additional Workload	*… I closed accepting new patients, so that's another thing that changed when I'm seeing less patients on a daily basis. I still see some new patients, family members, I accept family members, things like that, but because of the workload, I am not accepting new patients like before. (RII, PCP 50)* *Because if you've got somebody who's been to three or four different places, you may have, and they're on ten meds, you may have each of the meds listed three or four times. And to clean up the med list can take 5 minutes or more. (RI)* *The biggest changes that happened, I'd say last year, with the pandemic, you know, it was interesting. You were hit with the, I call it triple whammy, that the pandemic was tough. But then you had coding changes that occurred. And then you also had results and notes you had to get out. And you feel that there's a penal system that's started to develop that is, you know, you get penalized if you're late with the notes, late with the revieing the labs. But the system makes it so painful to get through them. And it doesn't allow flexibility. And it should. You know? (RII, PCP 80)*
Frustrations with EHR Functionality and Usability	*… stumbling into new features. So I think it happens by chance at time, unfortunately. So I'll give you a great example. The formal training that we get with Epic upgrades, we've had four upgrades. I found nothing of value of meaning with them. (RII, PCP 80)* *I think what, as we're talking, what I feel is missing is good mechanisms for summative information. Right? Because I feel like every time you open Epic, it vomits on your face with information. (RII, PCP 10)* *And I think part of the problem still with EMRs that it is disruptive for engaging communications…. The hospital needs to be more responsive in making a program that's more user friendly … And it's not a matter of not liking technology. I can use the iPhone and feel very efficient, and I don't feel that sense of satisfaction with this system. (RII, PCP 80)* *And when they provide information, they need to have things indexed. You know, you should be able to, there are things that you want to read on your own, and you can't find that. You have to stumble or call IS. That's ridiculous. You know, there should be a good index. You do a search, and you find the feature you want. And video. It seems like, oh, yeah, other people have come across that. There should be a frequently asked question. (RII, PCP 80)*

One of the major challenges related to engagement is the challenge of information overload. Information overload was mentioned in a number of PCP interviews. PCPs found the quantity of information overwhelming at times. As one PCP noted,

> *So I think that people have information overload and there are ways that people are really struggling to figure out how to recover. And there are still a lot of old habits. So there are still people who email about patient care, where I would much rather have it be in Epic now, because then I can attend that in basket. I have patients who are patients in the system who didn't get a timely response to their My Chart message, so then they email me. So there are more buckets now that people are trying to attend to, and all of those buckets have increased. And I think that has been challenging over the past two years. (RII, PCP 10)*

Several PCPs noted information overload issues as not directly related to the EHR, but that nevertheless impacted their work. Examples of these issues included the ability to focus, prioritize work, triage information, and to select and sort through information to identify what was urgent and what could wait, as one PCP noted,

> *It's that, for example, I'm reading, I try not to move the task. And I do that deliberately, because I have read that it's bad. From good sources. And I've tried to avoid it. But I can't. I keep, sometimes, I open something, a message pops up, or I know there is a message, or there is a new message that was marked urgent, and I changed that, they have like a square, like oh, there's an urgent message. I have to check and then I have to go back and see, OK, what I was doing. And the workflow was interrupted. That happened a lot with messages, because one of the things is, for some reason, or we know that patients know that, and others, pharmacies, and other places, know that the office is going to be closing at certain times (RII, PCP 50)*

The second topic related to the challenge of additional workload was pointed out in PCP interview comments. Every request, ask, task added to the ongoing burden of additional work. As one PCP noted,

> *Somebody would be bringing them things to be addressed today rather than me trying to dig through the last six months, figure out OK, what's wrong? What doesn't, so yes. I mean technically it's there. Now it's there and again, it depends on well, what's the onerous? Is that the role and I'm not sure you're asking more and more of family care physicians without providing the support and resources or the functionality to do that. (RII, PCP 100)*

PCPs face additional work coming from multiple sources regardless of time of day, day of week, or month, or year. It affects their workload as one PCP commented,

> *Definitely affects it because you want to, even though that is, if it's a simple or complex question, you want to follow up in a timeline manner, and sometimes you have to balance*

that with the daily workload, the lab results follow up, paperwork. So it adds up to the daily work. (RII, PCP 50)

The third topic related to frustrations with EHR functionality and usability was a common thread raised by PCPs interviewed. They described a number of challenges with EPIC, related to these two areas. These might be related to their limited engagement in the design and implementation of the overall technology. Additionally, the environment in which they had been working changed dramatically with the pandemic. Adaptation to change needed to be implemented quickly and the way things worked was not always the way they continued to work. Issues raised related to the EHR and frustrations with the EHR in terms of functionality and usability included the need for standardization of advanced features, tools that support prioritization, and better indexing to support self-learning.

Limitations and frustrations were presented in terms of the need for standardization of advanced features, as one PCP noted,

I think there's a common thread. So I mentioned, for example, daisy chain of prescriptions, things that make prescribing a lot easier. The information that people can access quickly; it would make everyone more efficient. And people would have access to the care, and you wouldn't have to divert people to urgent care. I find that these are the consequences. When you can't provide access, you run the risk of people running overtime. You run the risk of staff attrition. You run the risk of, well, you do get burnout. You know, people are exhausted. (RII, PCP 80)

Another PCP comment related to indexing noting,

You know, Epic has the potential to do great things. It's done some very, very good things. But it's so cumbersome to have to fish for things to not have communication, to have incomplete information, inaccurate information, repopulate, that's the big problem, I think. And there has to be an index and a way to be able to convey your concerns and get meaningful things out of it. To send me an update, you know, oh, you have to do mandatory training on the Epic upgrade. How is it relevant to me? It's done nothing. You know, that's the feedback I would give. (RII, PCP 80)

Learning about the EHR capabilities and advanced features was a source of frustration in several areas. Another PCP notes that there was a lot of serendipitous learning instead of standardizing of advanced features and the way in which they were rolled out to PCPs and other physicians to use them,

… each individual has to figure that out on their own or have someone teach them how to set it up. We are having some increasingly leadership within our department with Epic, which I'm really happy to see. My dream would be like, you log in as a family doctor, and you have everything you need. You have the right filters. You have the right order sets.

You have the right note access. We're years away from that. And that is disappointing to me (RII, PCP 10)

The PCPs interviewed recognized that challenges related to burnout and engagement were not solely linked to the EHR. As one physician noted,

(whether it is referred to as) physician burnout, moral exhaustion, or a new moral outrage there's been so much stuff happening at the same time, so the electronic record has happened, but prior authorizations are going through the roof for medications. That's not the electronic records (RI)

Another physician described the impact of staffing changes as a frustrating factor not related to Epic:

"I mean, we already always feel that we are understaffed. That is not obviously anything new. It's typical of, I mean, part of it is I've worked in an academic practice environment, probably not as chaotic as this but, yeah, academic practices with the kind of patient population we deal with are very high not just morbidity but very high complex social needs, healthcare needs, you know, they don't have housing, they have, you know, a lot of mental healthcare needs, opioid use, so it's such a population. And I do think one practice change that I have noticed and is probably relevant is we've lost some of our social support, social workers, care managers, legal aid, things that are probably important for this practice. I don't think that has anything to do with Epic." (RI)

Across the U.S., the need to manage healthcare costs, the shortage of PCPs (Jung et al., 2023) and increasing documentation and compliance requirements, among other factors have contributed to the dissatisfaction of physicians. The PCPs in HC System share these concerns. As noted in Chapter 4, implementing Epic provided greater visibility to PCPs about the work to be done. PCP frustration arises in many areas and while recognizing the positive aspects of the EHR, the challenges were also noted in interviews. A comment from one PCP summarized the frustration and offered a solution as follows,

There are certain areas I see, wow, this is great. You know, I have the report from the specialist. I don't have to carry big charts home. I can remote in. But I find some of the hospitalist(s) too slow to respond. My big request would be, make the system more efficient. Be responsive. Expand the people who give you feedback about Epic and don't just make it a select task force. Start to really look at the things that give people problems (RII, PCP 80)

7.3 Discussion

In the first round of interviews (2019-2021), we found that PCPs recognized that Epic provided an opportunity to become "visible" and "brought Primary Care into the System", as described in Chapter 4. We also heard that the practice of primary care had not changed in HC System, expecting Primary Care "to do it all" while recognizing the opportunity and the difficulty of

transforming the culture of health care in which the PCPs worked. In the second round of interviews, which focused more on communication and care coordination, we heard much more clearly the strong emotional connection the PCPs interviewed had to delivering better health care. Their comments were not just about the Epic system, but what it meant for them as professionals.

Physician engagement is one of the most important aspects of a PCP's work. It means not only having the health information technology necessary to do their work but the processes and culture to support the work they do. Engagement is influenced by their work at a practice level centered around patient care (physician-patient), at the health care system level, and at the level of working not only internally within their health care system, but also with external organizations on a more macro level (Perreira et al., 2019).

In our research we found that inter-personal interaction and trust built through communication and collaboration were key to care coordination. While PCPs may not often have had direct contact with their colleagues, the ability to use Epic and other technologies such as Secure Chat, Halo, Telehealth, e-consults, Haiku, and other means of communication simplified their need for direct engagement in many situations, relating to the HC System's culture and trust between HC System providers. Achieving the same outcome using indirect engagement was an efficiency gain in achieving resolution of patient care questions and issues using technology while also building collegial relationships.

At the physician-patient level, we found that an organization-wide EHR had the potential to supporting physician engagement by involvement "in activities at the individual, physician-patient level, initiatives that impact day-to-day, direct patient care" (Perreira et al., 2019, p. 105). This included building inter-professional relationships through communication and teamwork, interaction with patients and their families, and in decision-making with their patients and their families (Perreira et al., 2019). As mentioned in Table 7-1, PCPs interviewed often made proactive use of Epic features to provide patient care. From their office or clinic, PCP's now have more timely visibility, greater accessibility, and stronger connection to:

- Other physicians and HC providers caring for their patients
- Information in general about their patients
- Greater advocacy in their patient's care on the patient's health care journey

More options for communication and therefore greater impact on care coordination, with enhanced ability to advocate for their patient and understand their patients' overall care.At the health care system level, our findings were focused on how an organization-wide EHR supported engagement at this level. We found that the EHR afforded physician engagement through PCPs visibility and a sense of being included as part of the HC System. It afforded a way for PCPs to be recognized and for other HC Providers to leverage the value they bring to patient care in a more general manner. The EHR supported PCP's added value to the Health Care System's ability to provide the best patient experience possible, thus enhancing overall organizational performance. For the PCPs we interviewed, it also meant being able to provide feedback and contribute as part of overall changes in technology and processes that were going on in the organization that affect their work both directly and indirectly.

At the level of working within the internal Health Care System and with external providers who affected their ability to provide patient care such as pharmacies, insurance companies, and other health care organizations, they provided recommendations into how changes could and should be made that would improve communication and care coordination overall. They wanted to contribute to population health work, and advocate for changes that affect their work and their patients.

In our interviews, physicians expressed their satisfaction with the EHR and provided numerous examples of how they harnessed features in ways that improved care. Some became involved in making system-level changes related to the EHR, demonstrating one aspect of engagement defined in the literature. Unfortunately, the physicians interviewed also identified frustrations that have been associated with disengagement in the literature. When PCPs felt they had not been heard or listened to, if issues persisted, they felt less satisfaction and more concern. For example, they would have appreciated more attention when they offered suggestions or came forward with options to focus on remediation in a given area, such as the need for the EHR to include standardized processes, additional training on advanced features, or tools that enhanced search capability for efficiency and time saving purposes, and to enhance productivity. While challenges to engagement were noted, they are balanced by the benefits of using the organization-wide EHR. At the HC system level, there is an opportunity to encourage PCP comments and feedback to understand challenges that map to decreased engagement and to

work with PCPs to help overcome them, turning challenges into accelerators for PCP engagement going forward.

The comments from the PCPs we interviewed reflected not only concrete changes in processes and tasks brought about by implementing Epic, but also more abstract, qualitative areas such as their dedication and devotion to doing the best job they can in the environment and culture they work in to care for their patients. This perspective led us to examine how an organization-wide EHR might influence physician engagement from a PCP's perspective.

Our results in Research Question #4 added depth to our work on the impact of the EHR system on primary care communication and care coordination. Understanding the effects of technology on organizational work must be coupled with an understanding of the impact on people. By combining the technology lens with an understanding of the human, people-focused aspects that technology has on physicians and their work, we were able to develop a more profound view of the change and impact technology has on the way Primary Care Physicians work. Their comments from interviews in terms of what was working and areas of opportunity for improvement were not just about technical features and capabilities, but reflected personal attestation to the benefits of the EHR along with areas where they were deeply frustrated about patient care delivery and their own professional engagement in medical practice.

8.0 Harnessing Technical Integration to Accelerate Clinical Integration

Based on an analysis of HC System physician interviews, we sought to develop generalizable insights about the role that technically-integrated organization-wide EHR's might play in moving toward clinical integration. Linking back to the conceptual 4-stage model presented in Chapter 2, which broadly describes the evolution of integration in U.S. healthcare institutions, a major goal of organizations implementing a system-wide EHR system is to move the organization forward on the path to integrating patient care across settings and through time. Technical integration (Stage 2) serves as a major advancement in an organization with clinical integration (Stage 3) as one goal. Linking PCPs previously using a separate HIT with other department and divisions within the HC System, eliminates barriers to horizontal integration.

We established in Chapter 2 that there are many definitions of clinical integration. In this research we use elements of the American Medical Association (AMA) definition of clinical integration and define it as,

> *The ability to provide patient care across the continuum of patient health care needs for acute and chronic conditions, delivering patient-centric care to the right patient, at the right time, in the right place, that is safe, appropriate, timely, and equitable (based on AMA reference https://www.aha.org/websites/2012-09-12-clinical-integration)*

Integration in multiple areas is considered key for the improvement of patient care, however it is often complicated by the definition of what "integration" means (Singer et al., 2020). Integration is defined across different dimensions and levels including horizontal, vertical, system, organizational, professional, clinical, process, structural, functional, and normative (Singer et al., 2020; Valentinjin, 2013). Key findings in a recent article identified financing, health information technology (HIT), and workforce as priorities for integrated care (Docherty et al., 2020). Here, we specifically consider the relationship between technical integration, represented by an organization-wide EHR system, and clinical integration, which results in the intermediate outcome of patient-integrated care. Singer et al. (2020) define the need for research that explores the relationships between different types of integration; our work fills one piece of this gap.

We also consider the links between technical and clinical integration from the perspective of primary care physicians. In our interviews, PCPs expressed that the organization-wide EHR with greater technical integration had broader implications for culture and patient care. For example, one physician noted:

> *And there's a lot of cultural sensitivity to like, we can't just be thinking about the mothership, we also have to think about (Group A), and we also have to think about (Site A), and we've got to think about (Site B), we've got to make sure those people, at least are in the discussion to make sure that this is going to work everywhere. So that was huge. (RI)*

From the perspective of delivering integrated patient care, another PCP noted:

> *(HC System) must now think like a system, rather than the parts and pieces that previously worked together sporadically and genuinely embrace the need for cross organizational coordination in patient care (RI)*

In thinking about the goal of clinical integration, another physician expressed:

> *I think in reality it is an aspiration because the nature of work you know, I saw 20 patients yesterday, just constrains the amount of time I can go back and look at what happened between when I saw them in December versus now that I'm seeing them five months later. So, what happened to the diabetes? What happened to the depression? How did the psychiatrist visit go? I mean the nature of the work in a perfect sort of integrated system; I would be aware of those (RII, PCP 100)*

Because the interview comments reflect relationships between a technical artifact (an organization-wide EHR), organizational actors (PCPs and system-level decisionmakers) and an intermediate goal (integrated patient care or clinical integration), we applied affordance actualization theory to examine the question of how technical integration might foster clinical integration. In section 8.1, we consider affordances related to an organization-wide EHR. Section 8.2 describes broad themes and perspectives from our interview analysis, which led to defining factors important to actualizing affordances as defined in Section 8.3. We conclude with a discussion in Section 8.4 which presents practical implications, limitations of the research, and opportunities for additional research.

8.1 Affordance Actualization – Generating Insights Through a Theoretical Lens

Published literature defines affordances as "the possibilities for goal-directed action provided by an object in relation to a goal-oriented actor (Strong et al., 2014, p. 54)." Affordance theory is based on a seminal paper by Gibson in 1977 (Greeno, 1994), however the use of affordances in understanding technology applications did not arise until 2001 (Pozzi et al., 2014). In this context, affordances are considered as "possibilities for goal-oriented actions (Pozzi et al, 2014, p. 2)" that arise from a relationship between the information technology features and functionality, organizational systems, and "afforded to specific groups of actors (users) by technical objects (Pozzi et al., 2014, p. 2)."

Affordances are considered potentials for action, but they also need to be "triggered or actualized by a goal-oriented actor (user) to achieve an outcome (Pozzi et al, 2014, p. 2)." Strong et al. (2014) extend affordance theory by defining a mid-range theory for EHR- associated organizational change in a healthcare organization, considering "the materiality of the IT artifact, the non-deterministic process by which IT leads to organizational effects, the multilevel nature of IT-associate change processes, and the intentionality of managers and users as agents of change (Strong et al., 2014, p. 53)."

Affordances exist, they are actualized, and have the potential to cause an event or effect (Strong et al., 2014). Affordance potential can be actualized by user action to utilize the affordance through the use of technology to iteratively achieve goals or outcomes, and they have the potential to cause effects or events (Pozzi et al., 2014). Volkoff and Strong (2013) identified affordances as real and generative mechanisms, existing only in relation to the user's goal or intention, and therefore do not need to be perceived (as reported in Pozzi et al., 2014).

To understand the effects of an organization-wide EHR system implementation on Primary Care delivery of clinically integrated care, we use the following affordance-actualization lens as defined and described in Strong et al. (2014):

- Affordances are defined as "the potential for behaviors associated with achieving an intermediate concrete outcome and arising from the relation between an artifact and a goal-oriented actor or actors (Strong et al., 2014, p. 69)
- Artifact refers to an organization-wide EHR system
- Actor or actors are the "goal-oriented individuals or groups of individuals engaging purposefully in professional tasks in the healthcare organization (Strong et al., 2014, p. 69)"
- Goals are linked to 'immediate concrete outcomes' (Strong et al, 2014) that are expected from actualization, in this case integrated patient care or clinical integration, are seen as intermediate steps to achieving broad organizational goals such as higher value care.

Affordances as described herein have specific parameters as shown in Table 8-1.

Table 8-1: Parameters and Definitions of Affordance-Actualization

Term	Definition
Specificity	Affordances are technology and user specific
Goal Directed	Affordances are directed based on potential behaviors of a user toward a goal or goals
Behavioral	Affordances arise in part due to user characteristics
Technological	Affordances arise in part based on technology features
Relational	Affordances are relations between the abilities of the users and features of the environment
Possibilities	Affordances are possibilities for action
Not infinite	Affordances have limited possibilities for action; the possibilities are not infinite
Enabling	Affordances can be enabling
Constraining	Affordances may also be constraining
Cross Levels	Affordances cross organizational levels to consider individual users and organizational effects

8.1.1 EHR Affordances Related to Clinical Integration

We identified several affordances related to the use of an organization-wide EHR and the effect on Primary Care delivery of clinically integrated care. An EHR system provides a multitude of affordances; our focus was only on those emerging from our data and related to clinical integration from the perspective of primary care. The affordances we identified include:

1) Accessing and using patient data through a unified data source
2) Visualizing system requirements and patient needs
3) Facilitating provider-to-provider communication
4) Engaging primary care physicians throughout an HC System
5) Coordinating care across providers and sites

Other researchers (Bardram and Houden, 2017; Øvrelid and Kempton, 2019; Strong et al., 2014; Vos et al., 2020) have identified EHR affordances related to collaboration and care delivery. Our work provides additional insight into these affordances and explicitly introduces the potential to engage (or disengage) physicians.

Each affordance is summarized in Table 8-2, using the format identified in Strong et al. (2014). The table was constructed describing elements giving rise to the affordance, user characteristics, expected immediate concrete outcome expected from the affordance, goal-directed actions needed to actualize the affordance, and applicable goals and context. A short discussion of each affordance is provided in the following paragraphs.

Table 8-2: Affordance Existence, Actualization, Expected Outcome

Impact of a System Wide EHR Implementation on Primary Care Delivery of Clinically Integrated Care				
Elements giving rise to this affordance		**3. Immediate concrete outcome expected**	**4. Goal-directed actions required to actualize affordance**	**5. Applicable goals and context**
1. EHR Capability	**2. User Characteristics**			
Affordance 1. Accessing and using patient data through a unified data source			**Actualization**	
Single source for input, throughput, and output of patient information within system Structured data entry, allowing for variation via templates, text-based entry, and other means	Physicians enter information into the system in a variety of ways; verbally, typing, use of scribes, transcription Over time, clinicians gain efficiency using the system and proficiency using information in new ways	Single problem list, single Rx list Visibility to patient history, labs, imaging studies, comments from other physicians and providers Visibility to referrals, past patient visits, treatment regimens, hospitalizations, etc.	Physicians, clinicians, and other providers within the system use the system as a single source of truth Patient visits to providers outside the system, are captured in the EHR through manual entry via fax, email, scanned into the EHR	**Goals**: Higher productivity of PCPs, higher quality care reflected in decision making, better coordin-ation and improved metrics such as lower 30-day readmission and satisfaction, improved revenue, and cost **Organizational Context**: Culture supports patient data as an important shared resource
Affordance 2. Visualizing system requirements and patient needs			**Actualization**	
Physician can see data entered by other providers in other settings, providing a more wholistic view of each patients' care over time. System priorities and requirements are visible to physicians through reminders and other structures	HCPs use patient care history and care notes from other providers caring for patients Providers balance professional and system priorities	Patient clinical history available via EHR provides in-depth information for HCPs treating patients Duplication of effort is reduced, e.g., for imaging studies System requirements for quality metrics are more complete	HCPs recognize the value of PCP entered data leading to better knowledge of patient background, clinical history, acute and chronic disease history	**Goals**: Better quality based on awareness of patient condition, reduced costs **Organizational Context:** Greater awareness and sense of connectedness between departments within hospital, and between hospital and ambulatory, improved cultural awareness of whole system
Affordance 3. Facilitating provider-to-provider communication			**Actualization**	
Common EHR protocols, definitions, and terminology Shared medical record Secure messaging and ability to CC charts in messages	Users know how to use the EHR to share care information Users respond to requests from other providers	Strong collaboration between providers caring for same patient when needed Users understand the EHR is the common communication system for care provision	All HCPs communicate through the EHR HCPs use both Indirect and direct communication methods as needed	**Goals:** Real time exchange of needed information for patient care throughout the HC System **Organizational Context**: HCPs see the value of communication tools

Impact of a System Wide EHR Implementation on Primary Care Delivery of Clinically Integrated Care				
Elements giving rise to this affordance		**3. Immediate concrete outcome expected**	**4. Goal-directed actions required to actualize affordance**	**5. Applicable goals and context**
1. EHR Capability	**2. User Characteristics**			
Affordance 4. Engaging primary care physicians through an HC system			**Actualization**	
Features that improve patient care, e.g., secure chat for urgent issues Features that hinder efficiency (e.g., clicks) or interfere with workflow (e.g., quality reminders during acute visits)	PCPs use the system to develop new ways to care for patients PCPs participate in system efforts related to optimizing and standardizing the EHR	Engaged PCPS in patient care across the HC System	PCPs are supported in using new EHR features in their work context Tools are provided to support prioritization and address workload PCPs are directly involved in decision making processes that affect their practices	**Goals:** Increased ability to meet system goals and provide quality care, improved HCP satisfaction **Organizational Context**: Shared belief in the importance of engagement
Affordance 5. Coordinating care across providers and sites			**Actualization**	
Features that support communication Shared medical record and documentation of patient journey	HCPs input data on patient care in real time HCPs utilize data and act to ensure patient receives right care, at the right time, for the right condition (acute or chronic)	Utilization of the EHR as central hub of information for coordination of care Well-coordinated patient care	The importance of real time data input is emphasized HCPs are supported in prioritizing workload and in gaining an overview of patient needs	**Goals:** Better quality care, satisfied patients, reduced costs **Organizational Context:** Recognition that the system needs to work to improve workflows and balance organizational and individual priorities

Affordance 1: Accessing and using patient data through a unified data source

In siloed system models, different technologies are often employed for different areas or divisions. Systems may function in siloes multiple ways, including horizontally or vertically. Siloed systems may share information within a given silo; however, visibility into occurrences and information in other siloes may not be available. This limits, in some cases seriously limits, knowledge sharing that may result in duplication of effort, increased cost, and resource waste, as well as limitations in patient care.

This affordance focuses on the evolution of moving to a single HC system-wide data source. Primary care and other physicians in the system using the single, organization-wide EHR have access to information from multiple sources across the organization. The now "common source"

of patient information enables visibility to information PCPs may have had little to no access to previously, affording them a panorama of information about their patients that was previously not available at such a detailed level.

Other researchers have identified this affordance, describing it with slightly different terminology. Strong et al. (2014) discussed *capturing/archiving digital data* and *accessing/using patient information*. Bardram and Houben (2018) and Vos et al. (2020) describe *portability* across sites and *co-located* access. Anderson and Robey (2017) introduce the concept of affordance potency to describe the utility or power of an affordance to support individual-level goal achievement. While a siloed EHR system provides a unified data source, an organization-wide EHR captures a bigger universe and thus might be described as having greater potency. Such a view is supported by our interview data.

Affordance 2: Visualizing system requirements and patient needs

In siloed health care systems, primary care may receive delayed and/or little information about the care received by a patient in another setting. The challenge is the timeliness, accuracy, and clarity of the information received via indirect communication, which may necessitate further communication.

In a system-wide EHR, all physicians caring for a patient can access EHR data to provide a broader and deeper picture of the patient. For primary care, responsible for the whole patient, the patient pathway of care over time is visible and can support their understanding of each patients' needs. The work of PCPs has elevated visibility within the HC System as well. The information PCPs enter into the EHR can give other physicians within an HC system a broader and deeper understanding of patient medical history and specific PCP concerns, which they might not formerly have had access to. In our interviews, PCPs described this as an ability to have a greater voice. Øvrelid and Kempton (2019) describe this as an *individualizing* affordance, while Bardram and Houben (2018) and Vos et al. (2020) use the concept of *shared overview* and *mutual awareness.*

In our interviews, we also found that an organization-wide EHR also provided visualization of system priorities and needs. For the PCPs we interviewed, this system viewpoint was reflected in creating common workflows and EHR structure across sites. In addition, the need of the health care system to meet quality metrics was incorporated into the EHR through reminders and other

structures. Øvrelid and Kempton (2019) referred to this element of a visualizing affordance as system *monitoring.*

Affordance 3: Facilitating provider-to-provider communication

Primary Care Physicians are at a disadvantage in providing the best patient care possible when there is limited provider-to-provider communication. Messages sent through EHR features required clarity about patient status, overall care, or next steps needed. When messages are sent and are not clearly understood, expected outcomes may not occur. Assumptions may be made on the part of the HCPs reading EHR information, allowing for no scheduled patient follow up, unclear messages about who is to follow up and role and responsibility confusion.

This affordance focuses on enabling and enhancing provider-to-provider direct and indirect communication; such communication is essential for care coordination. Current EHR systems have the capability to enable both forms of communication effectively. For acute patient care needs, a PCP with questions about EHR notes may send Secure Chat through the EHR. Although there are limitations with this direct communication capability, it affords a PCP with a question the ability to directly contact a HC Provider for clarification. Vos et al. (2020) describe this element of communication as a *messaging* affordance. The EHR also facilitates patient transitions of care from in-patient to outpatient, and from the Emergency Department to in-patient or to outpatient. In systems with siloed EHRs, little to no communication between PCPs and hospital-based settings might occur. Visibility to notes increases the amount of information shared; indirect communication can occur as it is used and understood by others.

Affordance 4: Engaging primary care physicians throughout a HC System

Primary Care Physicians are impacted by the implementation of a system-wide EHR, gaining access to new sources of patient care data, opportunities through use of the EHR to communicate and collaborate with other outpatient HC providers, specialists, Emergency Departments, and in-patient areas throughout an HC System. Their world of data access and visibility into their patients' pathways of care is available in a single source, the EHR system. In our interviews, PCPs were also excited by features in the system that allowed them to provide better patient care; they provided a variety of anecdotes about how they changed their work and used the system to improve care.

Yet in our interviews, PCPs also found the wealth of information was burdensome. It required greater care in formulating PCP notes, now being written for a wider audience, and greater clarity

in terms of messages sent and understanding information received. The PCPs were automatically copied on notes, increasing the volume of information they received; information they needed to follow up on was often buried. In addition, they were frustrated by inefficiencies such as 'clicks' or reminders that took their attention away from the immediate patient issue.

This affordance focuses on the potential an EHR affords for PCP engagement with an HC System, with their professional colleagues, and with their patients, in ways that can change operational modes of working. As discussed by Volkoff and Strong (2017), an affordance potential can be both enabling and constraining. EHR features that users can harness to improve their work can enable engagement. But EHR use has also been associated with burnout (Jung et al., 2023; Nguyen, O. T., et al., 2021; Rotenstein et al., 2022). With more data often comes more responsibility. It takes time to search, identify, understand, respond, and close out issues, requirements, next steps and often takes follow up to ensure completion of care requirements. This affordance examines the impact to PCPs in terms of workload, work/life balance, balance of time spent in direct patient care in contrast to time required to fulfill HC System requirements, and areas where process improvement and technology come together to help address the challenges Primary Care Physicians face throughout their working and non-working hours.

Affordance 5: Coordinating care across providers and sites

An organization-wide EHR affords the potential for coordinating care across different divisions, providers, and sites within a health care system. Strong et al. (2014) also identified this care coordination affordance. Vos et al. (2020) termed it an *orchestrating* affordance. Care coordination requires providers utilize data ensuring the patient receives the right care, at the right time, for the right condition whether it is acute or chronic.

In terms of resources, an organization-wide implementation of an EHR system may improve the ability to disposition patients from the Emergency Room to a hospital bed if needed, transitioning thinking from a single group of providers or hospital beds in one area of the system to thinking "system wide." If ED waits are long at one hospital in the system, physicians can suggest a different hospital. Additionally, thinking "system" instead of one hospital system, can enable PCPs and other specialists to consider referral options for their patients they may not have considered previously. Through the EHR the PCP would know where their patients were at a given time, what care their patients needed, and could make a call, send a message through the EHR to directly participate in patient care as needed.

Care coordination requires defined processes to ensure overall efforts from end-to-end result in a successful patient outcome. Processes need to be clearly delineated, timely, and effective. A major factor in coordination of care related to processes is speed. We found that the PCPs we interviewed appreciated their ability to cut through red tape and speed up processes. For example, the addition of technical capabilities such as e-Consult enabled faster response time and more efficient resolution to patient care related questions. Another factor is quality. Improving quality of care through coordination was also an important outcome. With the Epic system, a focus on population health became available, more so than before Epic was implemented. This enabled PCPs to measure metrics and provided visibility into status on quality measures.

Care coordination through the EHR enabled PCPs to have more visibility and knowledge of their patients' care journey through the HC System. In some cases, it also connected health care providers external to the HC System to share electronic records with HC Providers internal to the system. The ability to share information both from within and externally to the HC System provided PCPs with a better picture of patients on their panels.

As the role of the PCP in coordination of patient care became more visible, it also solidified expectations around their role. PCPs had always considered they had a key role in coordination of patient care. They considered themselves the "Grand Coordinator" for their patients' care from end to end. They advocated for their patients receiving the right care, at the right time, and in the right place. The EHR enabled PCPs visibility to a bigger picture of their patients' care provided by other HC Providers. If afforded the PCP the ability to communicate and coordinate patient care within the HC System and in some cases, external care provided to their patients.

8.1.2 Affordance Interrelationships and Actualization

Affordances do not exist in a vacuum; an EHR system artifact and system users provide 'bundles' of affordances (Strong et al., 2014). To amplify thinking about affordances related to human-computer design and interaction, terms defining different types of affordances have been used, such as cognitive affordance, physical affordance, sensory affordance, and functional affordance (Zhang and Patel, 2006). Understanding the types and dependencies among affordances supports insight into how they might be realized (actualized) in a particular environment. Hausvik and Thapa (2017) characterize affordances in two levels, dependent affordances that are tightly coupled to the EHR features and interdependent affordances, which are more loosely connected

to EHR features are require more reliance on social factors and processes to be realized. Affordances can also exhibit dependencies, where some affordances are unlikely to be actualized until other affordances have been (Strong et al., 2014). These connections may be strong or weak and also change over time (Hausvik and Thapa, 2017; Meske et al., 2023); as affordances are actualized, the system, the users, and the organization change, adjusting affordances and generating new potentials.

Qahri-Saremi et al. (2018) find that health care is moving away from simply promoting use of the EHR to promoting effective use of the EHR as measured by patient outcomes. Affordance theory frames the potential of EHRs in the context of outcomes and goals. Understanding the process of actualizing affordances as HC Providers use the EHR is important for improving patient care (Qahri-Saremi et al., 2018). Actualization occurs on the individual level and varies by user (Strong et al., 2014). The abilities, preferences and characteristics of individual users influence their actualization, yet Qahri-Saremi et al. (2018) found that limited studies have been done to understand how EHR users think about and perceive the EHR. They examined routine and innovative use of EHR features and examined how decision-making style and cognitive framing might influence actualization. Actualization also influences an individual's ability to perceive the EHR and the link to the individual's goals (Anderson and Robey, 2017). The features of the EHR system and the work environment also enable and constrain actualization (Strong et al., 2014).

In our work, we specifically sought to identify EHR system features, factors in the work environment and individual characteristics that influence actualization, focusing on the outcome of clinical integration. As an example, building on the observations of Qahri-Saremi et al. (2018), we found PCPs described initially using the system routinely based on their training. They learned more about the system as they began to use it and often learned serendipitously of new EHR system capabilities. They did not necessarily explore alternatives, in some cases because of time, but brought forth ideas about how the EHR might be modified and tailored more for their specific work with patients. A small number of the physicians interviewed actively sought out innovation, perhaps because of their computer literacy and interest, finding ways to make the EHR work for them instead of their working for the EHR.

Actualization of the care coordination affordance (Affordance 5) is most closely aligned with clinical integration. Improving care coordination depends on visualization (Affordance 2),

communication (Affordance 3) and engagement (Affordance 4). Visualization and communication are strongly dependent on accessing and using patient data through a unified source (Affordance 1). Affordance 1 is connected closely to the technical features of the EHR, while Affordances 4 and 5 are more interdependent on social processes for actualization (Hausvik and Thapa, 2017). While actualization occurs at an individual level, organizations often evaluate affordance actualization at the system level, described by Strong et al. (2014) in terms of extent, consistency, and alignment across individuals. In identifying important factors influencing the clinical integration outcome, we focused primarily on the care coordination affordance. While care coordination has been identified as an EHR affordance, there is less understanding of the conditions that support its actualization; our work contributes to this understanding.

8.2 Formulating Themes from Findings

To develop insight into factors that influence the effects that technical integration represented by an organization-wide EHR may have on clinical integration, we examined the literature and performed a crosswalk between the findings presented in Chapters 4-7 to identify themes, higher level perspectives from our interviews with PCPs. Themes captured broader concepts that influenced how PCPs experienced working with the EHR, reflecting both enabling capabilities and assets as well as barriers and challenges. Details on the process of developing themes and their evolution are described in Chapter 3.

We defined eight themes, divided into two major categories, as shown in Table 8-3. Themes were categorized at the level of the environment/organization and the level of individual PCPs. Themes related to the environment focused on system-level influences, including how the Health Care System viewed primary care, the cultural impact of the system-wide electronic record system, and areas identified where at the health care system level improvements had been made and challenges remained. PCPs work within the Health Care System.

Themes related to individual PCPs perceptions and comments included workload and specific EHR system issues, the impact of working within an integrated health care system, changes to their behavior related to the use of an integrated EHR, and their overall view of the EHR as it enabled and challenged their work, their relationship to the Health Care System, to other physicians and care givers, and to their work with their patients. Each theme is briefly defined in Table 8-3 and described in the following paragraphs. Tables 8-4, 8-5, and 8-6 illustrate how findings were used to

generate themes, linking across the different areas of communication, care coordination and engagement.

Table 8-3: Descriptions of Themes

Theme	Description
Environment	
#1 - Health Care System View of Primary Care	This theme captures the perception and expectations of the primary care physician by the institution, administrative leadership, colleagues in ambulatory services, in-patient, and the Emergency Department
#2 – Cultural Impact of a System-Wide EHR	This theme describes PCPs' observation that as Epic moved the system to become more integrated technically, the system also needed to become more integrated culturally
#3 – Health Care System Level Improvement	This theme reflects how improvements in resources, processes, and technology at an HC system-level could enable PCPs to be more productive, efficient, and patient-centric in their work
Individual Primary Care Physicians	
#4 – Workload and Specific EHR Issues	This theme focuses on effects on PCP workload and factors exacerbating increased workload and burden, some Epic related and others related to system expectations about care provision and regulatory issues.
#5 – Impact of Working in an Integrated Health Care System	This theme captures PCP comments regarding their ability to participate in system wide and global coordination of care in ways they could not do so previously as well as captures concerns related to integration.
#6 – PCP view of the Role of Primary Care	This theme describes the PCPs' view of their role in terms of the operational, day-to-day overall responsibility for patient care coordination
#7 – EHR and PCP Behavioral Changes	This theme captures PCPs comments about changes they made in providing care, behavioral changes in work routines and interaction with patients
#8 – PCP View of the EHR	This theme describes PCPs' perspective of the Epic system, related the ways the integrated EHR enabled and created barriers in their work and ability to deliver quality primary care

Table 8-4: Environment - Themes & Key Findings

Environment - Themes & Findings

Enablers	Challenges
Health Care System View of Primary Care	
Primary care becomes visible	HC system requirements transparent/visible
Primary care needs a voice	HC system demands on PCPs
Cultural Impact of System-Wide EHR	
Ability to view data everywhere connected people	Ability to view data everywhere required PCPs time to search, sort, and determine clinical actions required Inability to access data outside the HC system was challenging for PCPs
Secure Chat added value for direct/indirect IP communication	Limitations of Secure Chat - use requires copying "chat message" and pasting it into chart
IP connectedness fostered increased communication and improved trust	Improving communication requires cultural change
Application of appropriate care coordination is patient-centric and dependent on patients' clinical condition	Appropriate coordination is dependent on PCP having up to date patient information from inside & outside HC system
Health Care System Level Improvement	
Direct communication with Emergency Department has improved	Direct communication with the ED is still sporadic
Use of Scribes has improved PCP workload and satisfaction	Use of Scribes is selective and should be offered to more PCPs
Limited EHR training is offered and available	Learning if often serendipitous; more specific training is needed to increase PCP engagement

Table 8-5: Individual PCPs - Themes & Key Findings

Individual PCPs Themes & Findings

Enablers	Challenges
Workload and Specific EHR Issues	
More indirect communication between physicians (messages, notes)	Demands and expectations for Primary Care are increasing
Primary Care work/life balance is out of proportion	Primary Care work/life balance is out of proportion
Ability to have direct/indirect communication with providers	Primary care overload leading to frustration and burnout
Impact of working in an Integrated Health Care System	
Communication using the Epic EHR added value	Confusing EHR entries/data requires more communication
The Epic EHR improved access to patient data	Inability to easily access, track, understand patient data and follow up needed
Direct communication with the Nurse Coordinator in ED (follow up with PCP)	PCPs continue to have concerns communicating with the ED
Improvement in PCPs' ability to track patient care pathway	Ensuring physicians notes provide clear, useful patient data
Physicians coordinating care through EHR	Role confusion over who is responsible for following up on patient care in specific areas
Transitions of care with ED improved	Lack of consistency with transition of care instructions and follow up needed
In-patient notes may contain specific name of physician caring for patient in-hospital	In-patient direct communication with PCP while patient in-hospital generally does not occur

Table 8-6: Individual PCPs - Themes & Key Findings (Continued)

Individual PCPs Themes & Findings

Enablers	Challenges
PCP View of the Role of Primary Care	
PCPs felt they were proficient utilizing Epic and that it would improve over time	PCPs challenged by lack of role specific training PCPs did not aspire to be a "10"; system did not expect PCPs to be a "10"
Primary Care is part of the HC System	HC System placed increasing demands on Primary Care PCP time for direct patient care decreased
Primary Care needs to lead care coordination (integrator)	Clarity of PCP role in care coordination needed Clarity of care team role in care coordination needed
Definition of care coordination is patient-centric (centricity)	Clearer expectations of PCP role in care coordination needed
EHR and PCP Behavioral Changes	
The Epic EHR required PCPs to think and behave differently	Adaptation to use of technology during patient visits Lack of system provision of guidelines for integration of technology with patient visits
PCPs focused their EHR entries to ensure clarity and completeness of reporting in the EHR for use by other HCPs	PCPs concern that their notes were not being utilized by other physicians taking care of their patients
PCPs found ways to utilize the EHR in their patient visits	Increasing requirements for EHR data entry
PCP View of the EHR System	
Technical integration promises value	Technical integration has not fully realized promised value
Technical integration enables PCPs	Technical integration has not fully realized promised value Global care coordination is a requirement not fulfilled PCPs challenged accessing information from external providers

Theme #1 – Health Care System View of Primary Care

The practice of medicine is continuously undergoing change. This theme captures how the HC System view of primary care influenced the experience PCPs described related to the organization-wide EHR. In particular this HC system view is reflected by the finding that PCPs perceived the role of primary care becoming more visible in the organization, described in Section 4.2.3. Their work was more visible and available to physicians in other settings through notes in the EHR. In addition, they could view the various aspects of their work – to support quality metrics, to review notes from other physicians - more completely. Reminders built into the system created 'noise,' as described in Section 6.2.2. With the introduction of integration, PCPs observed their role was more administrative and that their administrative burden increased. Now, in addition to what they were doing before, more compliance, regulations, metrics, and data needed to be entered into the EHR system for quality of care, payment, and patient care.

The system influence and view of primary care was also reflected in PCPs discussion of their role in care coordination, explored in Section 6.2.1. While a PCP's patients may see a world of caregivers, it is the PCP who is ultimately responsible, working in conjunction with other providers, the patient, and the patient's family, to collaboratively make medical decisions for their patients care and well-being. Yet while PCPs saw themselves as central to care coordination, there was

sometimes ambiguity in which physician would do what for a patient, a lack of clarity around roles and responsibilities in care provision and coordination. In a study based on interviews with "primary care physicians and specialists, institutional supporters and managers of a public health network in Pernambuco, Brazil," Mendes (2020, Abstract) found that "knowledge about the role of primary care was incomplete, not being understood its primary role as a care provider. The primary care physician was not recognized as the responsible physician by most professionals (Mendes, 2020, Abstract)." Transitions of care are often a potential risk for patients, and defining clear roles and standard communication processes can be an improvement opportunity at the HC system level, facilitate by an integrated EHR (Mendes, 2020; Munchhof et al., 2020). While data flow to and from PCPs to other care givers treating their patients improved, some PCPs still felt as though they were on the margin of medicine instead of included as fully integrated members of the patient care team.

Theme #2 – Cultural Impact of System-Wide EHR

A technically integrated health care system results in changes to the cultural dynamic of providing care, forcing commonality in some processes across the organization and coupling formerly siloed groups more closely. This theme reflected comments in our interviews about needing to think and behave as a single system, as described in Section 4.2. In addition, with secure messaging to support effective direct communication and by breaking down walls that enabled PCPs to view more complete information across providers and sites, PCPs expected better care coordination to improve patient care delivery as discussed in Section 6.2.2. During interviews, some PCPs felt that Primary Care had been viewed by the HC System as operating in a vacuum, possibly the product of years of disconnect from inpatient, the Emergency Department, specialty physicians, and global provision of care for their patients. Integration through Epic was changing that view.

Culture change can be supported in several ways. Role engagement and workplace interactions are important considerations in cultural change (Apker et al., 2020). Apker et al., (2020, p. 1329) identified "specific communicative phenomena that makes up (dis) engaging working conditions"; such knowledge can support communication-based interventions that can support system-wide cultural change (Apker, et al., 2020). Additionally, trust and faith by physicians in interactions with the healthcare system's administrative staff, their medical and clinical colleagues, with each

other, and with their patients could be designed into a system wide transformation efforts that focuses on technological advancement (Raj et al., 2020).

Theme #3 – Health Care System Level Improvements

At the HC System level, PCPs noted the role of the system in making improvements to processes, resources, and technology, but also described areas where the HC System should focus to improve resource availability, process efficiency and effectiveness, and technology functionality to support productivity as described in Sections 5.2 and 6.2. These system level improvement actions and opportunities impacted PCPs experiences with Epic, including initiatives related to people, processes and technology, as the examples below illustrate.

People: As one example of a system-level improvement related to people, the HC System provided scribes to some practices, adding value by improving productivity and documentation quality as well as a better experience, as described in the literature (Ziemann, 2021). Not all PCPs had scribes; some felt this program should be expanded.

Another opportunity identified as a HC System level improvement was the availability of resources to see and treat patients referred to specialists as described in Section 6.2. In our interviews, we heard about the difficulty of PCPs in scheduling referrals. Even though Epic facilitated communication both directly and indirectly between PCPs and specialists, scheduling of patient visits was often delayed due to lack of lack of availability of Specialists. As described in Section 5.2.4, the use of technology such as Secure Chat enabled scheduling of referrals more efficiently through direct communication.

Process: In both Round I and Round II interviews, system level process improvements and opportunities were recognized by PCPs. For example, areas PCPs found enabling included use of the EHR for communication and the fact that the HC System was adding new technologies such as Halo and Secure Chat to facilitate inter-practice interaction. As described in Section 7.2.2, PCPs identified issues with processes to access mental health patient data for their patients, referral processes, and the process of accessing patient data when patients visited physicians outside of the HC System

Technology: The HC System's introduction of Epic was an impactful event, as many of the Primary Care Physicians interviewed described in Section 5.3. It enabled availability and access to data they had been asking for over the years such as information on their patients' visits to the

Emergency Department and in-patient admissions, from imaging and laboratories, from pharmacies within the HC System, and from health care providers outside of the HC System. Epic made it possible to see in real time notes once entered into the EHR in many cases, allowing PCPs to "follow along" with what was happening with their patients.

Although PCPs discussed issues with the EHR such as the workload, sporadic communication with the ED and in-patient, more training that needed to be provided by the HC System, ongoing communication, and care coordination issues, they felt that there was tremendous value and improvement in their ability to deliver patient care using Epic.

Theme #4 – Primary Care Workload and Specific Epic Issues

PCP workload has increased in the U.S. overall as documented in the literature, although for a very few, it actually decreased (Fogg et al., 2023; Tai-Seale et al., 2019). From our interviews we consistently heard similar comments and workload related issues were at the top of mind for many PCPs interviewed.

There are several areas that PCPs discussed related to workload impact. First, as described in Sections 4.1, the PCPs interviewed described a learning curve. The first year on Epic resulted in a drop in productivity overall for PCPs and the HC system. During Round II interviews, PCPS generally described greater productivity. A second impact on workload was caused by administrative tasks such as compliance and health maintenance requirements, which cause PCPs to spend more time in Epic, filling out necessary and required information as reported in Section 4.2.2. A final example pulled from our findings, reported in Section 6.2.2, was the increased flow of data coming to a PCP and the data outflow the PCP must transmit to others. PCPs described "Note Bloat," which has been reported to cause information overload leading to compromises in patient safety due to the "many clinically inconsequential details *(that)* are included in documentation (Nijor et al., 2022, p. e1002)." PCPs are sorting out how to best triage and utilize the data to improve patient care given the more holistic picture of their patients.

Theme #5 - Impact of Working in an Integrated Health Care System

This theme captures the impact that working with system wide EHR technology in an integrated health care system from a PCP perspective, considering their ability to participate in care coordination relative to working in an environment with different siloed IT systems. Care coordination is critical to the provision of "modern medicine" (Dixon et al., 2018). In an integrated

healthcare system, effectively coordinating patient care creates better quality of care, reduced hospital admission and readmission rates, and less waste and financial burden due to uncoordinated care provision (Kim et al, 2015, p. 47). An integrated electronic health record (EHR) system can support this coordination. Yet as health systems invest in more integrated infrastructure, delivering on coordination also requires process and organizational integration. The challenges and opportunities experienced by individual providers can inform this organizational change.

For the Primary Care Physicians interviewed, the system-wide ability to coordinate care represented a breakthrough in their ability to contribute to delivery of quality care as described in Chapter 6.2 Access to data globally, also allowed coordination of care through a more effective and wider lens. Apker et al. (2020, p. 1329) found that "varied workplace interactions that contribute to primary care providers' experience of role engagement". They found that PCPs "consider communication with patients to contribute to role engagement and disengagement (Apker et al., 2020, p. 1323)". As described in Chapter 7.2.1, PCPs enthusiastically described using EHR features to improve care.

Yet PCPs are reported to have a wide range of concerns about practicing in an integrated health system. According to a recent study, physician well-being is a major priority for healthcare organizations, however, the impact of workplace environment on clinician's well-being is poorly understood (Anderson et al., 2020). Anderson et al. (2020) found that PCPs in integrated healthcare systems were confronted with unique stressors related to organizational features that restrict clinicians' autonomy. In our research, PCPs also reported on care coordination concerns (Section 6.2), including information overload. The additional workload might also lead to disengagement and burnout, as explored in Section 7.2.2. Apker et al. (2020) found PCPs considered, "that electronic health record/patient portal communication exacerbates role disengagement" (Apker et al., 2020, p. 1323).

Theme #6 – PCP View of the Role of Primary Care

This theme reflects the PCPs' own view of the ways Epic has impacted their role at the operational level. In contrast, Theme #1 focused on how the overall health care system views the role of Primary Care within the system. We identified this theme through interview comments, although it is referred to in the literature to a limited extent. This theme allowed us to consider

how PCPs discussed their role overall and how they work together with physicians in other settings for care coordination purposes. As described in Section 6.2.1, PCPs saw themselves as the "Grand Coordinator," the central figure in care coordination. PCPs are responsible for the whole-person and while specialization is important, the PCPs' view is "as broad and deep as the human experience (Fong, 2021, p. 3)." Care coordination is a key part of the PCP's role and as such Primary Care "demands approaches that require dynamic systems of support (Fong, 2021, p. 2)."

The PCPs we interviewed found, similarly to a Kaiser 2017 study, that "there are specific skills and support needed for effectively practicing within an integrated delivery system (Chesluk et al., 2017, p. 1). Chesluk et al. (2017, Abstract), found that, "Physicians identified 3 primary skills: orienting to teams and systems, engaging patients as individuals, and as a panel, and integrating cost awareness into practice". As described in Sections 5.2.2, 6.2, and 7.2.1, PCPs found the use of technology facilitated patient care and engagement. Epic, Secure Chat, Halo, Telehealth, and e-consults enabled PCPs to communicate with colleagues improving access directly and indirectly to information and resulting in more timely, efficient patient care.

Coordinating patient care requires PCPs interactions with other settings, yet Raj et al. (2020) noted that little is known about how physicians build and maintain trust with their other providers and further how systems like EHRs might affect trust. In their comments, the PCPs interviewed expressed trust that most physicians contacted via secure chat would respond as described in Sections 5.2.2 and 5.2.4, but also described situations where they felt communication was only one way. The closer connection enabled by the EHR may raise expectations about faith and trust in ways not considered in the previously decoupled system.

Theme #7 – Epic and PCP Behavioral Changes

Epic plays a transformational role in changing physician behaviors, bringing in a whole world of information that previously was difficult to come by. This theme emerged due to the changes PCPs described in the way they interacted with their patients, with each other, with technology in general, with their colleagues, with others system wide. For example, while not a focus in this study, this included the way they interacted with patients in exam rooms, balancing the need to focus on the patient for eye contact and the need to enter information in real time into the EHR. The theme links to the literatures on physician concerns including trust in provider care teams (Raj et al., 2020), trust within Doctor-Doctor interactions (Moerenhout et al., 2020), physician stress

and burnout (Gardner et al., 2019), and the need for physician-to-physician personal relations (Wormwood, et al., 2020).

With the influx of data from multiple sources, new requirements for PCPs based on system-wide programs tracking health-maintenance and preventive care, and ACO requirements, the Epic implementation changed the way PCPs work and, in some cases, the way they think about decisions in care delivery. These changes impacted physician workload and compensation. Since physicians' time with patients is the only way for them to bill, work in Epic is not billable work. Work in MyChart is not billable work. Calls made to patients are not billable work. As one physician put it, "*You have to start paying people for that, that's real work, and at the end of the month, we're still in a very visit-driven world."*

Physicians vary in the amount of time it takes them to do the work they need to do in Epic. This includes note taking, writing, and ensuring the quality of the work they produce and the information they put into the Epic system. One PCP noted that a colleague had related that "*my notes take me 90 seconds, but I suspect that person's notes, he doesn't change anything..."* The goal as one PCP put it is "*to be able to efficiently take care of the patient and extend the knowledge as opposed to just reprint."*

Additionally, PCPs we interviewed were extraordinarily concerned about burnout. Physicians realize that it is not all an Epic problem. Demands have increased for physicians to enter more information into the EHR, to focus on metrics, to ensure data is accurate for accounting purposes, and for health maintenance, for preventative medicine, and for ACOs and accreditation. Another concern is whether the time PCPs spend inputting, verifying, validating, and ensuring they provide the most complete information possible is being utilized by their peers, colleagues, and others in the provision of patient care.

Theme #8 – PCP View of the EHR

The literature suggests that "There is strong evidence for the benefits of an EMR in terms of efficiency, reliability, and care quality, especially in primary care" (Janett and Yeracaris, 2019, p. 1302). There is also importance in considering the impact of the EHR workflows, especially clinical workflows. To take advantage of using the EHR to improve patient care, it is important for PCPs and other HC professionals to be actively engaged in the deployment and use of EHR systems (Janett and Yeracaris, 2019).

Over the course of our interviews, the PCPs interviewed evolved in their view of the Epic electronic health record system. Initially the PCPs were hopeful that technical integration through the implementation of Epic would make a significant difference. However, during the first year of implementation, PCPs found there were numerous issues including a drop in billing, noted in Sections 4.2.2 and 6.2.3. Over time, PCPs found significant value in the system as noted in Sections 4.2.4 and 5.2 and commented on the positive impact the EHR had on patient care, for example in Sections 4.2.2 and 7.2.1.

8.3 Drivers for Change - Using Technical Integration to Achieve Clinical Integration

The analysis of the PCP interview data led to identification of eight themes, which reflected different perspectives that influenced how the physicians experienced using the EHR and their perception of its value. We sought to generalize the findings and themes specific to the research setting to a broader context, defining what drives effective use of an organization-wide EHR from a primary care perspective. Clinical or horizontal integration represented the goal defining effective use; we were interested in mechanisms derived from technical integration that would improve clinical integration. Using an affordance-actualization lens, we sought to identify conditions or drivers that motivated or constrained actualization of care coordination.

From our research it became apparent that from the PCP's perspective any model for achieving clinical integration would require a number of confluent factors, with the EHR system a critical force. Without the technology provided in an EHR system, along with the capability to add supportive features such as Secure Chat, the pathway for achieving improved clinical integration is likely to be longer and more complex. However, by itself, the EHR cannot achieve clinical integration in any HC System. In the schematic in Figure 8-1, the EHR system is an underlying artifact that affords a potential for greater clinical integration. Drivers are factors or forces that can support actualization or constrain it. The organization can take actions that build on positive forces and mitigate constraining ones. In a technically integrated system, transformation work must recognize, plan for, and proactively act on these critical forces on a pathway to achieving clinical integration. Table 8-7 lists the eight drivers that influence the actualization of care coordination to improve clinical integration, building from the potential afforded by a system-wide EHR; each is discussed in the following paragraphs.

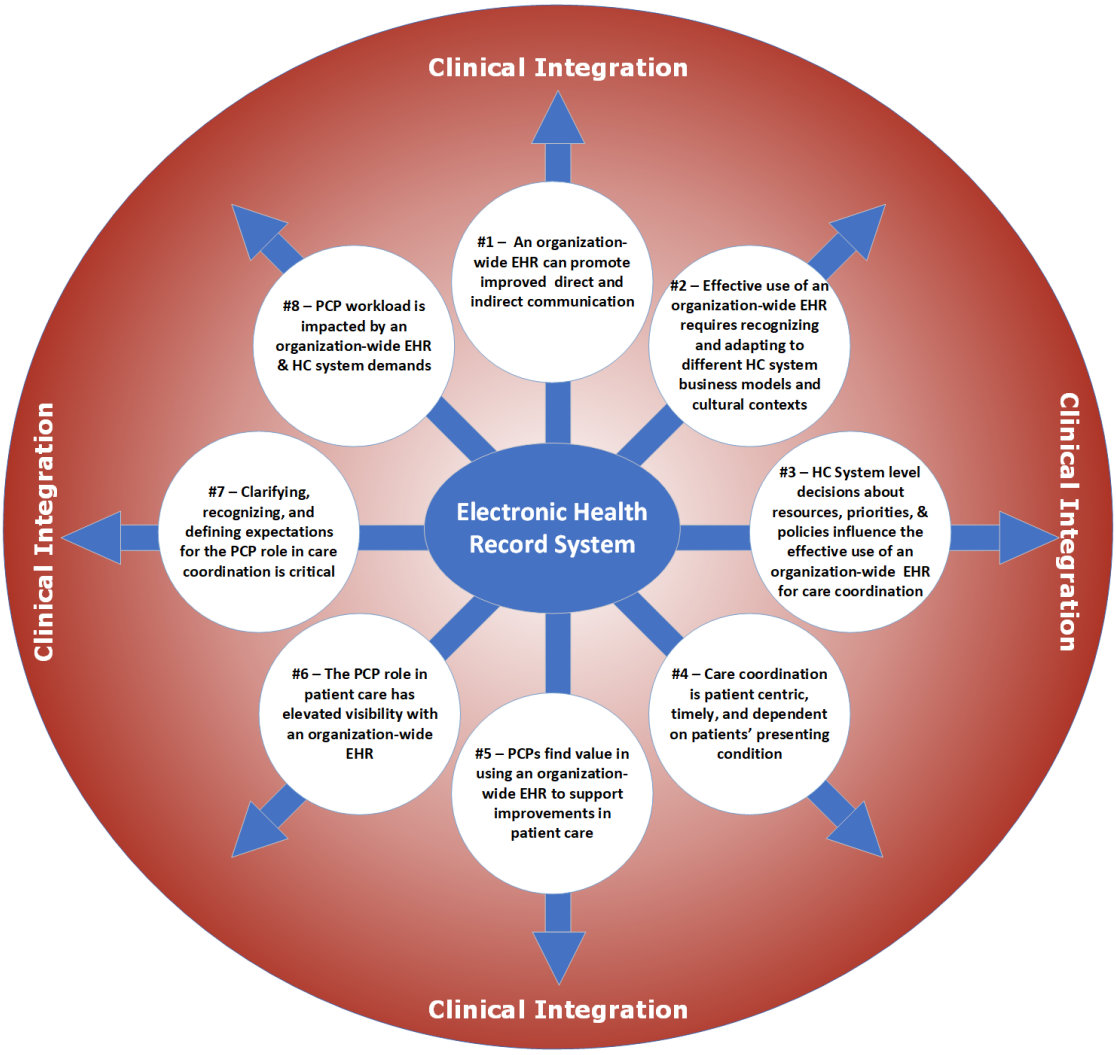

Figure 8-1: Model for aligning the EHR, Drivers for Change, and Clinical Integration

Driver #1:
An organization-wide EHR can promote improved direct and indirect communication leading to more timely and effective care coordination and connectedness

This critical driver requires PCPs and other HCPs to maximize their skill and competence in utilizing the EHR system for both direct and indirect communication. We found this driver is important for physicians in improving patient care, to determine issues and triage the need for response based on need such as, urgent-acute cannot wait, emergent- acute but acceptable to short wait, not urgent-can wait, or anything in between. HC systems can adopt a variety of technologies/features to support communication EHR systems. These options may include technologies supporting direct physician communication such as Secure Chat or Doximity for tele-health calls to patients (https://www.doximity.com/). There are also transcription tools for ease of note taking and writing.

Table 8-7: Descriptions of Drivers

Drivers Impacting Actualization
#1 – An organization-wide EHR can promote improved direct and indirect communication leading to more timely and effective care coordination and connectedness
#2 – Effective use of an organization-wide EHR system requires recognizing and adapting to different health care system business models and cultural contexts
#3 – Health care system level decisions about resources, priorities, and policies impact the effective use of the EHR for care coordination
#4 – Care coordination is patient centric, timely, and dependent on patients' presenting clinical condition
#5 - PCPs find value in using an organization-wide EHR to support improvements in patient care
#6 - The PCP role in patient care has elevated visibility with an organization-wide EHR
#7 – Clarifying, recognizing, and defining expectations for the PCP role in care coordination is critical
#8 - PCP workload is impacted by an organization-wide EHR and health care system demands

The ability of the EHR to enable direct and indirect communication is a major step forward in gaining efficiency and time savings for HC providers. The implementation of Secure Chat enables HC providers to gain direct access to other HC providers. Provider-to-provider communication can result in rapid resolution to patient care questions not achievable through other means. Expediting needed responses to urgent questions results in faster resolution of patient care related issues in acute and emergent situations. It is also valuable in transitions of care settings and adds a valuable tool for getting answers to important questions. In our research site, physicians found the use of Secure Chat remarkable at enabling quick resolution to issues that required clarification or follow-up.

Driver #2:
Effective use of an organization-wide EHR requires recognizing and adapting to different health care system business models and cultural contexts

An organization-wide EHR assists HC systems on the path to technical integration. It can be a major achievement and has been shown to be a critical, positive force for change. However, expecting that a change of this magnitude to yield immediate results in unrealistic. Moving from siloed, semi-isolated areas on independent technology within a HC System to a technologically

integrated HC system on a single technology such as Epic is a major transformational effort, which involves consideration of numerous variables the top down and the bottom up. HC systems embarking on this journey require years of preparation and planning. Determining a model for change within a HC system should be part of the overall strategic goal for transformation. Often one of the last things considered is the cultural change that must take place for an organization that has been working in technically decentralized manner to now working with a single, centralized technological system requiring all personnel to use the same system for data capture.

A critical driver for EHR implementation is the need to consider cultural change, which is of equal importance to technological and process change. An organization-wide EHR connects formerly de-coupled parts of the organization more directly. Due to different practice cultures and models (for example, between the ED and Primary Care), the system will be used differently by physicians in these areas. Recognizing differences and creating new processes and routines to support connection can support more effective transitions between areas.

It is important for PCPs and other HC providers to be involved in system-level EHR planning to represent potential impacts to their ability to provide patient care. Their understanding, experience, and guidance can better inform necessary changes in workflows, process redesign, and subject matter expertise proactively applied to the overall implementation. Their active involvement in the planning process enables a HC system to better understand their work, and how potential EHR changes would affect their patients. To support care coordination and clinical integration, such action addresses how to best facilitate the integration of Primary Care into the system-wide changes.

A key driver of transformation efforts is involving stakeholders, in the planning stages, during implementation, and in ongoing optimization. Bringing Primary Care and other HC providers into the process as early as possible can mitigate ineffective decisions. Process ownership is developed when people are part of the design and are able to have input into the design. Once implemented, inefficiencies and issues will arise, and organizational changes and new technical features create new possibilities, requiring ongoing EHR efforts. Involving PCPs and other HC providers increases their engagement, involvement, and ownership of the end result.

Driver #3:
Health care level decisions about resources, priorities, and policies impact the effective use of the EHR for care coordination

The implementation of an organization-wide EHR system raises high expectations in terms of cost savings through reduction in duplication of effort in areas such as imaging studies, laboratory testing, reconciliation of medical lists and problem lists, with higher quality of patient care achieved through clinical integration. While the ultimate outcome is improved patient care, existing HC system resources may be strained by the increase of communication and need for care coordination in a technically integrated HC system. Resource limitations and other system priorities can also constrain care coordination.

The EHR system's capability to improve sharing of data and information to a wider audience requires responsiveness on the part of professionals within the HC system. The referral system within a HC system is one illustration of the need to consider this critical driver. PCPs request referrals for their patients through the EHR; however, if the medical specialty does not have the resources or availability for timely appointments, the timeliness of effort to schedule referrals does not improve. To accommodate referrals in a timely manner, an HC system also needs to focus on resource management, which that may include addition of new personnel to improve access or process changes that help to prioritize requests within an appropriate time frame to meet specific patient care needs. For example, in the HC System we studied, PCPs used secure chat to coordinate care more directly for urgent cases.

Driver #4:
Care coordination is patient centric, timely, and dependent on patients' presenting clinical condition

Primary Care Physicians think of patient-centric care coordination. Their activities related to a particular patient depend on the needs of that patient. The EHR is often regarded as the "central clearing house" for patient information or the single source of "truth" to learn about a patient throughout their health care journey, a compendium of all data about a patient in one source. Supported by EHR data and current health issues and needs, the PCP develops treatment including connecting with other parts of the system to plan care. They assess urgency and evaluate acute needs in light of chronic conditions and a 'holistic' view of a patients' health.

Considered across all of their patient panels, PCPs' work involves interactions with many other HC providers. The providers involved in a patient's care are part of a 'care team', but across

locations and specialties, such teams often have little formal structure and come together and communicate based on need. Care teams may be defined and designed differently in different health care organizations. PCPs often identify care teams as needed to fit specific patient conditions at a point in time. For example, if a patient has a chronic illness, a patient might see a specialist(s) for those ongoing illnesses, and the PCP should be aware that the patient was visiting specialists as appropriate. In this situation the need for a "formal" care team might not be utilized. In the case of an acute situation, where the patient needed emergency care, a care team in the ED might be formed that included the PCP for consultation, transition to in-patient, and transition back to outpatient care. Such teams are dynamic, changing over time. Individual PCPs are part of many such care teams, involving many different physicians. An organization-wide EHR provides infrastructure connecting these teams, through a shared medical record, notes, and direct communication features such as secure chat. Developing processes that support inter-practice work have the potential to improve effective use of EHR features.

Driver #5:
PCPs find value in using an organization-wide EHR to support improvements in patient care

In the research site studied, the Primary Care Physicians supported the HC System's move to a system-wide electronic health record system. In particular, they recognized the need and the value of a single source of information about their patients as well as more direct communication as a major step forward to improving clinical integration.

More generally, HC systems implementing an organization-wide EHR should recognize the value PCPs place on care improvements, which such systems enable. This driver is especially important in considering PCP and HCP engagement as satisfaction can be a key factor supporting engagement. With greater data accessibility and visibility, PCPs can see patient notes from specialists, ED, and in-patient visits. Knowing where their patients were going, who they were seeing, and why they were being seen, with notes often readily available, assists PCPs with the knowledge needed to ensure overall patient care. HC systems should consider PCPs and other HC providers to be in a continuous learning mode, which can be enhanced by providing time for formal training, onsite training in their practice, or serendipitous learning just by working in the system. Such training can focus on methods for communicating with colleagues within and external to the HC System and with their patients, managing system data, as well as improving care coordination for their patients.

While recognizing the EHR's value in moving HC Organizations towards clinical integration, PCPs also recognize constraints based on the time they spend working in the EHR. Implementation of an EHR brings with it added responsibilities for PCPs and other HC providers. There is a balance that HC Systems need to find between requests for metrics, requirements for institutional and governmental organizations, and the time PCPs need to spend focusing on direct patient care. HC systems need to recognize that time requirements at the system level and at the individual PCP level must be considered to avoid overload and additional workload that can lead to burnout.

Driver #6: The PCP role in patient care has elevated visibility with an organization-wide EHR

With the implementation of an organization-wide EHR system, notes from all health care providers within the HC system become visible to other HC professionals. The Primary Care Physician's patient care data, and the patient care data of others, is elevated to a higher level of visibility. Enabling not only greater visibility, the EHR was found to support timely access to patient information. Such visibility and timeliness provides the means for smoother transactions including transitions of care of patient from one location to another (hospital to home, ED to home, ED to hospital), patient follow up needed by the PCP post hospitalization, and improved PCP awareness of patient visits to the Emergency Department often in "real time."

With this visibility also comes challenges. Among these concerns for PCPs are the volume notes from other HC providers and the timeliness, clarity, and comprehension of notes. The EHR documentation may sometimes lead to confusion about meaning and thus a delay in understanding what is needed and action. Realizing this, HC organizations might provide guidelines or instructions, templates, or other technical means to streamline PCP work in the EHR. Adding scribes to assist with data entry, greater search capability to facilitate access to information buried within the EHR and not easily accessible, and guidelines for information pathways within the EHR for ease of identification such as an index or table of contents may be helpful. The importance of data entry and understanding that clarity of written notes and data in the EHR can simplify transactions, save time in posing clear questions and receiving clear responses, all cost savings efforts supporting facilitated patient-centric care.

Providing access to all data needed is also a challenge. Access to data from health care organizations and providers external to an HC system is often limited. Insurance requirements may also be unavailable. The need to address this challenge is paramount to continuity of care.

HC providers need to communicate and collaborate whether they are within a HC System or external to it as patient care may be global in nature. PCPs at our research site, having access to notes and information accessible through the Epic CareEverywhere network for example, appreciated the more complete picture of their patients.

Another aspect of visibility related to implementation of an organization-wide EHR is support for system-wide thinking. The routines and features embedded in the EHR need to work across the system, for different types of practices and locations. PCPs and other professionals have greater visibility to system resources, which can help them in directing patients to care. System priorities for care, for example quality metrics, can be embedded in the EHR. From a PCP perspective, visibility can be disruptive and overwhelming. Care reminders can distract attention from a current patient issue. Within the EHR, the volume of notes and documentation requirements are in one place; in our study, PCPs described this as beneficial but also overpowering.

Driver #7:
Clarifying, recognizing, and defining expectations for the PCP role in care coordination is critical

Patient care often begins with patient selection or assignment to a Primary Care Physician. The PCPs role is essential for overall patient care and patients who do not have a PCP are at a major loss for coordination of their health care needs. Other health care providers look to the PCP for a more "complete" explanation of a patient and to understand patients' past and current state of health. The PCP is the "hub", coordinating patient care, responsible for the entire patient, throughout the patient's health care journey. They see their patients holistically, as though through a 360-degree lens. PCPs need to work in coordination with other HC providers to reconcile problem lists, medication lists, to review imaging studies and laboratory results, however, it is the PCPs role to coordinate patient care in many cases. Often HC Providers look to the PCP to ensure EHR data is up to date. An organization-wide EHR can improve Primary Care's ability to coordinate care, improving performance and quality of care.

To avoid confusion among HC providers within health care systems, it is critical to define the PCPs role and to ensure that throughout the HC System, the PCP is recognized as an integral part of patient care, and coordination of that care. The PCP serves as an ongoing advocate for their patients regardless of where their patients may travel or be in the world. Without a clear HC

System-wide definition of the PCPs overall role in patient care, it becomes confusing for other HC providers. Using the EHR to identify follow up that a patient may need and specifically who is responsible for that follow up, is a major part of the PCPs' role working in concert with other HC Providers. In a HC system, clarity and cross organizational understanding of the PCP role is a major step toward better health care coordination and quality patient care.

Additionally, it is important for all of a patient's care providers, whether there is a "formal care team in place" or not, to have all the names of any physician or health care provider taking care of a PCPs patient, listed in at least one place in the EHR. This prevents PCPs from having to search for names of providers and by itself identifies an "informal" patient care team. If a PCP and patient know the names of physicians taking care of them, care teams can be formed as needed for consultation and treatment.

Driver #8:
PCP Workload is Impacted by an organization-wide EHR and health care system demands

In the literature, and reflected in our interviews with PCPs, workload is a critical issue and source of dissatisfaction. An EHR system alone is not the sole cause for the increased workload on PCPs, but we found in our interviews that implementation of an organization-wide EHR did affect workload. Working in the EHR takes time, effort, and concentration, which may result in fewer hours dedicated to provision of direct patient care. On a "bell shaped curve" this driver focuses on the increased demands from HC systems and the volume and quality of information in the EHR on Physician's ability to provide clinically integrated care.

From a HC system perspective, demands may include data required for quality, regulatory, legal, and compliance requirements to meet qualifications for hospital accreditation, licensing, and certification for other programs. Academic institutions may also require data for research purposes.

Enabling technologies such as the EHR facilitate communication. In addition to utilization of email, PCPs and other HCPs are now focused on both direct and indirect communication through the EHR. Communication through use of any technology takes time and diverts concentration to respond in as timely a manner as possible. There is also the "switching cost" of having attention diverted from, for example, writing a patient note to responding to an urgent email or text message. Switching cost and the time to return to a previous task is costly in terms of time and

dollars. The larger volume of information shared indirectly within the EHR takes time to process. PCPs and other HCPs need to identify ways to mitigate the competing demands through prioritization and other means that enable efficiency in focusing on the task at hand.

8.4 Discussion and Insights

The impact of the EHR system on clinically integrated patient care can be viewed through different lenses. We asked an initial research question to learn more about the impact of an organization-wide EHR system on primary care delivery of care. This led to additional research questions addressing inter-practice communication, care coordination and physician engagement. In this research we performed interviews with PCPs at one HC system, then analyzed data to identify findings and themes grounded in the research site. From this analysis and literature review, we developed generalized affordances and drivers for change, which supported practical insights and implications for future research, which are described in this section.

8.4.1 Practical Implications

There are five major insights derived from this research:

1. Primary Care Physician perspectives are important for improving clinical integration but they can be overlooked
2. Implementing a system wide technology such as an EHR does not correlate to having a clinically integrated system
3. Communication and care coordination are supported by the EHR, however the EHR should not be relied on for the sole means of inter-personal communication
4. HC system-wide transformation efforts require parallel use of organizational, cultural, behavioral, and financial levers
5. The model design for moving a HC organization from technical integration to clinical integration requires customization of generalizable drivers for individual organizations.

Insight #1:
Primary Care Physician perspectives are important for improving clinical integration, but they can be overlooked

The first insight is that Primary Care Physicians' perspectives are important given the critical role they play in coordinating care, but they often feel overlooked. An organization-wide EHR raises PCP visibility and offers a means for PCPs to be "heard", as described in Driver #6 in Section 8.3. They accomplish their work through extensive communication practices and care coordination processes. They use EHR systems like Epic to support this work; they seek competency in their use of the EHR and to improve their skill with the system, given many demands on their time (Driver

#8). They find the EHR has added value to their practice and appreciate the HC Organization's investment in implementing the EHR to improve quality of patient care delivery system wide (Driver #5). As one PCP commented,

> *I think that the decision to move to a modern electronic record was huge. I think there are opportunities to make it work better. But I think the biggest thing is that, I think Epic is a good thing. Like I think that we are on the right track. I just think it's taking us a long time to get working the way that our patients and teams need. (RII, PCP 10)*

Including PCPs in the entire life cycle of an organization-wide EHR transformation process, before, during and after implementation, can enhance clinical integration and care coordination. Their insight into patient care and care coordination should not be overlooked. Ensuring Primary Care has a seat at the table when decisions are being made is key. In the concept phase, their input identifies potential issues and prioritization of different areas that need to be sequenced in terms of overall need and value, potentially avoiding costly efforts to fix issues that might have been identified earlier.

During rollout, PCPs can provide guidance on issues that may arise due to different practice settings as previously decoupled areas are connected more closely through real-time information (Driver #2). The practice model in Primary Care is different from that in other areas such as the hospital (In-patient) or the Emergency Department. Recognizing that regardless of the model, an integrated EHR creates opportunity for HC Providers to work more closely on patient care. When identifying improvement opportunities, such as process changes, it is important to include the different provider perspectives in the decision-making.

PCP input to ongoing efforts to optimize effective use of the EHR helps to prioritize action and ensure concerns are listened to proactively. Such input helps to identify inefficiencies and burdens experienced by PCPs (Driver #8) to develop approaches that may alleviate them. In our study, PCPs appreciated improvements made by the system to address pain points. But they also expressed frustration about hearing their concerns heard, as one physician noted:

> *I think we need to have more consistency with trying to understand what individual departments need from the record and listen to that more readily. So like, for me, the PCP issue has been a major, major impact on my practice. I brought that up as a clinical leader, who is a reasonable person, as a problem, and then was asked to prove that it was a problem. So now I'm sitting here like trying to like show examples of why it's a problem, and the impact it has. And so now my new strategy is, now I keep filing incident reports every time I see that it could have had an impact on the patient care. There's just, there's*

not a really clear way to feel heard and then understand what's being, what's happening with it, because there is, and maybe it's prioritization. Right? Like, what's a big problem to me I understand is not necessarily seen as a big problem to the system, but there's not a good mechanism for that feedback. And as a primary care provider, my perception is that there's far more understanding and investment on the inpatient side. (RII, PCP 10)

Decisions at the health care system level (Driver #3) regarding resources and access as well as documentation for billing and quality, affect PCP's ability to care for patients. Clear processes and feedback as well as shared discussion and decision-making to ensure goal alignment proactively can reduce reactive issue resolution.

Insight #2:
Implementing a system wide technology such as an EHR does not correlate to having a clinically integrated system

An EHR system is incredibly useful in the practice of medicine, however by itself it is not a panacea and should not be expected to be one. As with any health care organization, the HC System we worked with to perform our research supported a level of clinical integration prior to the implementation of the Epic EHR. Prior to Epic, the HC System was technically siloed; implementing Epic enabled a major step towards improved clinical integration. Drawing on Driver #5, PCPs found value in using an organization-wide EHR to support improvements in patient care, as one PCP commented,

I think it comes back to having those resources in place where we need it and when we need it. So I have others, for example, I have patients that spend some time here in Massachusetts, and spend some time outside Massachusetts in other states. And they talk sometimes about the difference. For example, in some places, they say, oh, I tried to see this doctor, or the coordination of care wasn't that great. Here I think that overall I think we are in a good place, and (HC System) does a good system, a good job maintaining that system with their resources. And obviously thinking about Epic, I think that was a huge step going to integrate that system. (RII, PCP 50)

There are many factors that need to be identified and aligned in order to achieve clinical integration. Using Driver #8, an example of the need for other considerations to achieve clinical integration are called out by one PCP who found that while there was a lot of value using Epic, there were other time-consuming demands that needed to be addressed and a request for process and EHR improvements needed,

…some of the areas include sort of reducing inefficiencies across systems and now, you know, if things, if changes were made at a diabetes visit that I need to know about, I mean I don't really need to know, like I get copied on 30 labs were done by, for X, Y, Z by 10 providers. I get copied on 30 labs which 29 of them somebody else has reviewed and taken

action. So do I really need to see that? So, I think being selective, prioritizing who needs selection of care, even thinking about, like what are the downstream implications of doing more? Say tomorrow something comes out as a quality indicator and you're going to implement it in that (way). Everybody wants some you know… Some sort of tool, something in that way. Well what are the implications? How are we going to figure them? That's the question, is how are (we), especially as a primary care physician. I really don't have time. I cannot do one more thing. I mean that's, anybody asks me to do one more thing, I said well take away something, then I'll do it. I cannot do one, I just don't have time. So, I think Epic needs to, and the developers and whatever the system wants to do, needs to pay attention to how much time people are spending on inefficient tasks in Epic, and that's a lot of time, I would say. (RII, PCP 100)

To act on this insight HC systems need to consider the end goal, in this case clinical integration, not just from a digital perspective but from a wider frame of the precursor processes in place with a wider, more global view to the impact technology has on all aspects of the organization. Before implementing technology, a major planning phase must take place to consider processes, other technologies in place, current resources, and staffing for example. Planning before digitizing is key. Only through considering and understanding existing processes, identifying where changes may be needed, and exploring impact can as much mitigation take place proactively prior to digitization technologically. Establishing a baseline of where a health care organization is at the beginning of an EHR implementation, defining quantitative and qualitative goals and ongoing comparisons can help monitor and measure the overall processes of change.

Insight #3:
Communication and care coordination are supported by the EHR, however the EHR should not be relied on for the sole means of inter-personal communication

The third insight centers around communication and care coordination, building from several drivers. Driver #1 recognizes that an organization-wide EHR promotes improved direct and indirect communication. Driver #5 identifies that PCPs find value in using an organization-wide EHR to support improvements in patient care. As one PCP noted, the change in communication capability from pre-Epic to post-Epic was significant, saying,

I think it has changed. It can go up and down depending on what's going on with that specific department. But in general, I think it's better with Epic, because if I remember, I did this shortly with the previous system, but I did it a few years when I was a resident, and before there was a lot of calling to the specific clinic. You have to, you were in front of the telephone either waiting on call back, or calling yourself on hold, waiting that the staff had time to coordinate the specific appointments for the specific patient. Right now I can send a message, continue to do other things, and when the message is ready, I see it, and we continue the coordination. So yeah, in that way definitely better. (RII, PCP 50)

Communication and care coordination are two areas critical to delivery of quality and safe patient care. Implementing technology must be supported by a review of current practices, The EHR technology should be expected to support communication and care coordination, however the EHR should not be relied on for the sole means of inter-personal communication. Developing interpersonal relationships and trust must be supported not only by technology but also by HC system facilitation and support for collegial means of HCPs working together.

In many instances, communication has shifted from reliance on direct contact through telephone or paging, to indirect communication through the EHR and integrated electronic technologies such as Secure Chat. The EHR is recognized as facilitating both indirect and direct communication within HC systems and some external, as one PCP noted:

> *Communication shifted from interpersonal interaction to the EHR or more electronic based interaction (RI)*

Another PCP commented on the value of indirect communication:

> *Yeah, I mean, I think that the fact that everything is in one place has really improved our ability to kind of like make sure an after-visit summary includes their appointments like across the breadth of who they're seeing. So that kind of stuff, when they come to my office, they're seeing whether or not, when their next cardiology visit is, when their next pulmonology visit is, when their next visit with the oncologist is. So I mean, that kind of stuff really kind of helps keep people on track. (RII, PCP 60)*

The importance of cross-organizational support for a transformation or change effort is critical to the success of the overall effort. HC organizations need to promote alignment and support cross-functionally or change management efforts will fail. Drawing on Driver #5, one PCP noted that this was the case in our research site saying,

> *I think it's a conscious effort at all levels to improve communication. Everybody's bought into that. Really, I don't see resistance to that anymore. (RII, PCP 20)*

As noted in the discussion of Driver #2, PCPs communicate with many different care providers as they care for their patient panel. Particularly in large health systems, many of these interactions may be with physicians they do not know well. Underlying the interaction is the need for trust in the work and responsiveness of other physicians; the HC system plays a role in developing this culture. Patient referrals are based in some cases on relationships and reputation. These factors are built over time through direct and indirect means of personal interaction arising from multiple means, not just through an EHR.

Insight #4:
HC system wide transformation efforts require parallel use of organizational, cultural, behavioral, and financial levers

The fourth insight considers that HC System wide transformation efforts require parallel use of organizational, cultural, behavioral, and financial levers. Driver #2, which recognizes the need to encompass different business models and cultural contexts with an HC system, foreshadows the fact that implementing a system-wide EHR is not a one-time activity. Similar to any technology it requires ongoing maintenance and support, updates and upgrades, and the addition of new technologies and features. An organization-wide EHR requires HC organizations deeply understand and have insight into all areas of the system that will be affected. A small change in one area may result in a dramatic change in others. As noted in Driver #6, the EHR codifies a system view; it needs to work for everyone.

Technical changes in the system have organizational, cultural, behavioral, and financial impacts. HC systems need to understand these implications when considering transformation and change. For individuals, change is often viewed from the perspective of their work. For example, in responding to a question about the effect that the Epic system had on ability to coordinate care, one PCP found that,

> *…this communication sort of helps with coordination. Getting the files in the right place, therapy, you know, care coordination managers, ACO's, (HC System) ACO's who are able to get information of who needs to be involved looking at the records. And finding out who else is in the care team that needs to be aware. Finding out who the healthcare proxies, guardians is. Sometimes we need to know that too. So I think having that information right up front in cases where patient's families or caregivers are involved. So I mean the information again is out there. The onerous really on us as like for everything. How far and how much do you want to take it sometimes, you know. We'll write a letter to the patient and their families and what's going on and other times we'll pick up the phone and call, so it's really, it's really onerous, I mean everything is there. I'm happy. (RII, PCP 100)*

Even when planned at a system level, discovery of a system feature or change can seem haphazard, as the following quote illustrates:

> *So the most positive I think is specialty care. This has been a surprising benefit with the pandemic and with Epic was the ability to now have more ease communicating with specialists. And that was just, and that was something that I stumbled across. It wasn't something that was really, I think promoted so much within the system. I mean, they gave me information. But that was perhaps the biggest thing, I think, to have that information. (RII, PCP 80)*

In implementing and updating an EHR, each health care organization establishes its own requirements gathering processes. These processes need to involve all areas of an organization, including Primary Care. Additionally, change processes need to involve and understand specific differences between practice cultures, on the ground issues, and business models. Balancing standardization and recognition of individual practice style is also an important consideration.

While clinical integration is an organization level goal, it is patient-centric as described in Driver #4, built from the experiences and needs of individual patients. Technology can spur innovations in patient care, as in an example described by a PCP regarding e-consults:

> *We're also, just another thing in terms of coordination, we're also in the process of implementing what are called e-consults. So that's a, let's say I have a diabetic. It's kind of like the next test, next drug kind of thing. So let's say you come in. You're a diabetic. And you know, we're not where we want to be. Yeah, I could send you to a diabetologist, but another option would be for me to send an e-consult and say, here's the situation. Here are the drugs we've tried. Here's where we're at. What would you recommend as the next step? And you don't have to go. You may get a copay. But you don't have to go and spend your time there. I can get the message back and then say, OK, we're going to try this. And the e-consultant may say, try this, this, or this. And if these don't work, then they need to see me. But that means that it's much more convenient for the patient. The response time is much faster. It opens up slots for the specialist to potentially see sicker people who need to be seen sooner. So that's something we're beginning to implement. (RII, PCP 60)*

As recognized in Driver #7, the new processes require thinking through the roles and responsibilities each provider contributes to the process.

Insight #5:
Model design for moving a HC Organization from technical integration to clinical integration requires customization of generalizable drivers for individual organizations

The fifth insight finds that there is no one size model to achieve clinical integration that will fit every health care organization. Even if there are commonalities among HC organizations, each one is unique and individual. Figure 8-1 describes drivers we identified as playing an important role in either enabling or constraining improved clinical integration after implementing an organization-wide EHR. Each HC organization needs to understand these drivers within their own context, and tailor drivers and actions to fit the organization. Learning from other HC organizations' experiences is helpful and should be sought. However, because "one size does not necessarily fit all," the guidance may serve as best practices and invaluable lessons learned. Transformational implementations such as replacing multiple, individual IT systems with a single organization-wide integrated EHR system affect many areas in a health care organization. It is

therefore critically important to involve all areas of the HC system during implementation and ongoing optimization.

8.4.2 Research Implications of the Affordance-Actualization Lens

Several areas of insight arise from consideration of the affordance-actualization lens and are described in this section. The affordance-actualization model captures use of the IT artifact (in this case the EHR system), the process through which technology leads to organizational change, the multiple layers of the change processes involved, and individuals and their roles as "change agents," in order to consider how IT (technology) produces effects on organizations (Strong et al., 2014, p. 53)." This multi-layered approach recognizes that change is not simply the result of work in one level of an organization, but in fact requires a collaborative approach involving actors at all levels within the organization to realize outcomes on multiple levels. Results may be defined at one level of an organization, but ultimately how an organization views success is the product of work done at all layers and levels within the organization. Affordance-Actualization Theory represents the complexity of change, considering "top down" organizational goals and the "bottom up" actions of individual actors. All layers, including those in the middle, influence the extent to which a technical artifact is used effectively to meet an organizational goal.

Strong et al. (2014), describe actualization as individual journeys in a dynamic organizational context and as an organizational journey. While individuals think about the implementation of an EHR in terms of how it will affect them (often the question during a change process is "What's in it for me?"), each individual user is affected differently within a single system. Regardless of planning, deployment, launch, and system stabilization, each system user comes to the new artifact and approaches change with different education, training, background, experience, knowledge, ability to problem solve, and many more individual characteristics. For the same reason we do not all drive the same car, and even if we did, we would not all drive it the same way, EHR users follow their own pathways in thinking about goals and affordances, individual actions and interactions with the system, and how what they do and need to do impacts their own work and their patients. As individuals become more comfortable, they can increase their capability to use the new technology or process, and continuously go through a cycle of learning leading to increased insights about the technology and what it can do for them.

Because of this, affordances, and the actualization of those affordances, even within the same organization, may move forward on different timetables. Individual differences in learning styles and personality styles, as well as many other characteristics impact the pace of change. Because culturally organizations differ, EHR implementations vary considerably regardless of the attempt by the seller of the technology to "systematize" the software application, from buyer to buyer.

Strong et al. (2014) define three measures for evaluating achievement of organizational goals emerging from individual actualization actions and resulting outcomes. These include alignment, extent, and consistency. Such metrics can be used as key performance indicators (KPIs) to support achievement of organizational goals related to actualization (Parmenter, 2019). Each is discussed in the following paragraphs.

Alignment considers whether achieving individual goals is consistent with the desired organizational goal (Strong et al., 2014). To be successful in any change effort, the process must consider individual user goals that roll up to organizational goals. While the organization may have defined specific goals and objectives, expectations for outcome, and projected qualitative and quantitative concrete results, the individuals using the system may have very different ideas about what the system is being implemented for, how it will be utilized, what it will mean for them and their work, how they will use it, and the impact the change will have on their current practice. Organizations must think individually and act universally, taking this into account when planning, designing, and communicating overall system related goals internally and externally.

Actualizing organizational goals for a system wide EHR implementation requires alignment between the organization as the sponsor and promoter of a system-wide EHR implementation, with the practitioners (physicians, clinicians, providers) and others using the system. When investigating EHR enabled transformation of primacy care services, Findikoglu and Watson-Manheim (2016) found that goal alignment between those designing the system and the clinicians using the system influenced the outcomes of the EHR-enabled transformation. In the context of clinical integration, the PCPs interviewed at the study research site were enthusiastic about improving care coordination, and particularly appreciated the information available on their patients and ability to advocate and intervene to provide timely care for urgent issues. Broadly, individual PCP goals for care coordination were aligned with an organizational goal of clinical integration.

Strong et al., (2014, p. 73) describes consistency of actualization as assessing "the horizontal aggregation across individual actions or outcomes to capture how well the actions of individuals considered jointly serve to actualize organizational affordances." In our interviews, for example, we found that while all PCPs interviewed used the EHR to enter patient care notes and information, they entered data in varying levels of detail depending on the individual PCP experience. Additionally, some PCPs used scribes to enter patient information during an examination, thus facilitating the extent of capturing data, while other PCPs did not have access to or use scribes. Another area of consideration was access to EHR patient information. While all PCPs accessed patient information and data in the EHR, they did so with varying levels of EHR system knowledge resulting in differences in time accessing information, and differences in ability to search the system for information needed.

Strong et al., (2014, p. 73) describe the extent of actualization as, "how far the actualization process goes toward achieving desired organizational level immediate concreate outcomes". In the HC System we studied, the extent of EHR use to improve care coordination was realized to a workable level by the PCPs interviewed. Between RI and RII interviews, with additional training and experience, the actualization process appeared to progress further. Across the HC System, almost all divisions and departments were integrated with the EHR system. This enabled a single source of truth for the system facilitating data capture, data visualization, and data accessibility, leading the PCPs interviewed to comment on the important nature of the system-wide technology transformation. The features and functionality of the technical artifact enabled improved direct and indirect communication between PCPs and Specialists, in-patient physicians, and Emergency Department physicians. It significantly improved visibility to patient health care journeys and the sharing of knowledge and information between providers enabling somewhat better patient care.

In seeking greater clinical integration through more effective use of an organization-wide EHR, actualization is dynamic and continues over time. The drivers identified in Section 8.3 represent conditions or levers that can both enable and constrain continued actualization. For example, PCPs described how workload concerns (Driver #8) limited their opportunity to find time to optimize their use of the system. Both system inefficiencies as well as their own capabilities meant more time trying to sort to find priority items. Actions that help prioritize work (such as note templates that place key information first and seek out PCP input) are opportunities to mitigate this condition. Connecting with the value that PCPs express about technology and its

positive effect on care (Driver #5) presents an enabling opportunity for actualization. For example, the use of artificial intelligence (AI) and natural language processing (NLP) is an exciting new development for enhancing the EHR artifact that has come to the forefront in health care (Xu et al., 2022). New uses for these technologies are being considered to reduce search time for medical and clinical patient information, create letters for prior authorization, and other purposes, providing value to PCP work related to patient care. Use of AI has been and is being considered as a next step in the evolution of capability for the EHR. While it will introduce a learning curve, the extent of actualization may increase because PCP use of the EHR is heightened (and potentially that of other HC Providers). Consistency of use may still vary due to individual styles and practice but may become less of an issue with the introduction and incorporation of new technical artifacts such as AI into EHR capabilities.

8.4.3 Limitations and Opportunities for Future Research

There are limitations to the research developed in this study. First, our research included a sample of Primary Care Physicians who were part of the same health care system. Although there was a great deal of consistency in many of their responses to the questions asked, future research would benefit from a broader and deeper sampling in several dimensions.

First, future research should examine these research questions and others through the lens of Specialty Care Physicians, Hospitalists and physicians practicing in-patient medicine, Emergency Department Physicians, and other HC Providers. These questions should also be considered at a HC System level to obtain administrative perspectives. Such a study would most likely result in additional insights due to different working models and cultural considerations.

A second avenue for future work would be to interview additional PCPs and to follow up with the PCPs interviewed in this study. There is diversity in Primary Care practices and patient populations. For example, in a large HC system that has absorbed smaller regional networks, the PCPs originally affiliated with the smaller region might experience an organization-wide EHR differently. A longitudinal study could also provide additional insight and theory related to adjusted affordances (Meske et al., 2023), capturing changes in PCP perspectives in relation to ongoing HC System and technology changes.

Finally, it would be important to carry out a similar study in other health care systems, to examine how factors such as organization size and technology features impact the role of drivers

and clinical integration. Although the aim of other HC Systems may be similar in terms of outcomes, improving the access, quality, and delivery of patient care for example, each HC system is different. A cross-system comparison would generate understanding about how these differences influence our study results.

We did not use survey methods as a data collection technique. We felt that it was important to meet face to face, when possible, for PCP interviews. While we would have been able to reach a wider selection of PCPs through survey distribution, we elected to carry out interviews (both in person (RI) and virtually (RII) due to the global situation) to explore more open-ended research questions. The results of this study might be used to develop focused research propositions that could be explored in survey research, similar to the study by Qahri-Saremi et al. (2018).

9.0 Conclusions and Future Research

The overall goal of the thesis was to examine how an organization-wide EHR might enable clinically integrated care, from a primary care perspective. The insights reported in Chapter 8 raise the question of what is at the core of "integrated care." In Chapter 2, we developed a four-stage conceptual model describing how integration has evolved for healthcare systems in the United States. Systems have moved to become more vertically integrated, are increasingly technically integrated, and seek to achieve horizontal or clinically integrated care. However such integration is defined, is it even possible to achieve integrated care or is integrated care an aspiration that health care organizations are continually working to achieve?

Singer et al. (2020b, p. 205) writes, "Ultimately, integrated care is an aspirational feature of the American health system, particularly for the growing number of patients with complex needs that it serves (Singer et. al., 2020b, p. 205)." Singer goes on to write,

> *"Achieving this goal will require not only a comprehensive, theoretical understanding of integration, but also disciplined, systematic efforts to experiment, evaluate, and learn from initiatives that leverage supportive context, structures, and functions and that promote norms and relationships that foster processes to benefit and protect patients (Singer et al., 2020b, p. 205)."*

Some PCPs interviewed for this research raised the question of integrated care as an aspiration as well, when asked about the effectiveness of the HC System in delivering integrated or clinically integrated care. Some thought that the organization-wide EHR enables integrated care, others were positive while pointing out some of the challenges, and others were not sure. Their responses are telling in that some said they did not know. Yet even though they may not know, they did find that the HC System was good at it, represented by the following comments by one physician:

> *We would call ourselves that (a technically integrated system), but practically that's, I would say an aspiration rather than a reality. I mean that's just the reality of medicine.*
>
> *… I think we're quite good at it. I mean we won't say that we're not delivering integrated healthcare, but true integration requires more than just physicians practicing in an electronic healthcare record. I mean I think it requires a lot more thought, a lot more engagement of physicians, a lot more integration, and a lot more back and forth, time, resources, support for all of us to practice. So…it's like an aspiration. (RII, PCP 100)*

9.1 Conclusions

The implementation of an organization-wide EHR opened a new chapter in the evolution of the HC System in which our research was performed as well as changes for its HC Providers. It helped the HC System transform from siloed segments to a more technically integrated, more modernized system. Competing in health care today is difficult and challenging without an integrated system-wide EHR. Although EHRs have been available in various forms for decades, only in the past decade has it become a necessity for a healthcare site to implement one. In large part the volume of data available today is overwhelming. At the research site for this study, data generated from the HC System's patient-centered approach requires data repositories that can be shared access an integrated organization. Data from external HC systems is also needed. Today's EHRs enable integration across healthcare systems providing an even broader and deeper access to patient data. Physicians cannot be expected to deliver patient-centered care without full access to their patients' data and the EHR is the best means to be able to accomplish that goal currently.

We used a Grounded Theory approach in our research. We interviewed 10 primary care physicians (PCPs) at our research site in a first round of interviews in 2019, followed by a second round of interviews with 7 of these physicians approximately two years later. In RII interviews we focused on communication and care coordination based on analysis of RI interviews. While analyzing interview data, we also identified a fourth research question related to PCP engagement, based on interviewees' emotional connection to delivering better patient care.

Through in-depth analysis of these interviews, we learned about the enormous adjustments PCPs make to their role and to their practice of Primary Care with the implementation of an organization-wide, integrated EHR. While some aspects of care delivery remained similar, the integrated technology required major adjustments in three major areas for the PCPs we interviewed. These included inter-practice communication, care coordination, and physician engagement. Changes occurred across people, process, and technology in order to support the movement of Primary Care from a "stand alone" practice to a more integrated, visible health care partner within their HC System.

The implementation of a system-wide electronic health record system afforded PCPs with visibility and access to internal HC System information they had limited or no visibility or access to previously. It also afforded an improved, but limited level of visibility to patient information from

external providers. In many ways, this revolutionized the way PCPs needed to think about their role in the health care system, the way they practiced Primary Care, communicated with other physicians and health care providers, and with institutions within and external to their own HC System. The adjustments required thinking about their "world" differently, as their worldview was expanded by the increased access to data, to other providers, to other institutions, and to work now happening in "real time," as opposed to waiting hours, days, or weeks to access information if they were able to access it at all.

We found in our interviews that PCPs found value in the technical integration offered by an organization-wide EHR at HC System. They seemed to rate their skills in using the EHR objectively, acknowledging that they did not aspire to reach the highest level of skill and that the HC System did not expect them to reach it. They were comfortable with their current skill set and ability to learn more with experience using the EHR. They identified both the visibility of information they entered into the EHR and access to information on their patients' from other HC Providers to be of value. They acknowledged the EHR as a platform to improve patient care.

From a communication perspective, PCPs needed to learn a new technology and utilize the new technology – the Epic EHR system – to communicate about their patients, indirectly through the information in the system and directly with individuals. They found value in the timeliness and completeness of the patient information in the Epic system, from providers across the HC system including the ED and inpatient units. They developed new routines for accessing the additional data available to them and incorporating that data into the care they provided to their patients. They spent additional time thinking about what they wrote in notes to ensure understanding across the broader setting. Challenges included information overload from the volume of information they were copied on, as well as the clarity of the information due to 'note bloat.' They recognized the different practice cultures and business models in other parts of the organization (i.e., the ED) led to different ways that information was used; shared data through an EHR did not automatically improve communication processes. Through secure chat and the ability to copy charts with notes, the PCPs interviewed found that direct communication was significantly improved, supporting improved care when urgency was required.

From a care coordination perspective, we categorized findings related to people, process and technology. They considered care coordination as patient-centric, with 'care teams' not defined

by formal structures but rather by myriad patients' needs that changed over time. In the large HC System, they needed to connect with many other physicians on a wider and broader scale and trust in communication channels. They expressed that additional clarity around care coordination roles could be helpful. Given the accessibility and visibility into more data continued, the workload per PCP generally increased and PCPs needed to learn how to become proficient and efficient in their care coordination efforts using EPIC. They also found that the 'noise' of frequent care reminders in the system interrupted routines and visits. They appreciated secure chat and other newly introduced technologies that facilitated care coordination, describing an improved ability to manage urgent patient needs.

From an engagement perspective, PCP comments reflected areas positively related to engagement in the literature as well as challenges. The PCPs interviewed were enthusiastic about capabilities of the Epic system that supported improved care and told stories about new ways they used the system. The ability to directly communicate with other physicians to address questions and resolve issues such as those related to access created a sense of connectedness and agency. System improvements were directed at some key challenges and several interviewees described playing roles in ongoing EHR improvements. Overall, challenges linked to disengagement were also clear. Workload was a key issue. The HC System began to make demands on PCPs that previously were much more difficult to fulfill, including for example responsibility on a wider scale for reporting population health data and fulfilling other system-wide requirements for data and metrics. Frustrations with EHR functionality and usability were also expressed.

By looking across these findings, we captured themes that reflected different perspectives influencing how PCPs experience the EHR. These included consideration of the HC System view of Primary Care, the cultural impact of the HC System-wide EHR, Primary Care workload and specific Epic issues, the impact of working in an integrated HC System, the PCP's view of the role of Primary Care, the effect of Epic on PCP behavioral changes, and the PCPs view of the EHR.

Using grounded theory, we then sought to develop generalizable contributions to both theory and practice, which concentrated on how technical integration can support improved clinical integration. In terms of theory, we identified five affordances and dependencies between them. Affordance #5, coordinating care across providers and sites, directly leads to improved actualization of clinical integration. This affordance is dependent on communication,

engagement, and visualization affordances, which depend on the ability afforded by access and use patient data from a unified source. Coordinating care across providers and sites (Affordance #5) is enhanced by providers communicating effectively (Affordance 3) and the ability to visualize system and patient data (Affordance 2), which is only possible if data is accessible through a unified data source (Affordance #1), supported by PCPs and other HC Providers who are engaged (Affordance #4). While some of these affordances have been identified in the literature, engagement is a new affordance and we also posit the dependencies among them, which helps to support actualization.

We also identified drivers or conditions that influence actualization of the coordinating affordance and the goal of clinical integration. These include the increase in PCP workload driven by utilization and health care system demands, the increased visibility of the PCPs role in patient care, the recognition that the EHR promotes improved direct and indirect communication, the need for process and cultural change to support greater connection between formerly decoupled areas, the need to balance care coordination capability with resource availability across a health care system, the nature of PCP care coordination as patient-centric, the opportunity for engagement created by PCPs finding value in using the EHR, and the need to define expectations and support the central PCP role in care coordination. From a theoretical perspective these drivers provide guidance on the conditions that are important for actualization, providing an additional case study for exploring how actualization can occur as well as specific mechanisms that might be investigated further.

9.2 Recommendations and Future Work

We derived practical implications from our work mapped to five major insights, which are a significant outcome of this study. These were informed by the drivers we identified that influence actualization. These insights provide guidance and recommendations to other health care organizations considering the transformational journey from a siloed healthcare system to an integrated health care system using an organization-wide EHR.

First, we identified that PCP perspectives are important and should not be overlooked, given their key role in care coordination. PCPs need to be included in the entire life cycle of an organization-wide EHR transformation process, before, during and after implementation. Their

input provides the opportunity for dialog about priorities and issues related to more closely connecting areas that had previously been decoupled.

Second, implementing a system wide technology such as an EHR does not correlate to having a clinically integrated system, although it is a major component. In addition to the EHR, factors at the environmental and individual PCP level must be in place and aligned to support clinical integration. For example, referrals must have sufficient resources to support clinical integration and PCPs must find a balance between the requirements of the health care organization with their work delivering patient care.

Third, while the EHR supports communication and care coordination, it should not be relied on as the sole means of inter-personal or inter-practice communication. Serving as the overall coordinator of care for patients, PCPs communicate with other physicians in caring for their patients. This communication is facilitated by the EHR, Secure Chat, and other health information technologies for increased efficiency and productivity, but also requires trust, resources, and cultural norms that ensure responsiveness.

A fourth insight is that an organization-wide EHR transformation effort requires parallel use of organizational, cultural, behavioral, and financial levers. An organization-wide EHR requires personnel at all levels to include Primary Care and to think "system and system wide," instead of in silos and siloed thinking. Care delivery processes supported by the EHR need to balance standardization and recognition of individual practice styles, as well as responsive to the needs and requirements of individual patients.

The final insight is that the drivers we identified as enabling and constraining in moving a health care organization from technical integration towards greater clinical integration require customization. Each HC organization needs to understand these drivers within their own context, and tailor drivers and actions to fit the organization. Areas to consider proactively, among others, include establishing common health care organization-wide accepted definition of terms such as the meaning of clinical integration, key success measures, alignment on roles and responsibilities, and expectation setting for data entry into the EHR.

For future work, we recommend studies that follow the course of transformation over a longer period of time and in other health care systems. Asking similar research questions and adding one or two new ones can provide a pathway for understanding the extent of change and the longer-

term impact of an organization-wide EHR on Primary Care, and the effects on a healthcare organization overall as well. Another opportunity for future research would be to seek the perspectives of health care managers, in-patient Hospitalists, Emergency Department Physicians, and others in the HC System, whose experience using a system-wide EHR is likely different.

From a theoretical perspective, our work identifies key affordances related the goal of clinical integration and the implementation of an organization-wide EHR, introducing the affordance of physician engagement. Additionally, we described how the affordances identified are interrelated and dependent on each other for actualization. We also identified drivers or conditions that influence actualization. Longitudinal studies could explore how affordances change over time as a health care system changes and the EHR is optimized (Meske et al., 2023). The results of this study might also be used to focus on the role of specific drivers in actualization.

For our research site, PCPs interviewed shared recommendations for improvements to consider by the HC System. The areas they called out span a wide range of topics. Table 8-1 summarizes a partial list of their concerns regarding growth and evolution within the HC System and on a wider scale. Recognizing that many of these recommendations may be achievable only on a regulatory, legal, compliance, or quality level, we present Table 9-1 to share their thoughtfulness and insight.

Table 9-1: PCP Recommendations for Future Consideration

Topic Area	Primary Care Physician (PCP) Recommendation
Diversity, Equity, & Inclusion	• Expanded scope – More organization, wider capability for collaboration, recognition of patient differences • Capability to provide care coordination for individuals with disabilities • Improved capability to provide care coordination for patients with language difference
Information Exchange	• Improved capabilities to exchange information with HC Systems and Physicians external to the HC System • More facility to access PCP patient mental health information
Integration	• Greater integration with external payors • More access to other data sources and with other HC systems
Future Capabilities	• Look ahead to single “National EHR” similar to that of other countries • Improved capabilities to enhance care coordination within the HC System • Integrating acquired hospitals / organizations faster • Process improvement for referrals to facilitate needed appointments with additional resources needed to meet need and capacity

9.3 Reflection

This work was a true labor of love. The learning gained would be hard to come by through any other means. Qualitative research is different from quantitative research, yet it is equally important. Learning qualitative research using the Grounded Theory approach was a critical element of this research work.

It is important to share that the PCPs interviewed are all dedicated to their patients, to the HC System, and to their profession. They freely shared their responses to interview questions and made themselves available to complete this work. We are grateful to HC System for allowing us the opportunity to work with such dedicated PCPs and to Worcester Polytechnic Institute for their support in this effort.

The implementation of the Epic EHR in the HC System where our research was conducted was considered a major and positive step forward to achieving clinical integration by PCPs interviewed. They recognized that there would be continuous change as part of the HC System's evolution and development and that things would not always go as planned. When asked about the impact of Epic on patient care, one of the PCPs we interviewed made the following comment when asked, "Do you have any final comments for us in the areas we've spoken about today or anything else that you want to tell us about this implementation and the impact on the (HC) system?"

> *I think it's been the single most important change in patient care in my career, which is 43 years, it's truly revolutionized the way we take care of patients. Some of that might have been lost because of COVID and the drain that that put-on people, but I can't imagine how it would have been if we didn't have Epic. It would have been so much worse. (RII, PCP 20)*

10.0 Appendices

- Appendix A – Definition of Terms and Terminology Used in this Dissertation
- Appendix B – Round I Study Protocol & Physician Interview Instrument
- Appendix C – Round I Coding Scheme
- Appendix D – Round II Study Protocol & Physician Interview Instrument
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- Appendix G - Bibliography

Appendix A – Definition of Terms and Terminology Used in this Dissertation

The following terms are used in this study defined as described. Additional terms may be defined in other chapters of this document.

Term	Definition
Primary Care	Primary Care provides "preventive, diagnostic, and treatment services close to home. Primary care providers care for patients of all ages and coordinate referrals to specialty physicians (Health System website).
Primary Care Physicians	The research institution utilized in this study identified Internal Medicine, Family Medicine, Pediatric Medicine, and Geriatric Medicine under the category of Primary Care. For the purpose of this research, we worked with Internal Medicine and Family Medicine Physicians. • *Internal Medicine Physicians* - care for adults and seniors, "specifically the diagnosis and nonsurgical treatment of diseases and internal disorders" (Health System website). • *Family Medicine Physicians* – care for all family members, and some deliver babies, providing "comprehensive medical care with particular emphasis on the entire family. This includes newborn, pediatric, and adolescent care, adult medicine, geriatrics, and gynecological care" (Health System website).
Electronic Health Record System (also known as an Electronic Medical Record System)	Electronic Health Record Systems (EHR), also known as an Electronic Medical Record System (EMR), store medical information about a patient on a computer. The patients' electronic medical record may include information, "about a **patient's** health history, such as diagnoses, medicines, tests, allergies, immunizations, and treatment plans," and more (Google Reference to Definition of an EHR (EMR)
Epic Electronic Health Record System	Epic is a "cloud-based EHR solution catering to a number of specialties. The software is in use across a broad range of practices, from community hospitals and independent practices to multi-specialty hospital groups and hospice care providers" (Google Reference to Epic EHR System). In January 2019, "For the ninth-straight year, Epic Systems earned the title of best overall software suite and tops among physician practices (Murphy, 2019, p. 1). Epic has also won nine "Best in KLAS" awards (Murphy, 2019, p. 1). Epic as "Best in KLAS" is one of the reasons Epic was selected by the healthcare system according to physicians interviewed for this study.
Integrated Health Care System	Many definitions of integrated care, integrated healthcare services, and integrated healthcare systems exist in the literature today (WHO, Technical Bulletin No. 1, p. 1 and Valentijn et al., p. 3). The World

Term	Definition
	Health Organization defines integrated health services as delivering the "right care in the right place (WHO, Technical Bulletin, No. 1, p. 1)." Specifically, WHO defines integrated service delivery as, "the organization and management of health services so that people get the care they need, when they need it, in ways that are user-friendly, achieve the desired results and provide value for money (WHO, Technical Bulletin, No. 1, p. 1)." Valentijn et al. (2013) report key elements of primary care include first contact care, continuous care, comprehensive care, and coordinated care.[1] Integrated care models can include integration on different levels including horizontal, vertical, system, organizational, professional, clinical, functional, and normative (Valentinjin, 2013, p. 3)
Clinical Integration	*"the means to facilitate the coordination of patient care across conditions, providers, settings, and time in order to achieve care that is safe, timely, effective, efficient, equitable, and patient-focused" (AMA definition, https://www.aha.org/websites/2012-09-12-clinical-integration)*
Care	There are many aspects to patient care. AHRQ reports that, "Achieving the goal of delivering high-quality, high-value, patient-centered care to all patients requires multifaceted approach" (AHRQ Website). Care Coordination is one of many processes or aspects of delivering care. There are many others, for example, access to care, care continuity, shared decision-making, all which factor into accomplishing the goal of care delivery. In this study, we focus on care coordination and the impact of a system-wide implementation of an EHR on primary care's role in care delivery through coordination of care.
Quality	We use the Institute of Medicine definition of Quality for this study as follows - "The **Institute of Medicine** defines health care **quality** as "the degree to which health care services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge (Institute of Medicine Definition of Quality) The Institute further defines the following six areas as components of quality including safe, effective, patient-centered, timely, efficient, equitable. Terms defined in more detail here Institute of Medicine

Term	Definition
	Definition of Quality and here Six Domains of Healthcare Quality, IOM, 2001, AHRQ Website as follows: • **Safe**: Avoiding harm to patients from the care that is intended to help them. • **Effective**: Providing services based on scientific knowledge to all who could benefit and refraining from providing services to those not likely to benefit (avoiding underuse and misuse, respectively). • **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. • **Timely**: Reducing waits and sometimes harmful delays for both those who receive and those who give care. • **Efficient**: Avoiding waste, including waste of equipment, supplies, ideas, and energy. • **Equitable**: Providing care that does not vary in quality because of personal characteristics such as gender, ethnicity, geographic location, and socioeconomic status. Six Domains of Healthcare Quality, IOM, 2001, AHRQ Website
Care Coordination **(Also referred to as Coordination of Care)**	In a research report published in 2007, over 40 different definitions of care coordination were identified (McDonald et. al., 2007, Abstract). Additionally, care coordination means different things to different people depending on the context (AHRQ website). In this study, we use the definition of Care Coordination as defined by the Agency for Healthcare Research and Quality (AHRQ). "Care coordination is the deliberate organization of patient care activities between two or more participants (including the patient) involved in a patient's care to facilitate the appropriate delivery of health care services. Organizing care involves the marshalling of personnel and other resources needed to conduct all required patient care activities and is often managed by the exchange of information among participants responsible for different aspects of care (AHRQ Website). Electronic Health Care Systems such as Epic, are expected to provide improvements in the overall coordination of patient care.
Intra-Practice Communication	We define intra-practice communication to mean communication internal to the Primary Care Practice between physicians and clinicians, between physician(s) and staff, and between staff members. This includes communication through any means including verbal and

Term	Definition
	written information transmitted electronically, through an EHR or other means, or in written format.

Out of Practice Communication (External Communication)	We define "Out of Practice Communication" to be external communication between Physicians/clinicians and other physicians or clinicians who practice outside of a primary care practice. This includes, but is not limited to communication in any form, including use of the EHR system, electronic communication, or verbal communication.
	• Intra Practice Communication (Internal to Practice)
	  ○ Physician or Clinician communication within Practice <-> to other Physicians or Clinicians within the same practice
	  ○ Physician or Clinician within the Practice <-> Practice Staff
	  ○ Practice Staff <-> Practice Staff
	• Out of Practice Communication (External Communication within the Health Care System)
	  ○ Practice Physician (PCP) or other Clinicians <-> Outside of practice, Physicians or Clinicians
	  ○ Practice Physician (PCP) or other Clinicians <-> Outside of practice Specialty Physicians (Cardiology, Gastroenterology, Psychiatry, or other Medical Specialties)
	  ○ Practice Physicians (PCPs) or other Clinicians <-> Hospital or inpatient Physicians or Clinicians including the Emergency Department within the Health Care System
	• Out of Practice Communication (External Communication with other Medical Professional outside of the Health Care System)
	  ○ Practice Physicians or other Clinicians <-> non-associated hospital Physicians or Clinicians in other primary care of specialty clinical settings, inpatient hospital settings, including out of system Emergency Departments
	• Provider to Patient, Patient to Provider
	  ○ Primary Care Physicians or Practice Clinicians to Patients
	  ○ Patient Communication to Physicians or Clinicians in the Primary Care Practice

Appendix B – Round I Study Protocol & Physician Interview Instrument

Appendix B.1 – Round I Study Protocol

Impact of a System-Wide Electronic Health Record on Primary Care Delivery

Planned Time: 60 Minutes, Including Consent Process

Interview Protocol:

Organization Name: (HC System)

System name: Epic

Introduction

I. Introduce ourselves

II. (HC System) recently implemented a system-wide electronic health record (EHR) system, Epic. This was a major system change for primary care from the previous Allscripts implementation. During the Allscripts implementation, we interviewed physicians and other personnel, gathering data to understand the impact of this technology change for primary care. Our goal during this study is to explore the impact of the Epic EHR on primary care in an integrated health system. In particular, we are interested in learning more about the perspective of primary care physicians about the impact of a system-wide EHR. Specifically, we focus on the impact of Epic on information flow and exchange, including orders and referrals. Additionally, we want to learn more about physician perceptions related to integration and coordination of care given that primary care can access (HC system) system-wide patient care information.

III. Review Consent Form. Be sure to emphasize that they can stop the interview at any time or choose not to answer questions they are uncomfortable with.

IV. During the interview, we will focus on what your work entails now, how it has changed, and how you expect it to change in the future. You may not have answers to all the questions, which is fine.

V. Review roles that we will play during the interview.

Appendix B.2 – Round I Physician Interview Instrument

Practice Improvements, and Background Information (5 minutes)

1. **Aside from the EPIC EHR implementation, what changes have been made within your practice in the past year or two to change how you deliver care?**
   - **[Flow and Process Change]** Staffing, patient flow, physical changes/renovations? Process changes, simplification, use of Lean?
   - **[Population Health]** Use of patient care registries or other population health management tools? Centered Medical Home? Participation in collaboratives? Clinical guidelines?

Information on Physician's Background (10 minutes)

2. How many years have you been practicing medicine?
3. Can you tell us about your patient panel (complexity, types of patients, size)?
4. How long have you been working at (employed by) (HC System)?
5. Tell us about your experience working at (HC System).
6. Prior to using the Epic Electronic Health Record System, what methods did you use to capture patient information? For example, were your experiences paper-based, other EHR systems?
7. What electronic health record systems have you used prior to using Epic?
8. If you used electronic health record systems prior to Epic, can you tell us what your experiences were like?
9. What was your involvement with Epic through the implementation process at (HC System)?
10. On a scale of 1 to 10, with 10 representing the highest level of proficiency using Epic and 1 representing a low level of proficiency using Epic, can you tell us where you fall in terms of Epic proficiency today?

Epic Effect on Physician Work (15 minutes)

11. In October 2017, (HC System) implemented the Epic EHR system-wide. How is that going?
12. What do you like best about Epic and why?
13. What do you like least about Epic and why?
14. What impact or changes has the Epic implementation had on how you deliver primary care?
    - **[Decision-making]** How does Epic affect your decision making related to delivery of patient care?
    - **[Data]** What changes do you find with Epic in your ability to access patient care information?
    - **[Tasks]** What tasks has Epic added to your day that you did not have to perform before?
    - **[Roles]** Do you do work now that others used to do? Is there work others now do that you used to do?

15. **What features and functionality of Epic help you the most in delivering patient care?**
    - **[Features]** What features are most important for delivering primary care?
    - **[Patient complexity]** Does Epic help you manage patient variability and complexity?
    - **[Flow sheets]** Are you using templates and flow sheets?

16. What are the major differences between your use of Allscripts and Epic, if any?

- **[Examples]** Usability, features, functionality, etc.?

17. What improvements are needed so that Epic can help you deliver better care?

18. How has Epic affected your workload?

- **[Allscripts]** Are you spending more, less, or about the same amount of time in Epic compared to Allscripts?

Epic Impact on the System and Primary Care Offices (10 minutes)

19. What impact, if any, did the implementation of Epic have on your practice/office over the past few months?

- **[Benefits]** What would you say is working well with the implementation of Epic for your practice?
- **[Barriers]** What would you say are areas of opportunities, areas that are not working well, with the Epic implementation for you and your practice?
- **[Workflow]** How well does Epic fit the workflow in your practice? What workflows worked well and what did not work well?
- **[Communication]** How have your interactions with other providers and staff in your practice changed?

20. What do you think of ePrescribing and order entry?

21. What impact has the system-wide use of Epic had on primary care provision?

- **[Data Availability]** Ease of finding data in the system? Type of data now available? The usefulness of data for use in patient care?
- **[Quality]** Has the Epic implementation impacted quality of care? i.e., improve, reduce, or remain unaffected. What is an example of a change in quality of care due to Epic? What specifically does Epic allow you to do to produce that change in quality?
- **[Care Coordination] Has** Epic impacted the coordination of care for patients throughout the system?
- **[Productivity]** How has Epic affected you and your staff's productivity?
- **[Satisfaction]** How has Epic affected you and your staff's satisfaction? How has Epic affected your patients' satisfaction with overall delivery of care?

Impact of Epic on Provider-to-Provider Communication (10 minutes)

22. Since the implementation of Epic, how has your communication or interaction with the Emergency Department regarding your patients changed?

- **[ED Visits]** What do you learn and when about your patients' ED visits, results of those visits, hospital admission, hospital stays, and readmissions? Has this changed with EPIC?
- **[Access to Records]** Does having access to ED records impact your provision of care?
- **[Reverse Communication]** Have you been consulted by the ED about your patients over the past six months?

23. Since the implementation of Epic, how has your communication with other clinics or specialty care providers changed?

- **[Other visits]** What do you learn and when about your patients' visits to other clinics or specialty care provider visits, results of those visits?
- **[Within/Outside System]** How does this communication differ for clinics/providers within the (HC System) and those outside the system?
- **[Access to Records]** How does having access to other clinics or specialty care provider records impact your provision of care? How and in what ways?
- **[Reverse communication]** Have you been consulted by other clinics or specialty care providers about your patients over the past six months?

24. How has Epic impacted referrals?

- **[Referrals to others]** How has Epic impacted your ability to refer patients to others within the (HC System) ?
- **[Referrals from others]** How has Epic impacted referrals to your practice from others?

Impact of Epic on Communication with Patients (5 minutes)

25. How has the Epic implementation impacted your communication with patients?

- **[Office Visits]** Has Epic changed communication with patients during office visits?
- **[Other channels]** How has Epic impacted you or your practice's ability to communicate with patients outside of office hours?
- **[Time]** Do you spend more/less/about the same amount of time communicating with patients directly? Do others in your practice spend more/less/about the same amount of time communicating with patients directly?
- **[Limits]** What limits your communication?

26. What value do you find in using MyChart (the patient portal)?

- **[Patient Satisfaction]** Has patient satisfaction increased with the introduction of MyChart?
- **[Benefits] What** are the benefits of MyChart for the patient?
  (Lab results, scheduling appointments, prescription refills, email questions, requesting forms)
- **[Communication]** Do you see MyChart enhancing communication between providers and patients?
- **[Health Effect for Patients]** Do you think there has been an increase in patient knowledge and understanding of their health? Does this support patient centered care? Have patients become more accountable for their own health?

Long-Term Benefits (5 Minutes)

27. What do you think are the long-term benefits of the Epic EHR implementation for you and for your office, if any?

28. What do you think are the long-term benefits for the system-wide Epic implementation within (HC System) as a whole? How would you measure the benefits?

29. Do you have any final comments?

Appendix C – Round I Coding Scheme Used: Codes Used 1 - 8

Theme	Code and Example Phases to Code
1	**Communication** Communication covers a wide variety of areas including general communication, communication with different departments, with the Emergency Department, with other physicians, patients, specialists, office staff, and the use of MyChart to electronically communication with patients
1a	*Communication General* General communication covers comments made related to information exchange for any reason not specifically focused at a specific audience or group of people
	Communication
	Admittance and Discharge
1b	*Communication with ED* Any type of communication verbal, written, in any form is covered under Communication with the Emergency Department or Emergency Room
	Communication between Practice and ED
	ED Consult with PCP
	Epic and Communication with the Emergency Department (Room)
	Epic and ED Paperwork
	Messaging from ED
	Patient visits with the ED
1c	*Communication with Other Physicians* Any type of communication verbal, written, in any form between Primary Care Physicians and other Physicians including but not limited to other Primary Care Physicians, Specialists, inside or outside the (HC System)
	Correspondence from other physicians
1d	*Communication with Patients* Any type of communication verbal, written, in any form between Primary Care Physicians and patients and impact on communication with patients
	Changes in communication with patients
	Epic and Communication w/Patients
	Has Epic changed how you communicate with patients
	Time in Practice Seeing Patients
1e	*Communication with Specialists* Any type of communication verbal, written, in any form between Primary Care Physicians and Specialists including inside or outside the (HC System)
	Messaging from Specialist
	Specialist consultations
1f	*Communication with Staff* Any type of communication verbal, written, in any form between Primary Care Physicians and their office staff within their practice
	Communication with staff
1g	*MyChart* Any comment referencing the use of MyChart as a way of communicating directly with patients either utilized by Primary Care Physicians and/or their office staff communicating with patients and/or communication initiated by patients to their PCPs
	Epic and Patient Portal
	How many messages; portal messages would you get like in a day

Theme	Code and Example Phases to Code
	What do you like about Patient Portal
2	**Epic Electronic Health Record System** Comments related to Epic Electronic Health Record System should be coded under this category
2a	*Epic General* Comments related to Epic that are general in nature, or include differences between Epic and other EHR systems, or about Epic in a very general nature
	Differences Between Epic and Allscripts
	Epic built originally for
2b	Issues the interviewees cite about their use of Epic in any way that prevent them from using Epic or areas of Epic that need improvement
	Issues with Letters
	Issues with Practice Type and Patients
	Epic Usability
	Needs improvement
3	**Epic Impact on (HC System)** Comments about Epic adoption, benefits of using Epic, Epic effect on coordination of care, impact on the Healthcare System
3a	Adoption of Epic Factors involved in the selection of the Epic system, including criteria, reasons for selecting Epic over competitive systems, etc.
	Skill in Using Epic Using Epic and skill in being able to use it
3b	Benefits of Using Epic Benefits cited for using Epic including examples of where Epic is different, better that previously used systems or technologies
3c	Coordination of Care Comments related to use of Epic to coordinate care either positively or negatively; reasons why Epic is useful/not useful for care coordination; patient care, coordination of patient care, quality of care
	Patient care
	Coordination of patient care; quality of patient care
3d	Impact on Healthcare System Comments related to overall impact of Epic on delivery of care in the healthcare system as a whole
4	**Epic Implementation at (HC System)** Comments about Epic related to patient care, Epic implementation issues, changes that PCPs would make with Epic, how they learned Epic, what implementation was like for them, what could have been done differently that would have made a difference
4a	*Patient Care* Comments on Epic and patient care, quality of care, coordination of care
	Patient care
	Patient care; coordination of care; quality of care
4b	*Epic Implementation* Comments around their use of Epic, how it was rolled out, what would they change, what they would have done differently with the Epic implementation
	How did you come up to speed

Theme	Code and Example Phases to Code
	How was it rolled out (initial training and Sprints)
	If you could change one thing about the implementation, what would you change?
	Implementation of Epic
	Participation in Epic Training
	Preparation for EPIC implementation
	SPRINT
	Support from IT
	Support from the (HC System)
	What else would you have done differently
	Where they fell short in Epic preparation
5	**Impact of Epic on Primary Care** Overall impact of Epic on primary care delivery, quality of care, behavioral changes PCPs have made using Epic, other impact Epic has had on practice of primary care medicine
5a	*Changes using Epic* What specific changes have PCPs made while learning and using Epic include behavioral changes; what have they noticed in their patients' behavior, how they work with each other, their staff, etc.
	PCP Behavioral Changes w/patients
	Perception
	Physician perspective
	Behavior changes in patients
	Mindset issue Time wasting (outside activities rather than spending time with Epic)
	Changes in Care Delivery
	Changes in PCP Work
	Changes in Practice
5b	*Impact on Primary Care* What has the impact of Epic been on primary care in general in any area
	Epic Impact on Primary Care
	Impact Epic has/has not made on practice of Medicine in Primary Care Practice
	Impact on reducing call volume or visits
	Impacts or changes Epic has had on your delivery of care
	Improved patient care
	In the past year or two that impact delivery of care
	Impact to patients
5c	*Epic - Like Best* Anything physicians pointed out that they liked best about Epic
	Epic working well
	No wait time any more for results
	What else do you like about Epic?
	What's best about Epic
5d	*Epic - Like Least* Anything physicians pointed out that they like least about Epic
	What do you like least about Epic
	Referrals

Theme	Code and Example Phases to Code
5e	*Epic – Patients* *Anything physicians told us about what their patients like about Epic*
	What patients like
5f	*Epic and Care delivery* *Anything physicians told us about the impact of Epic on care delivery*
	Quality of care
	Relative to decision making relative to patient care;
	Epic and decision making related to delivery of care
	Why not so good in Primary Care?
	How much of a difference has mobility made?
5g	*Epic Tools* *Comments physicians made about any of Epics tools, use of tools, issues with tools*
	Access to Tools
	After visit summary
	Alerts
	Med list
	Media Manager
	e-Prescribing
	E-Prescribing and Order Entry
	Features & Functionality that help in delivering patient care
	Forms processes
	Imaging studies
	Lab orders
	Medication list
	Medications
	Mobility
	Mobility and use of EHR
	Mobility and Use of Epic
	Order entry
	Ordering
	Patient privacy issues
	Referrals
	Risk Profile
	Smart Phone and iPad
	Sorting - works
5h	*Physician Workload* *Comments made related to physician workload; how Epic has impacted their workload; examples of how Epic increased or decreased their workload*
	Electronic burden
	Epic and Physician Workload
	Everything takes time - Time spend to do work
	Examples of in basket clean up (Behavioral Issues)
	Examples:
	How did it affect you

Theme	Code and Example Phases to Code
	Impact to workload
	Non billable time
	Not billable time
	Physician Workload Increase
	Physicians feel about Epic?
	Primary care and inbox issues
	Time spent with Allscripts and with Epic
	Use of templates
	What about everyday activity
	Where is the majority of the additional time being spent
	Working more
	Workload
	Would you use another system?
	Office flow and office workflow
	Personalization vs. Standardization
5i	*Epic and Processes* *Comments on process changes brought about by the Epic implementation*
	Process changes
	Process implications, use of lean, other changes; staff changes
	Standardizing
6	**Lessons Learned from (HC System) Epic Implementation** Comments made related to physician workload; how Epic has impacted their workload; examples of how Epic has increased or decreased their workload
6a	*Lessons Learned* What lessons Physicians learned about having Epic, not having Epic; was it better before Epic or after Epic implementation; how has Epic affected their lifestyle; any thoughts on Epic 18 months after go live
	Having it vs. not having Epic
	Is this going to change?
	Lifestyle Issues
	Pass onto another institution
	Thoughts on Epic 18 months after Go Live
6b	*Longer Term Benefits of Epic* What do the physicians think about the longer-term benefits of Epic; where will it add value; how will it make a difference in overall primary care delivery; how will the value be measured
	Long Term Benefit of Epic
	Long term effects of Epic
	Measuring long term benefit of Epic
	Permanence of EHR
	Health Maintenance
	Analytics and Measuring Benefit/Value
	Coming Closer to a Perfect System
7	***Physicians and their Practices***

Theme	Code and Example Phases to Code
	Characteristics of the physicians interviewed; what can we learn from who they are, where they practice, what type of practice they have; how long they have been practicing, their involvement in the healthcare system etc.
7a	*Physician Characteristics* Characteristics of physicians interviewed, their level of experience with Epic, their self-rating of proficiency with Epic
	About the Physician Interviewed
	Experience with prior EHR systems
	Gender
	Participation in Committees
	PCP Name De-Identified
	Self-rating of Proficiency w/Epic (Scale of 1-10, 1-less; 10-best)
	When the Interview Took Place
	Where Interview Took Place
	Years practicing medicine
	Years practicing medicine at (HC System)
7b	*Practice Characteristics* Characteristics of their practices, changes in their practices during the past year or so, characteristics about their practices; patient panels, type of practices, etc.
	Practice change - Characterizing practice as a "Change Practice"
	Epic and type of practice
	Medical Practice Information
	No. of physicians in practice
	Number of Patients
	Other practice considerations
	Panel composition
	Patient Panel
	Staffing
	Type of Practice
	Type of Primary Care Practice
8	**(HC System) Selection of Epic** About the selection of Epic for implementation at (HC System); why the organization moved to Epic, about Epic in general
8a	*Epic Selection* Why did (HC System) select Epic
	About Epic
	Why Epic was selected
8b	*State of Medical Practice* *Comments about the state of medical practice in this day and age*
	Complexity of medicine
8c	*Why move to Epic*
	Primary driver behind change from Allscripts to Epic
	Selection

Appendix D – Round II Study Protocol & Physician Interview Instrument

Appendix D.1 – Round II Study Protocol

Interview Protocol for Physicians Round II

Impact of a System-Wide Electronic Health Record on Primary Care Delivery

Exploring the Capability of Organization Wide Electronic Health Record System

to Enable Clinically Integrated Care

Planned Time: up to 60 Minutes, Including Consent Process

Interview Protocol:

Organization Name: (HC System)

System name: Epic

Introduction

I. Introductory comments – Since we last spoke in 2019 – 2020, a lot has happened within the health care system and globally. We very much appreciated your meeting with us for our research work and wanted to follow up to understand your current perspective on your use of Epic related to inter-practice communication and care coordination.

II. During our last interview (2019 – 2020 timeframe) (HC System) had recently implemented a system-wide electronic health record (EHR) system, Epic. This was a major system change for primary care from the previous Allscripts implementation. Our goal at that time was to understand your perspective on the impacts of changing to a system-wide EHR like Epic. In this interview we will focus on how Epic may have enabled inter-practice communication and care coordination capabilities for Primary Care Physicians.

III. During the interview, we will focus on what your work entails now, how it has changed, and how you expect it to change in the future. You may not have answers to all the questions, which is fine.

IV. Review roles that we will play during the interview.

V. Review consent form. Be sure to emphasize that they can stop the interview at any time or choose not to answer questions they are uncomfortable with and how interview data will be handled.

VI. Seek consent to begin recording and ask for verbal consent.

Appendix D.2 Round II - Physician Interview Instrument

Physician Interview, Round II (Planned Time: 60 Minutes)

Enabling Inter-practice Communication (10-15 minutes)

1. **The EPIC EHR has been in place for several years. What do you consider the most significant areas of changes (positive and negative) it has made to your ability to communicate with other health care providers?**
   - **[What]** What is communicated: patient data, recommendations for patient care
   - **[How]** How it is communicated: in person; through use of electronic health record system (EHR); virtually; or electronically in any form (telephone, digital, etc.)
   - **[COVID]** If Covid comes up, refocus on inter-practice communication

2. **Since the implementation of Epic, how has your communication or interaction with the Emergency Department regarding your patients changed?**
   - **[ED Visits]** What do you learn and when about your patients' ED visits, results of those visits, hospital admission, hospital stays, and readmissions? Has this changed with EPIC?
   - **[Access to Records]** Does having access to ED records impact your provision of care?
   - **[Reverse Communication]** Have you been consulted by the ED about your patients over the past six months?

3. **Since the implementation of Epic, how has your communication with other clinics or specialty care providers changed?**
   - **[Other visits]** What do you learn and when about your patients' visits to other clinics or specialty care provider visits, results of those visits?
   - **[Within/Outside System]** How does this communication differ for clinics/providers within the (HC) system and those outside the system?
   - **[Access to Records]** How does having access to other clinics or specialty care provider records impact your provision of care? How and in what ways?
   - **[Reverse communication]** Have you been consulted by other clinics or specialty care providers about your patients over the past six months?

4. **In what ways might Epic have improved understanding/interpretation between different providers about patient care? Limited or confused understanding?**

Enabling Care Coordination (15-20 minutes)

5. **What do you consider the most significant areas of changes (positive and negative) the Epic system has had on your ability to coordinate patient care?**
   - **[Definition]** Care coordination is a set of activities or plan for patient care that occurs over time **[Longitudinal]** and across settings, involving members of the care team, the patient and their family, and others

- **[Mechanisms]** How has EPIC changed the ways you coordinate care?

6. **What are some challenges you face in coordinating care?**
   - **[Factors]** What factors influence whether it is easier or more difficult to coordinate care?
   - **[Patient Situation]** In what ways does care coordination vary by patient (e.g., acute, or chronic)?

7. **How has Epic changed your ability to coordinate patient care with other providers?**
   - **[Specialty providers]** What differences have you noticed in your ability to coordinate care with other Specialty Providers within the system and outside of the system?
   - **[With ED]** How has Epic affected your ability to coordinate care with the ED?
   - **[With In-patient]** How has Epic affected your ability to coordinate care with in-patient (hospital)?

8. **How do you manage the many "care" teams you may be part of?**
   - **[Number]** Approximately many other providers do typically coordinate care with are a particular time?
   - **[Time]** How do you manage relationships over time?
   - **[Length of time]** What is the typical duration of care teams, total elapsed time over which care teams' function?

9. **What role(s) do you find most often on care teams you participate in?**
   - **[PCP Roles]** What role do you find yourself playing?
   - **[Care Team Member Roles]** What role do you find others on the care team expect you to play

10. **What role(s) do you find patients play in their care coordination?**
    - **[Patient Roles]** What role(s) do you find patients most often play?
    - **[Family Roles]** What roles do you find patients' families playing?

11. **What role(s) does the health care organization (HC System) play in care coordination?**
    - **[Current Roles]** In what ways does the system support care coordination, through mechanisms (like care coordinators) or processes (like referrals)? Limit care coordination?
    - **[Desired Roles]** What role would you like the system to play in care coordination?

12. **How does Epic or other electronic technology enable or constrain care coordination?**
    - **[Current]** In what ways does Epic support care coordination? Limit care coordination?
    - **[Improvement]** How might technology better enable care coordination?

Moving to a Clinically Integrated System (10 minutes)

13. **Would you say that today, (HC System) is a technically integrated system?**

- **[Technical Integration]** Would you consider (HC System)“ technically integrated” because information and data flow across the system, whereas previously information and data flowed vertically?
- **[Improvements]** What improvements would you recommend for the Epic implementation?

14. What changes would you say the implementation of Epic has brought to the ability to work horizontally across (HC System)?

- **[Horizontal]** How has Epic made a difference in your ability to exchange information horizontally across the organization?
- **[Vertical]** How has Epic made a difference in your ability to exchange information vertically (e.g., within Primary Care)?

15. In what ways is (HC System) effective in delivering clinically integrated care?

- **[Definition]** The American Medical Association (AMA) describes clinical integration as “the means to facilitate the coordination of patient care across conditions, providers, settings, and time in order to achieve care that is safe, timely, effective, efficient, equitable, and patient-focused.”
- **[People]** How might some of the following people-oriented factors support clinical integration: organizational structure, defined roles and responsibilities, trust, communicating across the system?
- **[Process]** How might some of the following process-oriented factors support clinical integration: support for a team-based approach, standardized record keeping and reporting systems, referral processes?
- **[Technology]** How might some of the following technology-oriented factors support clinical integration: implemented system wide, support for upkeep and maintenance, ongoing training, and support, shared key performance indicators?

16. What elements need to be improved for (HC System) to deliver clinically integrated care?

Changes Since First Interview (2 minutes)

17. Please describe any significant changes in your patient panel over the past two years.

- **[Patient Panel]** Complexity, types of patients, size

18. On a scale of 1 to 10, with 10 representing the highest level of proficiency using Epic and 1 representing a low level of proficiency using Epic, can you tell us where you fall in terms of Epic proficiency today and why?

Concluding Questions (5 Minutes)

19. Are there other changes that have impacted communication and care coordination?

Do you have any final comments

Appendix E – Round II Coding Scheme Used: Codes 9 – 17

Code	Code and Example Phrases to Code
9	**Epic Impact and Enablement of Inter-practice Communication** The Epic EHR has been in place for several years. Use this code series to identify significant areas of change (positive and negative) in PCP ability to communicate with other health care providers, the ED, other clinics, or specialty providers; health care providers outside the (HC System)
9A	*Epic Impact on Inter-practice Communication - General comments physicians have made regarding most significant areas of changes (positive and negative) Epic has made to their ability to communicate with other health care providers*
9A-1	Areas of positive changes Epic has made on inter-practice communication
9A-2	Areas of negative impact Epic has made on inter-practice communication
9B	*Type of data communicated - Any type of data, patient data, recommendations for the patient*
	Patient data
	Recommendations for patient care
	Other types of data
9C	*How the data is communicated - Comments regarding how data is communicated; through the EHR, virtually, electronically in any form, telephone calls, digital, etc. preferred methods of communication, impact on inter-practice communication*
9C-1	Improvements in data communication
9C-2	In person
9C-3	Medical record in the EHR
9C-4	Other means (email, phone, fax)
9C-5	Secure Chat
9C-6	Telehealth
9C-7	MyChart
9D	*Communication with the Emergency Department - Since the implementation of Epic, any ways in which PCP communication or interaction with the ED regarding patients has changed*
	What do the PCPs learn and when do they learn it about their patient visits to the ED, results of those visits, hospital admissions, hospital stays, readmissions
	Has this changed with the Epic implementation compared to pre-Epic or even a few years ago
	Does having access to ED records through Epic impact the PCP provision of care
	Consults from the ED where the ED may have reached out to speak to the PCP either electronically (through Epic) or by phone regarding their patient when in the ED
	How does having access to ED records impact PCP provision of care
	Outreach from the ED to PCP - Has the PCP been consulted by the ED about their patients over the past six months
9E	*Communication with in-patient (hospital) - Since the implementation of Epic, ways in which Epic has changed PCP communication with in-patient (hospital)*
	What do the PCPs learn and when do they learn it about their patient visits to in-patient (hospital), results of those visits, hospital admissions, hospital stays, readmissions
	Has this communication with in-patient (hospital) changed with the Epic implementation compared to pre-Epic or even a few years ago
	Does having access to in-patient (hospital) records through Epic impact the PCP provision of care
	Consults from in-patient (hospital) where inpatient (Hospitalists or other HCPs) may have reached out to speak to the PCP either electronically (through Epic) or by phone regarding their patient when in in-patient care (hospital)
	How does having access to in-patient (hospital) records impact PCP provision of care

Code	Code and Example Phrases to Code
	Outreach from the inpatient (hospital) to PCP - Has the PCP been consulted by the in-patient (Hospitalists or other In-patient HCPs) about their patients over the past six months
9F	*Communication with other clinics or specialty care providers within the system - Since the implementation of Epic, ways in which Epic has changed PCP communication with other clinics or specialty care providers*
	What do PCPs learn and when do they learn about their patient visits to other clinics or specialty care provider visits
	How has Epic impacted these communications - (e.g., how have electronic medical records replace some of the need for other types of communication)
	How does communication differ for clinics/providers within the (HC System) and those clinics/providers outside the system
	How does having access to other clinics or specialty care provider records through Epic impact their ability to provide patient care
	Have the PCPs been consulted by other clinics or specialty care providers about their patients over the past six months
9G	*Communication with external providers outside the system*
	What do PCPs learn and when do they learn about their patient visits to external providers outside the system
	How has Epic impacted PCP communication with external providers outside the system
	How does communication differ for clinics/providers within the (HC System) and those external providers outside the system
	How does having access to patient records from external provider outside the system through Epic impact PCP ability to provide patient care
	Have the PCPs been consulted by other external providers about their patients over the past six months
9H	*Epic improving understanding/interpretation about patient care - Descriptions of ways in which Epic facilitated or impeded understanding/interpretation between different providers about patient care.*
	Ways in which Epic improved or enable communication between different providers about patient care
	Ways in which Epic help make communication more understandable
	Ways in which Epic made communication more confusing
10	**Epic Impact on Care Coordination** Use this code series to identify significant areas of change (positive and negative) in PCP ability to coordinate care with other health care providers, the ED, other clinics, or specialty providers; health care providers outside the (HC System)
10A	*Definitions of Care Coordination*
	Definitions of care coordination as described by the PCPs interviewed
10B	*Positive changes on PCPs ability to coordinate patient care (Epic & non-Epic)*
	Benefits associated with data/information (Availability is a benefit)
	Improvements in care delivery process
	PCP comments about care coordination across settings
	PCP comments about involving members of the care team
	PCP general comments about involving the patient and their families
	Other positive changes
10C	*Challenges to PCPs ability to coordinate patient care (Epic & non-Epic)*
	Challenges with data/information (Bloat, difficulty finding information, too much information, not well organized)

Code	Code and Example Phrases to Code
	Challenges with care delivery process
	Challenges with care coordination across settings
	Challenges with care coordination involving members of the care team
	Challenge in care coordination involving patients and their families
	Other challenges
10D	*Epic impact on PCPs ability to coordinate patient care with other providers - Use this code series to identify ways in which Epic has changed PCPs ability to coordinate patient care with other providers within the (HC System)*
	Changes in PCPs ability to coordinate care with other Specialty Providers within the (HC System)
10E	*Epic impact on PCPs ability to coordinate patient care with external providers - Use this code series to identify ways in which Epic has changed PCPs ability to coordinate patient care with other providers outside the (HC System)*
	Changes in PCPs ability to coordinate care with other Specialty Providers outside the (HC System)
10F	*Epic impact on PCPs ability to coordinate patient care with the ED - Use this code series to identify ways in which Epic has changed PCPs ability to coordinate patient care with the Emergency Department*
	Differences in PCPs ability to coordinate care with the Emergency Department within the (HC System)
	Differences in PCPs ability to coordinate care with the Emergency Department outside the (HC System)
10G	*Epic impact on PCPs ability to coordinate patient care with in-patient - Use this code series to identify ways in which Epic has impacted PCPs ability to coordinate patient care with the in-patient (Hospitalist HCPs) within and external to the* (HC System)
	Changes in PCPs ability to coordinate care with the Emergency Department within the (HC System)
	Changes in PCPs ability to coordinate care with the Emergency Departments outside the (HC System)
11	**Epic impact on PCP work with Care Teams** Use this code series to identify ways in which PCPs work with care teams and how Epic has impacted their role in patient care coordination
11A	*PCP's ability to work within care teams - Understanding of the ways in which PCPs participate in care teams and composition of care teams*
	How PCPs describe their work with the many "care teams" they may be part of
	How PCPs manage relationships with others taking care of their patients
	Number of care teams a PCP might work with at any given time and how long they may last
	Descriptions of care teams, typical duration of care teams, total time over which care teams may function
11B	*PCP's role within care teams - Understanding of the ways in which PCPs participate in care teams and composition of care teams*
	Role PCPs see themselves playing on care teams they are involved with
	How PCPs think others of the care teams expect them to play
	How PCPs manage conflicts between other care team HCPs
11C	*Role PCPs find their patients and patient's family play most often on care teams - Understanding of roles PCPs find their patient's play in their care coordination*
	Roles PCPs find their patient's play most often in their own care
	Roles PCPs find their patient's families playing in their family member's care

Code	Code and Example Phrases to Code
11D	*Role the health care organization (*HC System) *plays in care coordination - Understanding expectations PCPs may have for the* (HC System) *to play in care coordination*
	Expectations PCPs have for the (HC System) to play in coordinating patient care
	Positive contributions (HC System) plays in patient care coordination
	Areas where PCPs would like the (HC System) to play a larger role
11E	*Impact of Epic or other electronic technology in constraining care coordination - Understanding from the PCP perspective the effect of Epic or other electronic technology to enable delivery of care coordination services*
	Ways in which Epic or other electronic technology enables care coordination
	Ways in which Epic enables delivery of care coordination
	Ways in which Epic might better enable care coordination
11F	*Impact of Epic or other electronic technology in enabling care coordination - Understanding from the PCP perspective the effect of Epic or other electronic technology to constrain delivery of care coordination services*
	Ways in which Epic or other electronic technology constrains care coordination
	Ways in which Epic constrains delivery of care coordination
	Ways in which Epic might improve current constraints on care coordination
12	**Moving to a Clinically Integrated System** Use this code series to understand more about how PCPs think about technical integration and clinical integration within (HC System)
12A	*PCPs understanding of what a clinically integrated system means*
	PCPs perspective on what a clinically integrated system is
	PCPs perspective on what a clinically integrated system is not
12B	*Consideration of whether* (HC System) *is a technically integrated system - PCP perspective*
	PCP's thoughts on (HC System) as a technical integrated system due to information and data flow across the system
	PCPs thoughts on previous state at (HC System) where information and data flowed vertically (siloed)
	Improvements PCPs recommended for the Epic implementation
12C	*PCPs perspective on changes the implementation of Epic has brought to the ability to work horizontally across* (HC System) - *PCP perspective*
	Differences Epic made in PCPs ability to exchange information horizontally across the (HC System)
	Differences Epic has made in PCPs ability to exchange information vertically (e.g., within Primary Care)
13	**Effectiveness of (HC System) in delivering clinically integrated care** Use this code series to identify ways in which (HC System) is effectively delivering clinically integrated care and areas for improvement from the PCP perspective
13A	*Definition of clinical integration - AMA definition of clinical integration as, "the means to facilitate the coordination of patient care across conditions, providers, settings, and time in order to achieve care that is safe, timely, effective, efficient, equitable, and patient-focused"*
	PCPs perspective on what a clinically integrated system is
	Ways in which people-oriented factors support clinical integration: organizational structure, defined roles and responsibilities, trust, communicating across the system
	Ways in which process-oriented factors support clinical integration: support for a team-based approach, standardized record keeping and reporting systems, referral processes

Code	Code and Example Phrases to Code
	Ways in which technology-oriented factors support clinical integration: implemented system-wide, support for upkeep and maintenance, ongoing training, and support, shared key performance indicators
14	**Elements requiring improvement for (HC System) to deliver clinically integrated care** Use this code series to identify ways in which PCPs think that (HC System) can improve clinicians ability to deliver clinically integrated care
14A	*Clinician comments - PCP perspective*
	PCP perspective on what the (HC System) can do to improve clinicians' ability to deliver clinically integrated care
15	**Changes since first interview** Use this code series to identify changes PCPs identified since RI interviews
15A	*Clinician comments*
	PCP description of significant changes in their patient panel over the past two years
	PCP comments on changes in the way they practice made of the past two years
	Changes to complexity of practice
	Changes to types of patients
	Changes to size of patient panels
	Other changes PCPs describe in interviews
15B	*PCP ranking of their proficiency using Epic - Scale of 1 representing a low level of proficiency using Epic and 10 representing the highest level of proficiency using Epic, PCPs self-rate*
	PCP's self-rate their Epic proficiency
	PCPs comments on self-ranking
16	**Additional PCP comments on changes that impact communication and care coordination** Use this code series to describe other changes PCP related as to the overall impact of Epic on communication and care coordination
16A	*Clinician comments*
	PCP additional comments to add on changes over the past two years or so that may have impacted their communication
	PCP additional comments on changes over the past two years or so that may have impacted their ability to coordinate their patient's care
17	**Closing thoughts from PCPs on the Interview Completion**
17A	*Clinician comments*
	PCP final comments and closing thoughts

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