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Connecting the Dots and Merging Meaning: Using Mixed Methods to Study Primary Care Delivery Transformation

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STRUCTURED ABSTRACT

Objective: To demonstrate the value of mixed methods in the study of practice transformation and illustrate procedures for connecting methods and for merging findings to enhance the meaning derived..

Data Source/Study Setting: An integrated network of university-owned, primary care practices at the University of Utah (Community Clinics or CCs). CC has adopted Care by Design™, its version of the Patient Centered Medical Home.

Study Design: Mixed methods.

Data Collection/Extraction Methods: Analysis of archival documents, internal operational reports, in-clinic observations, chart audits, surveys, semi-structured interviews, focus groups, Centers for Medicare and Medicaid Services database and the Utah All Payers Claims Database.

Principal findings: Each data source enriched our understanding of the change process and understanding of reasons that certain changes were more difficult than others both in general and for particular clinics. Mixed methods enabled generation and testing of hypotheses about change and led to a comprehensive understanding of practice change.

Conclusions: Mixed methods are useful in studying practice transformation. Challenges exist but can be overcome with careful planning and persistence.

Key words: practice transformation, patient centered medical home, mixed methods

I. BACKGROUND

Primary care redesign is described as change within a complex adaptive system (Nutting et al. 2009). Studying transformation within this dynamic system requires a mixed methods design because neither qualitative nor quantitative approaches alone are sufficient to understand complex phenomena (Creswell et al. 2011; Jaen 2009). We conducted a retrospective mixed methods study of practice redesign in an integrated network of university-owned, primary care practices (Community Clinics or CCs). In this context, we are interested in documenting practice change, exploring the process of and experience with transformation and investigating the outcomes related to changes in practice.

Our research team consists of two members of CCs leadership (Clinical Quality Director and Executive Medical Director) as well as University of Utah researchers in various disciplines (family medicine, marketing, healthcare administration, economics, and public health). Over several years the team has provided both research and strategic input to CCs leadership in an effort to improve clinic operations. During weekly meetings we discuss research methods, emerging findings and implications.

In this paper we describe the specific methods and data sources used, and demonstrate how we connected our methods and merged qualitative and quantitative data to generate novel learning. We conclude with comments about the ways in which our mixed methods study can help health care professionals and researchers understand practice transformation, as well as its implications for management in fostering further changes to the care model.

II. RESEARCH CONTEXT

The CC network includes ten practices that vary in size, composition of providers, services offered, and community demographic. Each practice is part of the CC network, which in turn is part of University of Utah Health Care (UUHC). CC providers are employed and practice at one of the ten clinics located in and around Salt Lake City, UT.

The CCs began implementing Care by Design™ (CBD), our version of the Patient Centered Medical Home (PCMH) model, in 2003. CBD is built on three key principles: appropriate access (AA), care teams (CT) and planned care (PC). The CBD model is described elsewhere (Blash et al. 2011; Bodenheimer 2006; Magill et al. 2006; Magill et al. 2009; Egger et al. 2012) and the context within which it has been implemented is detailed in the appendix to Day et al (in press). Although it is a comprehensive model, the operational constraints of ongoing practices required incremental change. Components of CBD were introduced sequentially and were modified as the transformation proceeded. The CC's motivation for implementation was to simultaneously improve patient care, provider satisfaction and financial performance.

A framework consisting of three levels and two cross-cutting factors depicts contextual factors important to understanding healthcare interventions (Tomoaia-Cotisel et al. in press). We summarize the context for our research within this framework in Table 1.

<Table 1>

Several contextual factors made this mixed methods study possible. First, the CCs performed real-time assessments throughout the 10 year focus of this project. Their assessments provided longitudinal data with which we could examine the transformation. Quarterly, bi-annual and annual reports about the transformation and its outcomes incorporated a variety of data including observations, data queries, surveys and financial and performance metrics. Second, the infrastructure required to capture these data was already in place. Our research team was granted access to this full set of data.

Consideration of the data's strengths and weaknesses guided decisions about what additional information was required to study the transformation. Prospective data from a broad set of stakeholders was desired and grant funding made this possible. However, data collection had to fit into the workflow of the operational clinics. It was also critical that new data be relevant to CCs' leadership and managers, while capturing their experience of the transformation along with that of the providers and staff.

III. MIXED METHODS DESIGN

Our study aims included a multifaceted, retrospective investigation of practice transformation. They required multiple types of data, including data from different levels within the CCs (senior leadership, clinic leaders, clinic providers and staff) and the perspectives of multiple stakeholders (providers and patients) (Jaen et al. 2010). Our analysis involved the integration of quantitative and qualitative data collected specifically for this project, as well as data drawn from existing sources. While each data source was included for specific purposes, the process of merging pieces of data to triangulate and contextualize meaning evolved organically (Creswell et al. 2011).

Figure 1 provides a schematic of our study aims and presents the specific sources of data we assembled to address each aim. A description of each data source, the types of data collected and the timing of data collection are presented in Table 2.

<Figure 1>

<Table 2>

Aim 1: Documenting Transformation and Exploring Process of Change

Our first aim was to document practice change. We used existing data from an internally developed tool that assessed CBD's level of implementation. Additionally, archived documents provided a sense of the sequence and management of change. Because context varied among our clinics, we collected new quantitative and qualitative data to provide contextualization.

Aim 2: Experience with Transformation

A second aim was to explore stakeholders' experience with change. New data were collected from individuals involved in planning and implementing the transformation, employees adjusting to the changes, and patients receiving care within the new model. To this end, we used semi-structured interviews and focus group discussions.

Aim 3: Assessing the Transformation's Outcomes

A third aim was to examine several of the transformation's outcomes. We used existing internal data and identified additional data sources with the potential to illuminate significant effects of the model. Operational data allowed us to assess the transformation's impact on quality measures, patient, provider, and staff satisfaction, and clinic operations. We obtained data from the Centers for Medicare and Medicaid Services (CMS) and from Utah's All Payer Claims Database (APCD) to assess information about cost and utilization of care. To determine the transformation's impacts on employees, we designed a survey incorporating standardized measures of aspects of work-life impacted by change.

This study was approved by the University of Utah Institutional Review Board.

IV. CONNECTING THE DOTS & MERGING MEANING

Two key steps underpinned the success of the study: connecting the elements of our mixed methods design throughout data collection, and merging findings from our mixed methods during analysis and interpretation (Creswell et al. 2011, p 5-6; Jaen et al. 2010, Crabtree et al. 2010). In the following sections, we describe both successes and challenges in making connections and merging meanings.

CONNECTING THE DOTS

Connecting multiple sources of data revealed a more complete understanding of the transformation process. Important connections were those across time, across contextual levels, and across research team members and methods. These connections are depicted in Figure 2a- c and discussed below.

<Figure 2a>

<Figure 2b>

<Figure 2c>

CONNECTIONS ACROSS TIME

Documenting practice change was the first step of our analysis. We combined qualitative data with documentary evidence. In the first year of the project, a document review produced archival data used to construct a timeline of important actions and milestones for CBD implementation. However, formal documents, did not tell the whole story as senior leadership made many decisions "off-line". Recognizing gaps in the archival data, we turned to personnel interviews.

The timeline reflected when each CBD component was introduced, allowing us to identify appropriate time periods for trend analyses. Trend analyses used internal longitudinal data about the level of implementation of CBD components and individual elements within each component, as well as outcomes.

Connecting historical “real time” data with employees’ subjective recollections was challenging. Informants tended to use today’s lens to reflect on the past, a bias called “presentism” (Fischer 1970). Additionally, employees’ experiences of changes were of different “realities.” For example, some leaders had been with CCs since before the transformation began. Others had joined the organization at various points during the transformation. Furthermore, some personnel had been part of the change process at more than one clinic and had experienced differences in implementation. In both the interviews and the analysis, presentism and experiences were considered in light of these contextual factors. The acquisition of new data was carefully sequenced, allowing insights from one source to inform components of the larger study. For example, the contextualization of local clinic environments allowed us to explore specific environmental factors during employee interviews. Research team members reviewed information acquired through the Clinic Characterization Audit (CCA) before conducting employee interviews and tailored the questions to each individual site. Conducting in-clinic observations and employee interviews simultaneously allowed us to ask about observed activities and processes.

ISSUES AND SOLUTIONS

In retrospective analyses, there is a potential for recall bias. To overcome this bias, we used two types of historical anchors (Martyn and Belli 2002; Happ et al. 2004): 1) the informant’s role and clinic location at that time, and 2) the transformation timeline. Informants who had worked at more than one CC clinic were asked to recall in which clinic they were working and the role they played during each phase of the transformation. They were also provided temporal cues during the interview (e.g., the year in which components of CBD were rolled out).

This information not only helped anchor the informant but also helped us interpret their comments. There are also other methods that could be used to calibrate these differences. For example, purposive recruitment of employees with experience at specific points during the redesign process, with specific clinics, and/or in specific roles could be used.

Despite careful planning, unanticipated disruptions emerged during in-clinic observations. During one scheduled site visit, a group of providers called an impromptu team huddle. This disrupted observation of “normal” clinic activity. Because the clinic was one of the larger sites among the CCs, the researcher adjusted her schedule to observe another group of providers. She returned to the first group later that day during time originally scheduled for reflection. Formal reflection was postponed until after the clinic closed thereby allowing the researcher to adapt to the changed circumstances. In conducting observations, it was important to incorporate flexibility.

CONNECTIONS ACROSS CONTEXTUAL LEVELS

Connections across organizational boundaries were critical to the success of this project. Using the contextual framework noted earlier (Tomoaia-Cotisel, et al. in press) we describe connections between the individual practices (Level 1) and between the clinic network (Level 2) and to the larger external environment (Level 3).

CONNECTING THE PRACTICES TO THE CC NETWORK

Researching the scalability of CBD has been an important part of our project. We began by connecting clinic-level data for CBD implementation analyses across the network. Our clinics vary with regard to characteristics such as patient mix and provider mix (Table 1). For example, family medicine faculty and residents staff 2 practices, while non-faculty clinicians and only a few residents staff the other 8. Team structure and dynamics are more fluid in the faculty/resident practices because these clinicians see patients on a more part-time basis. Additionally, new residents arrive annually and clinical skills change rapidly over the course of their 3 year training. These team-related factors affected implementation. Recognizing the differences, exploring their impact in qualitative analyses, and controlling for them in quantitative analyses provided a better understanding of the factors influencing CBD's implementation and outcomes as well as factors that affect external validity.

CONNECTING THE CC NETWORK TO THE EXTERNAL ENVIRONMENT

One motivation for implementation of CBD was to lower cost of care, both within CC and for care irrespective of where and how it was received. To examine the total cost of healthcare services associated with levels of CBD implementation, it was necessary to connect data across organizational boundaries and cultivate relationships between research team members, CC, and University Health Care analysts. The CC's implementation data were linked to Enterprise Data Warehouse files available from UUHC. We also established relationships between the research team and data managers from the Research Data Assistance Center (ResDAC), Buccaneer (CMS data distributors), and the Utah Department of Health (for the APCD data). Specifically, in order to have access to the APCD database, our team assisted in building the APCD infrastructure by contributing to the coverage of APCD staffing costs.

ISSUES AND SOLUTIONS

Many states are now in the process of creating an APCD-like database to inform research – which is in itself a huge undertaking. Even once created, the availability and quality of data may be outside the control of researchers. Data quality may be a particular issue as such databases are built by linking to multiple, previously independent sources. Teams that wish to take advantage of new external data sources should have contingency plans in place in case problems are encountered. Incorporating flexibility into timelines for access to and use of these data is critical to overcoming unanticipated challenges. Mixed methods designs allow for flexibility when such contingencies arise, since other aspects of the research can proceed when delays arise in accessing specific data sources such as the APCD.

CONNECTIONS ACROSS RESEARCH TEAM MEMBERS & METHODS

While collecting new data, connections across individual researchers and methods increased the team's efficiency and enhanced insights. For example, the researchers who designed the employee interview and the employee survey worked closely together determining what data were to be acquired through each method. This strengthened our ability to triangulate among disparate data sources, reduced unnecessary redundancy, facilitated interpretation of quantitative data, and optimized potential insights. Also, as employee interviews

and patient focus groups progressed over a two month period, the researchers leading these two efforts held reflection sessions once or twice a week, in which they not only discussed emerging themes, thus facilitating on-going analysis; but also identified issues for follow-up and issues that could be explored further, thus facilitating the refinement of ongoing data collection.

Furthermore, each researcher was in charge of several methods, thus connecting them and facilitating their on-the-spot integration. For example, the same team member who conducted the semi-structured interviews developed the Clinic Characterization Audit (CCA) and led the in-clinic observations. This enhanced continuity and facilitated integration of data from the CCA and on-site observations with the employee interviews.

ISSUES AND SOLUTIONS

However, concentrating data collection in one researcher may introduce bias. To mitigate this bias, we included three safeguards (Tashakkori and Teddlie 1998): (1) one of three research assistants accompanied the researcher on each site visit and participated in reflection throughout and after the visit; (2) periodically, this researcher and the three RAs met as a group; and (3) regular meetings with all research team members and periodic researcher sub-group meetings were also held. These activities allowed for reflection, formal recognition of emerging hypotheses, the development of consensus about what was being observed and identification of things to follow up on when returning to the clinic.

MERGING DATA TO MAKE MEANING:

Merging data from our multiple sources was the next step.

We reported analyses exploring the impact of practice redesign at the network level elsewhere (Day et al. in press). Using correlation analysis, Day and colleagues found associations between the extent of implementation of CBD and several outcome measures. These analyses relied upon multiple components of our data: the CBD implementation assessments, quality measures, patient and provider satisfaction surveys, and financial and administrative data. Findings revealed some unanticipated relationships including some potential trade-offs between different types of outcomes. Importantly, they revealed some relationships that might not otherwise have been discovered. For example, continuity with the primary care provider was correlated with quality, patient and provider satisfaction, and financial performance – relationships we would have missed had we examined correlations of implementation within a single domain of outcomes.

In this section, we further illustrate the potential for triangulation across multiple components of our project by exploring the Planned Care component of CBD at 1 of our 10 clinics. Planned care promotes a comprehensive perspective on the patient visit. Two key elements of planned care are 1) reports of newly-obtained laboratory results available for use during the visit and 2) the provision of an after visit summary (AVS) which reviews what was said and done during the visit, and includes the provider's follow-up instructions. Drawing from a sub-set of data sources, we illustrate the iterative process by which we integrated findings from our quantitative and qualitative data. By moving from one data source to another, we developed emergent hypotheses and subsequently tested them. Table 3 presents the quantitative data consulted as we tested and revised our hypotheses.

<Table 3>

A review of CBD implementation data across the clinics (data not shown) revealed that one clinic frequently referenced as an exemplar of the model actually demonstrated only average implementation scores. In our data, the clinics' CBD implementation scores are the mean implementation scores across all of the care teams in a particular clinic. We speculated that this aggregation could be disguising some differences in implementation among teams in this clinic.

To test the hypothesis that performance varied among teams, we examined this clinic's team CBD implementation scores. Focusing on planned care, we looked specifically at labs done prior to visit and whether patients were given AVSs and found that Team 1 was the lowest implementing team and Team 5 was the highest implementing team. (See "CBD Implementation", Table 3).

This observation prompted us to ask why two teams in the same environment were practicing so differently. We hypothesized that differences might be related to providers' commitment to the vision for CBD. To test this hypothesis, we consulted provider and staff interview data, paying particular attention to providers' overall approach to implementation and to discussions involving planned care.

Provider A (Team 1) describes himself as one of the busiest providers and says he is interested in new ways of doing things that increase efficiency and that work for him.

"I've always had an open mind to everything that's been presented in terms of 'will it help me provide better care to my patients, more efficient care to my patients, meet their needs...' but I'm also one of the busiest providers in the University system and the busiest provider here in terms of volumes... [so] it's more a matter of you know, what works for me on the day-to-day basis."

In contrast, throughout his interview, Provider B (Team 5) describes the tension that he sees between visit productivity and the time needed to perform preventive and health maintenance services:

"Again, if you are at a 20 minute visit and somebody comes in for bronchitis and (if) your patient hasn't had a mammogram; hasn't had a colonoscopy; hasn't had a flu shot; hasn't had, you know, we can't do those things if you're trying to crank things out. ... they [senior leadership] like to emphasize quality care and all the preventative medicine stuff, but the practicalities are there's not a lot of time to do that stuff, ... there needs to be more time allocated to that. I mean sort of like the push for the clinics is to see lots and lots of people, and generate lots of revenue, but you have to slow down to provide all of those quality issues that you need. So, there's no reimbursement for quality."

Our qualitative data suggested that the time needed to provide comprehensive care impacted how providers implemented CBD. With this in mind, we proposed a new hypothesis: that commitment to CBD implementation was higher among providers who emphasize quality over productivity. To test this hypothesis, we compared the same two providers' productivity and quality scores (see "Productivity" and "Quality", Table 3). Provider A (Team 1) is almost twice as productive as Provider B (Team 5) in terms of WRVUs and appointment count. Provider B has higher quality scores for chronic conditions. This comparison supported the possibility that commitment to CBD implementation was higher among providers who emphasize quality over productivity.

Productivity is important to financial solvency of the clinic. Quality is important to patient health. Given the tension observed, we hypothesize that attempting to increase either (or both) puts a burden on the care teams. We consulted employee surveys (see “Employee Surveys”, Table 3) to explore evidence of this burden in team functioning and team morale; in particular, responses to the Team Development Measure (PeaceHealth.org 2012) and the dimensions of the Maslach’s Burnout Inventory (Maslach, Leiter and Schaufeli 2009). Provider A’s team (Team 1) reported a more unified team identity than did Provider B’s team (Team 5). Team 1 rated their level of burnout as generally lower than did Team 5. To better understand this tension, we went back to the qualitative interviews. An MA from Team 1 explained:

“[Use of AVSs] with other doctors, yes. [On Team 1], no, just because [we have] so many regulars that we see so frequently that they are like ‘I don’t want any more paperwork’ for the AVS’s. We do give them but the patients leave them in the rooms... They just like to see [Provider A] and get their medications”. -- MA

Interview data revealed that Provider A’s MAs work specifically for him and focus on “rooming” patients.

An MA from Team 5 shared the following thoughts about the pre-visit planning portion of planned care:

“What we do, our team, with our doctors, anytime we have a physical and annual exam...we know what the doctor’s going to do, so... we drop in their history... we drop in the health maintenance... [we drop in] all the history from any labs done; any radiology done... and, then we put that in the chart so that it’s ready for the visit. And then, if we have a patient coming in for a follow-up from some kind of out-sourced specialty exam, like with a cat scan or an MRI, we get those results and we have them sitting on the desk in the room for the visit. A lot of times the doc’s already done that. That’s primarily the only prep we do ... it’s usually done that morning when we get to work.” –MA

Team 5 MAs appear to be more involved in pre-visit planning.

These descriptions strengthened our understanding of the tension between productivity and quality to which Provider B referred. They further suggest explanations for differences among teams in terms of team identity and burnout. A practice style in which MAs have clearly defined roles, are focused on less complex tasks, and have a team orientation that prioritizes visit efficiency, may contribute to higher team scores and lower burnout. A provider who prioritizes CBD implementation may work with different MAs and expect them to take on extra responsibilities. Following this practice style in a system in which incentives are misaligned and employee resources are limited may contribute to lower team identity and higher burnout.

The iterative process used to explore our multiple data sources allowed us to generate working hypotheses about observed outcomes and to test them by consulting additional data sources. We were able to simultaneously generate and test hypotheses about specific changes, and gain a more comprehensive and nuanced understanding of practice transformation more generally. Specifically, analysis of our personnel interviews revealed that a provider’s commitment to implementation of the new care model had implications for care team members. Our interview data revealed that the way in which team members operate appears to impact their perceptions. As demonstrated through responses to our employee survey, team identity and burnout were related to team roles. The tension between productivity and quality, the ways in which these goals are approached by providers, and the impacts staffing models have on team members all deserve careful consideration as care delivery transformation is pursued.

VALUE OF MIXED METHODS RESEARCH TO FOSTERING PRACTICE TRANSFORMATION

Implementation of mixed methods research is tedious and time consuming. The complexity of the processes and logistics involved with identifying and collecting data from diverse sources can be daunting. The sheer volume of assembled data can be difficult to distill without losing some of the nuanced implications. These nuances can subtly shape and change the direction of the research and consequently what is learned. Thus finding ways to manage the complexities of mixed methods research is invaluable.

At the beginning of our project there was a clear separation between operations and research objectives. Clinic leadership wanted to understand how the new care delivery model impacted quality of care and financial viability. Researchers wanted insights about the change process. The two seemingly disparate goals became interdependent. Currently, the new CC executive director has expressed a keen interest in our research and the best way to integrate findings into clinic operations. The organization is receptive to changes it previously resisted and the data amassed through our mixed methods project provides an evidence base to support the CC's ongoing practice redesign.

Findings from the mixed methods study facilitated more effective engagement between the research team and CC leadership. Our qualitative findings give us narrative – stories and on-the-ground experiences – while our quantitative findings give us numbers – data that illuminate relationships between components of our CBD model and important outcomes. Together they provide insights that will help shape the CC's future planning and strategies.

Research findings have already influenced specific changes in both the CC's strategic direction and operations management. Quantitative data analyses revealed that CBD implementation was incomplete and varied across clinics. Clinic and care team level analyses revealed substantial implementation variation. Qualitative interviews helped us understand contextual factors contributing to this variability. CC leadership is applying these insights to redesign clinic functions. Our data suggest that team-based care and continuity of care are linked to enhanced performance across outcomes (e.g., clinical quality, satisfaction, financial performance; Day et al. in press). The CC are now prioritizing continuity as a core principle of transformed care. Our project also compelled CC leadership to reevaluate its approach to implementation, focus on the most essential parts of the model, and plan for investments to ensure the successful transformation of care delivery. CC is pursuing National Committee for Quality Assurance (NCQA) recognition and insights from our mixed methods analyses are helping CC structure requests for resources and demonstrate return on investment of the CBD model in a value-based payment model as health care reform is implemented.

DISCUSSION

In this paper we describe the mixed methods design employed in our investigation of the transformation of CC to the Care by Design™ model. We illustrate the connections between our data sources including connections across time, across contextual levels, and across research team members and methods. We describe the processes by which we merged findings from the various components of our project to enhance our understanding of the transformation process and its impacts. Through the use of mixed methods we have been

able to gain a more nuanced perspective on implementation of our new care model on the ground. Different data sources helped us appreciate multiple perspectives and revealed different aspects of the change process and its outcomes.

By carefully planning and coordinating the various pieces of our research we were efficient in our data collection while including important and unique data sources. By making connections among our mixed methods and merging the meanings derived from individual methods we have gained important insights about the change process as perceived by various stakeholders and gained a greater appreciation for how local context influences these perceptions; we have extracted richer meaning than that available from any single source.

The use of mixed methods designs ideally involves the inclusion of multi-disciplinary research teams with members from inside and outside the organization, and requires significant time for both data collection and analysis. Future work should explicitly focus on the cost-effectiveness of such research. Documentation of the costs of each component of the research and careful assessment of the insights gained as the result of use of mixed methods are essential to determination of its worth.

CONCLUSION

Using a mixed methods design, we were able to gain new insights about not just the “what” of the change process, but also the clinic-specific “why” behind the experiences with changes. Our multiple data sources suggest that the effectiveness of transformation is highly dependent upon the response of clinic leadership, providers, and staff to the changes put into action by senior leadership. Our mixed methods project resulted in a rich description of multimodal efforts to drive change and a sense of the magnitude of effort required to effect transformation of a complex system. Through integrative analysis of our data, new hypotheses emerged regarding the inherent interaction of components of a complex redesign effort. Exploring the tensions created through these interdependencies should be a focus of future research.

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TABLES & FIGURES

Table 1: 2011 Contextual Factors of the University of Utah Community Clinics

Contextual Level		Level 2: Larger Organization				
		Ownership: Network of community-based clinics owned by University Health Care, an academic medical center. Degree of Integration: University Health Care includes 4 hospitals, specialty and primary care clinics, and University of Utah Health Plans. Contractual Arrangements: Primarily fee-for-service; NCI grant funding (EMR reminders, training, and workflow redesign)				
		Level 1: Practice Setting			Level 3: External Environment	
Clinic	Year Opened	# of Primary Care/ Total # of Providers ¹	Primary Care Patients' Race ² & Insurance Status CY 2011	Visits FY 2011	Additional Characteristics	Level of Urbanization; Transport Available
1	1985	12/22	55% Caucasian, 26% Other; 39% Commercial, 29% Medicaid, 22% Medicare	48,244	Multi-specialty, multilingual, evening/weekend urgent care	Metropolitan area; bus
2	1999	5/7	85% Caucasian, 8% Other; 65% Commercial, 14% Medicaid, 13% Medicare	20,155	Family practice with pediatrics	Rural area; bus
3	2001	5/6	89% Caucasian, 4% Other; 58% Commercial, 23% Self-pay, 16% Medicare	14,449	Multi-specialty and primary care	Affluent rural area; bus
4	1988	4/8	71% Caucasian, 16% Other; 41% Commercial, 42% Medicaid, 11% Medicare	27,247	Family practice and pediatrics	Suburban; bus
5	1976	8/16	72% Caucasian, 17% Other; 41% Commercial, 36% Medicaid, 18% Medicare	41,128	Multi-specialty, primary care, OB/GYN and pediatrics	Suburban; bus, metro
6	1989	5/6*	80% Caucasian, 12% Other; 41% Commercial, 22% Medicaid, 24% Medicare	13,133	Exclusively primary care	Bedroom community; bus
7	2003	6/10	81% Caucasian, 11% Other; 66% Commercial, 15% Medicaid, 17% Medicare	11,574	Family-oriented community practice	Suburban; bus, metro
8	1996	14/14	73% Caucasian, 14% Other; 51% Commercial, 25% Medicaid, 20% Medicare	17,502	High volume mental illness, residency training site	Urban; bus
9	1989	5/5	73% Caucasian, 14% Other; 66% Commercial, 9% Medicaid, 16% Medicare	16,763	Residency training site	Urban; bus, metro
10	2007	4/4	85% Caucasian, 6% Other; 58% Commercial, 14% Medicaid, 23% Medicare	9,288	Primary care	Suburban; bus
Implementation Pathway			Stepwise implementation process (Appropriate Access, Care Teams, then Planned Care), with existing EMR.			
Motivation for Implementation			Senior management's desire to improve care delivery; demonstrate business case for new delivery model			

¹ In the present study, primary care providers include Family Medicine, Internal Medicine, and Internal Medicine/Pediatrics providers because measures of chronic and preventive care services used to assess clinical quality applied only to adults. *One provider is a pediatrician.

² We report Caucasian and Other. Remaining categories are: American Indian and Alaska Native, Asian, Black or African American, Native Hawaiian and Other Pacific Islander, Patient Refused, and Unknown.

Figure 1: Research Aims and Data Sources

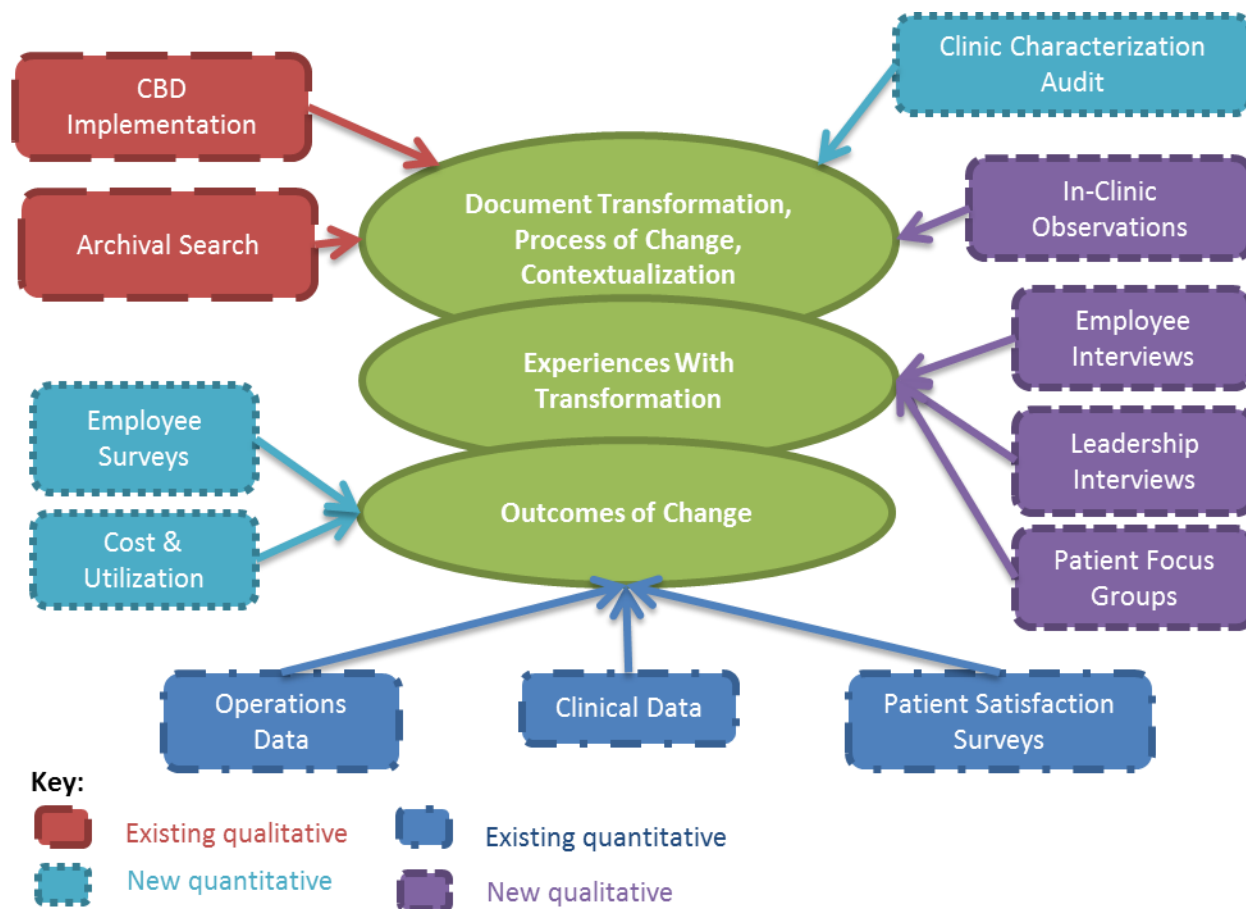


Table 2: Overview of Research Methods and Data Collection

<i>Data Collection Method</i>	<i>Description of Method</i>	<i>Type of Data</i>	<i>Information Gathered</i>	<i>Administration</i>
Aim 1: Document Transformation And Process of Change				
Archival Search	We used historical documents were used to gain perspective on the evolution of the care model over time.	Community Clinics Council (CCC) meeting minutes (senior leadership team, clinic medical directors, clinic managers from each CC); agendas & meeting planning committee minutes from Staff Development Institutes (SDI) (day-long education & strategic planning sessions attended by all CC providers and staff).	When/how Appropriate Access (AA), Care Team (CT) and Planned Care (PC) were rolled out	Monthly CCC meeting minutes – 2003-2011; SDI focus – 2003 (AA); 2004 (CT); 2006 (PC)
Care by Design Implementation Assessment	We administered an internally developed implementation assessment tool multiple times. Based on detailed operational descriptors for AA, CT and PC, and scales to measure performance. Assessments incorporate multiple types of data including observations, chart audit, EMR data.	Assessments of implementation of principles of CBD (AA, CT and PC) and individual elements of each. Direct observations of patient care and staff interactions, medical record audits of 5 patient charts for each provider in all clinics, and reports from our data warehouse.	28 measures: AA – 6; CT – 14; PC – 8.	Fall 2008 Spring 2009 Summer 2011 Spring 2012
Clinic Characterization Audit	We gathered background information about each clinic from clinic managers. Data were compared to objective data when such data were available (e.g., human resource department records of staff and FTE status).	Web-based survey completed by clinic managers	Size of clinic, patient volume, care team composition, presence of specialists, services offered, ancillaries on site, area competition	Summer 2011
In-Clinic Observations	We conducted observations at each clinic to gather information about the “feeling” in the clinic. Data collection included touring the clinic and observing patient flow and care team interactions for 1-3 days.	On-site observations systematically noted and observer journaling	Facilities design, work flow, patient flow, clinic processes.	Summer 2011

<i>Data Collection Method</i>	<i>Description of Method</i>	<i>Type of Data</i>	<i>Information Gathered</i>	<i>Administration</i>
Aim 2: Experience with Transformation				
Leadership Interviews	Personal interviews with clinic leadership were used to gain perspective on their personal experience with leading and managing the evolution of CBD. Their perspectives were essential to understanding the strategic goals for implementation of the new model of care and the management practices that were employed throughout the transformation.	Personal semi-structured interviews with senior leadership team, clinic medical directors, clinic managers; N=40	Personal experience with leading the care team rollout; experience managing the evolution of CBD, what and why; success metrics; incentives. On-the-ground reality faced by clinic level leaders implementing senior leadership's vision.	Summer-fall 2011
Employee Interviews	Personal interviews with providers and staff were used to gain insights about their experiences with the transformation process. Our goal was to obtain perspectives from different members of the care teams and staff with different roles within the clinics.	Individual semi-structured interviews with providers and staff. Both the provider and medical assistants (MAs) from the same care teams were interviewed, and for those clinics with registered nurses on staff, nurses were interviewed n=46	Personal experience with implementing care team; experience with local adaptations and innovations; culture and values. Personal characteristics – position and years with CC.	Summer 2011
Patient Focus Groups	Patients, key stakeholders in this project, were interviewed in focus groups to assess their perceptions of changes implemented and how those changes impacted them. We invited patients who had experienced the changes made in their clinics.	Patients with chronic conditions and multiple visits to CC over multiple years. n=63	Personal experience with change; relationships with provider and care team; communication; continuity.	Summer-fall 2011
Aim 3: Outcomes of change				
Clinical data	The CCs collect performance data on a set of clinical quality metrics for chronic and preventive care, including both process (frequency of testing of HbA1c) and outcome (HbA1c in control) measures.	Electronic medical records: process and outcome measures of chronic and preventive care.	Quality data elements are based on measures included in the Medicare Care Management performance demonstration project. Percentages of the eligible patients who received recommended screenings.	Annually
Operations data	A variety of data on provider productivity and financial performance are generated by CC operations staff. These data enabled us to examine the financial impacts of transformation for the CC organization.	Operations reports	Provider productivity, financial performance, characteristics of patients seen.	Quarterly

<i>Data Collection Method</i>	<i>Description of Method</i>	<i>Type of Data</i>	<i>Information Gathered</i>	<i>Administration</i>
Provider/ Staff Satisfaction Survey	The CCs conduct provider and staff satisfaction surveys annually.	Standardized satisfaction survey conducted as part of operations	AMGA Provider Satisfaction Survey; Moorhead Staff Satisfaction Survey	Annually
Patient Satisfaction Survey	The CCs regularly conduct patient satisfaction surveys. Over the time period under study CCs changed both the survey used and the method of administration.	Standardized patient satisfaction survey conducted as part of operations.	AMGA Patient Satisfaction Survey; Press Ganey Patient Satisfaction Survey; Press Ganey Patient Satisfaction e-Survey	Semi-annually through 7/2011; per visit 8/2011-2012
Employee Survey	To get a sense of the working environment in each clinic we designed an employee survey using standard measures of employee beliefs and attitudes. Surveys were distributed during staff meetings at each clinic to all primary care providers and staff involved in direct patient care.	Standardized survey including: Team Development Instrument, (TDI); Maslach Burnout Inventory (MBI); Organizational Culture Assessment Instrument (OCAI); Clinical Support for Patient Activation Measure (CS-PAM). n=144 in 2011; n=127 in 2012.	TDI – 31 items; MBI – 16 items; OCAI – 24 items; CS-PAM – 13 items Personal characteristics – position and years with CC.	Annually 2011, 2012
Cost and Utilization of Care	In order to assess cost and utilization of care we acquired data from CMS and Utah's All Payer Claims Database (APCD). APCD is a new compilation of health care claims records in Utah, publicly administered through the Utah Department of Health, which incorporates a comprehensive profile of health care utilization, regardless of source of payment.	CMS; Utah All Payer Claims Database (APCD); CC Operations data.	CMS – 65+; APCD – patients < 65 covered by Medicaid or commercial insurance. Enrollment, inpatient, outpatient, pharmaceutical costs.	2007-2009

Figure 2a: Connecting the Dots– Connections Across Time

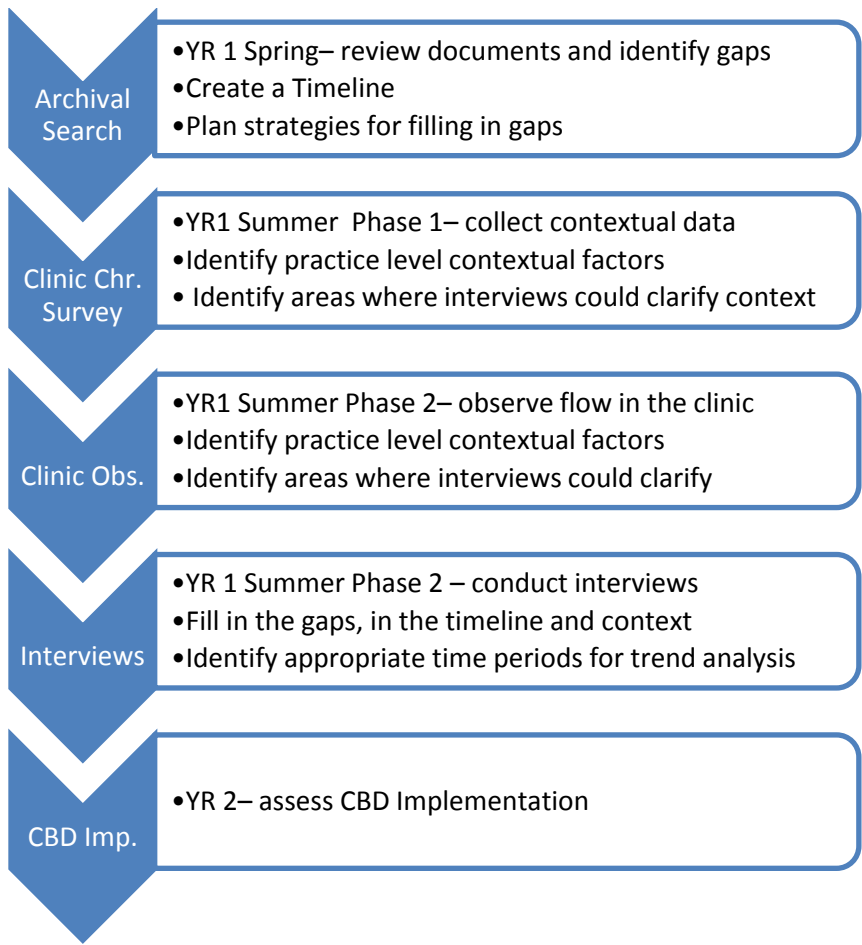


Figure 2b: Connecting the Dots– Connections Across Contextual Levels

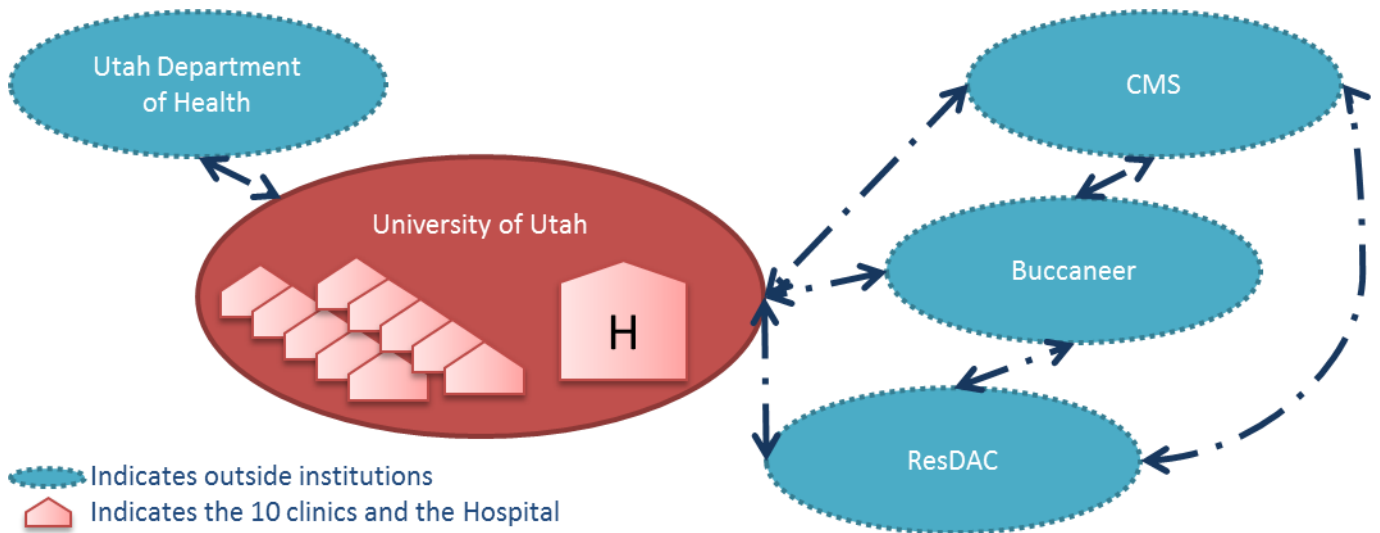


Figure 2c: Connecting the Dots – Connections Across Research Team Members & Methods

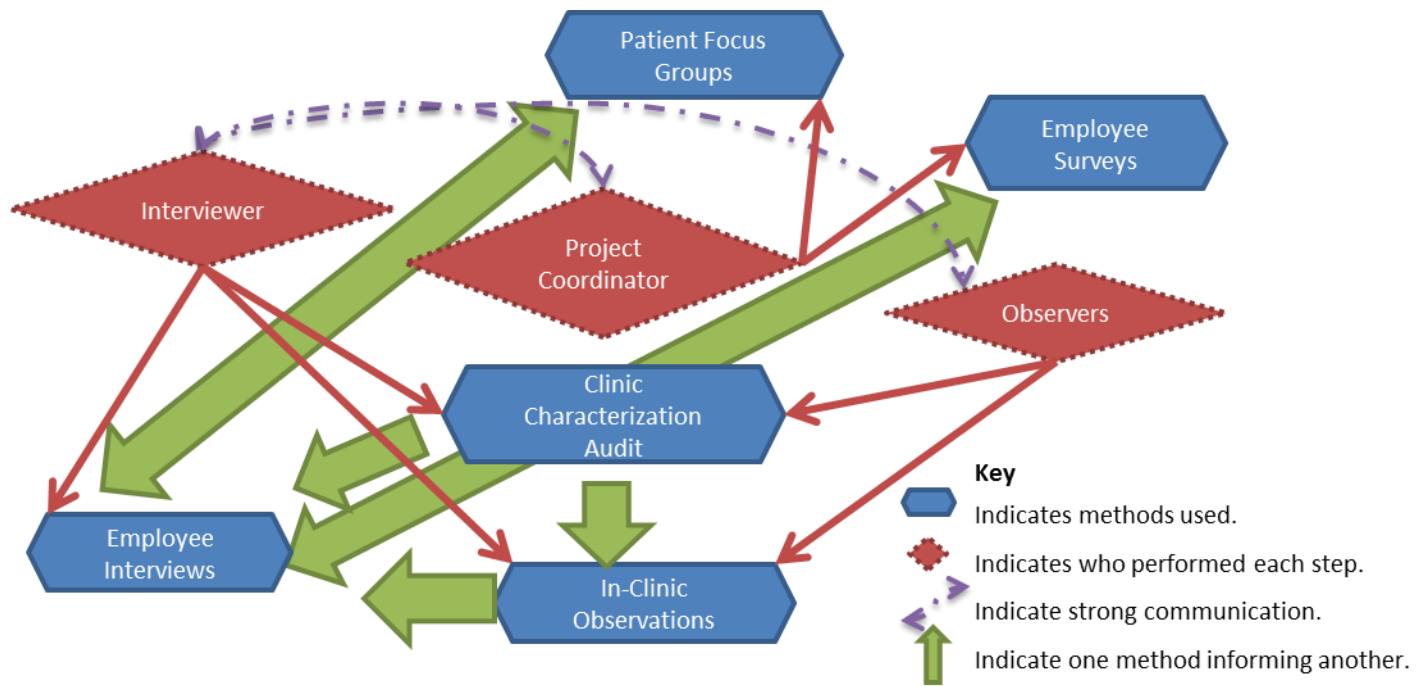


Table 3: Care Team Quantitative Data

Data Source ¹	Data Element	Team 1 led by Provider A	Team 5 led by Provider B
CBD Implementation Assessment²	Labs done prior to visit	0%	80%
	AVS given to patient	36%	75%
Productivity³	Work RVUs	Provider A has a 1.94 times higher RVU count than Provider B	
	Appointment Count	Provider A has a 1.47 times higher appointment count than Provider B	
Quality Scores⁴	Coronary Artery Disease	77%	91%
	Diabetes	65%	78%
	Heart Failure	40%	38%
	Preventive Care	49%	80%
	Total	54%	80%
Employee Surveys⁵	Teamness ⁶	71 (70,71)	56 (45, 65)
	Professional efficacy ⁷	26 (25, 27)	27 (7,35)
	Exhaustion ⁷	9 (6, 12)	20 (13, 29)
	Cynicism ⁷	11 (10, 12)	15 (1,28)

¹ More detailed information on the methods, instrument, and administration of each data source can be found in Table 2.

² July 2011 Care by Design Implementation Assessment.

³ April to June 2011 average productivity data; relative value units (RVUs), computed according to industry standards).

⁴ 13 months ending June 2011 average quality scores; percentage of eligible patients receiving recommended screenings.

⁵ All surveys were administered during regular employee meetings in spring 2011; averages (range) for the team.

⁶ Based upon the TDM: (0 – 100) higher scores indicates stronger team identity.

⁷ Based on the MBI: professional efficacy (0 – 36), exhaustion (0 – 30), and cynicism (0 – 30); higher score indicates a higher level of that component.