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Adoption of Evidence-based Practices: Patterns and Positive Deviants in the National Survey of  
Physician Organizations

A dissertation submitted in partial satisfaction of the  
requirements for the degree  
Doctor of Philosophy in Health Services

by

Isomi Muriel Miake-Lye

2016

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## ABSTRACT OF THE DISSERTATION

Adoption of Evidence-based Practices: Patterns and Positive Deviants in the National Survey of  
Physician Organizations

by

Isomi Muriel Miake-Lye

Doctor of Philosophy in Health Services

University of California, Los Angeles, 2016

Professor Emmeline Chuang, Chair

Despite evidence that care management practices (CMPs) are helpful in managing chronic illness, uneven adoption by physician organizations persists. This dissertation used an explanatory sequential mixed methods design to examine factors influencing physician organizations' adoption of evidence-based CMPs for chronic conditions. Data were drawn from the third wave of the National Survey of Physician Organizations (NSPO3). Three distinct studies were conducted.

The first study utilized item response theory to explore whether physician organizations' CMP adoption choices were linked, and whether adoption choices could be ordered by disease focus or CMP type. Scales for CMP type consistently ranked diabetes CMPs as the most adoptable, and depression CMPs as the least adoptable. Scales for disease focus consistently ranked patient reminders as the most adoptable CMP and clinician feedback and patient education as the least adoptable CMPs.

The second study examined contextual and organizational factors associated with CMP adoption. Results of a logistic regression conducted on the full NSPO3 sample (N=1,398) indicated that interest in patient-centered medical home accreditation or participation in an accountable care organization were among the factors associated with adoption of at least one CMP. Zero-truncated negative binomial regression conducted on the sample of organizations adopting at least one CMP (n=1,263) found that in addition to these variables, use of quality improvement systems and support of CMPs by external entities were also associated with number of CMPs adopted.

The third study explored different strategies that may be required to support uptake of diabetes CMPs in late- and non-adopting organizations, which are quite different from the early adopters typically described in the literature. Quantitative analyses were used to identify “positive deviants,” i.e., organizations that had adopted at least one diabetes CMP despite having organizational characteristics associated with non-adoption. Comparative case studies of two non-adopting and two positive deviant organizations revealed that positive deviants identified organizational priorities aligned with diabetes management and leveraged external support for CMP uptake.

*Implications/Conclusion.* Lessons learned from adoption patterns and positive deviants in real-world practice environments of physician organizations may be key in building strategies to promote uptake of evidence-based practices and combat variations in care.

The dissertation of Isomi Muriel Miake-Lye is approved.

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Emmeline Chuang, Committee Chair

University of California, Los Angeles

2016

## DEDICATION

This dissertation is dedicated to my loving and supportive bubba, who has grown and learned with me through this process and with whom I will continue to grow and learn even as our combined 42 years of schooling come to an end. It is also dedicated to the family of scientists I am lucky to be bonded to both genetically and in our shared passion for science, research, and learning. I love you all.

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## LIST OF ACRONYMS

<b>Acronym</b>	<b>Definition</b>	<b>Acronym</b>	<b>Definition</b>
ACO	accountable care organization	IPA	independent practice association
AHRF	Area Health Resources File	MD	physician
AHRQ	Agency for Healthcare Research and Quality	NSPO	National Study of Physician Organizations
CHF	congestive heart failure	NSPO3	National Survey of Physician Organizations, Third Wave
CMP	care management practice	PCMH	patient centered medical home
EMR	electronic medical record	PHO	physician hospital organization
HMO	health maintenance organization	QI	quality improvement

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## VITA

Isomi Miake-Lye received a Bachelor of Arts in Interdisciplinary Studies with concentrations in Health Promotion, Occupational Therapy, and Psychology from the University of Southern California in 2008; her senior thesis was titled “Getting Ahead Later in Life: Insight into Older Adult Lifestyles and Their Implications for Health Care.” She graduated magna cum laude with a minor in Peace and Conflict Studies, as well as being a Provost Research Fellow, Discovery Scholar Prize Finalist, Trojan Scholarship Recipient, Honors in Multimedia Scholar, member of the dean’s list all semesters, and member of the Alpha Lambda Delta Honors Society. Miake-Lye was principal investigator of “Adoption of Evidence-based Practices: Patterns and Positive Deviants in the National Survey of Physician Organizations” which was funded by Grants for Health Services Research Dissertation Program (R36) at the Agency for Healthcare Research and Quality. She was a recipient of the AcademyHealth Public Health Systems Research Student Scholarship and University of California, Los Angeles (UCLA) Graduate Division Graduate Research Mentorship Award, and was a UCLA Translational Science Fellow and Eugene V. Cota-Robles Fellow.

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Publications include:

Miake-Lye IM, Hempel S, Shanman R, Shekelle PG. What is an evidence map? A systematic review of published evidence maps and their definitions, methods, and products. *Syst Rev*. 2016 Feb 10;5:28. PMID: 26864942.

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## CHAPTER 1: INTRODUCTION

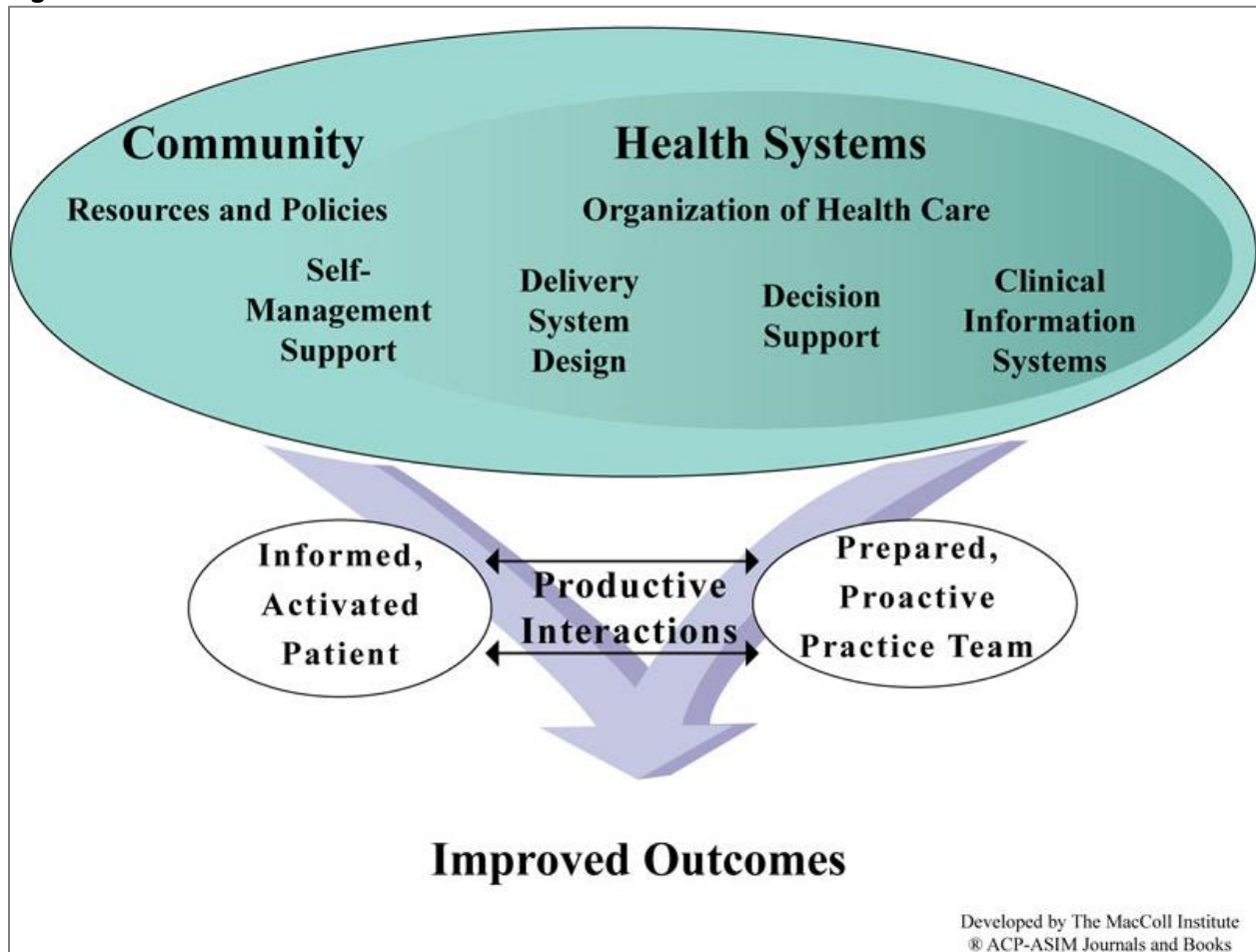
Improving chronic illness care is a key facet in the current healthcare reform;<sup>1,2</sup> about half of American adults have one or more chronic conditions.<sup>3</sup> Efforts to meet the rising demands of a chronically ill population by improving quality while reducing health care spending require the redesign of care delivery.<sup>4</sup>

Our healthcare delivery system was originally designed to handle acute episodes of care and is not well-suited for proactive care of chronically ill patients. The Chronic Care Model puts forth a comprehensive framework of factors at the community and health system level that will better support productive interactions between informed, activated patients and prepared, proactive practice teams (see



Figure 1.1).<sup>5-9</sup> Examples of community-level factors include supportive community resources that promote patient self-management. At the healthcare system level, which is the focus of this dissertation, basic elements for improving care for patients with chronic conditions include delivery system design, decision support, and clinical information systems.

**Figure 1.1. The Chronic Care Model**



Care management practices (CMPs) refer to a set of evidence-based guidelines, care management systems, and disease management programs based on the Chronic Care Model.<sup>5,7</sup> They are specific examples of the operationalization of the Chronic Care Model at the healthcare system level. These CMPs can be applied to any number of chronic conditions, and have consistently been shown to improve quality of care and clinical outcomes in a number of chronic conditions.<sup>5,7,10</sup> For example, in a meta-analysis that identified over 100 studies with interventions employing elements of the Chronic Care Model, the pooled results from studies reporting clinical outcomes for a number of chronic conditions were statistically significantly in favor of the intervention group (continuous outcomes effect size: -0.23, 95% CI: -0.31 to -0.15,  $p < 0.001$ ,  $n = 52$  studies; dichotomous outcomes relative risk: 0.84, 95% CI: 0.78 to 0.90,

p<0.001, n=46 studies).<sup>7</sup> There is a broad evidence base that supports the use of CMPs in chronic care delivery.

### **Physician Organizations in the United States**

Despite evidence that CMPs are helpful in managing chronic illness,<sup>5,7,10</sup> there is still uneven adoption of CMPs by physician organizations.<sup>1</sup> Variable diffusion particularly impacts organizations serving populations with high levels of socioeconomic vulnerability, as they tend to fall behind in adoption efforts.<sup>11</sup> This can exacerbate health disparities, and because poorly controlled chronic conditions can make employment difficult, socioeconomic conditions often worsen. In an effort to better understand differential adoption of CMPs, this dissertation focused on the real world context in which adoption choices are made.

In order to assess this context for CMP adoption, data for this dissertation were drawn from the National Study of Physician Organizations (NSPO). With three survey waves over the past decade, the NSPO aims to “provide healthcare organizations and researchers important data on the management of chronic illness as it relates to physician organizations.”<sup>12</sup> NSPO data describe the organizational characteristics of physician organizations across the United States, including practice size, management and governance of the organization, compensation models, patient population mix, and participation in various quality improvement and accreditation programs. The third wave, NSPO3 (2012-2013), was used in the analyses of this dissertation. Data came from a national sample of physician organizations ranging in size from solo practitioners to much larger medical groups.

Physician organizations were also asked about the adoption of five types CMPs: sending patients reminders for preventive or follow-up care related to their chronic condition, educating patients about their chronic condition, using reminders to alert providers of guideline-concordant care at the time of an appointment, providing feedback to providers about their quality of care, and maintaining a registry of patients with a particular chronic condition. Questions about CMP

use had a specific focus on four key chronic illnesses – asthma, congestive heart failure (CHF), depression, and diabetes – that are of particular interest to organizations managing care.<sup>7</sup>

These highly prevalent chronic conditions account for a significant percentage of national expenditures.<sup>13-17</sup> Given their contribution to the overall burden of chronic disease on the American population, policymakers and researchers recommend the use of CMPs to help manage these diseases.<sup>5,7,10</sup> Despite increases in uptake, a significant percentage of physician organizations do not adopt or sustain CMP use.<sup>18-20</sup> Understanding the factors contributing to variable uptake is critical to identifying effective strategies for improving CMP uptake. To the extent that late- or non-adopting physician organizations disproportionately serve socioeconomically vulnerable populations, uneven CMP uptake may contribute to inappropriate variation in care.

In order to account for community characteristics, the NSPO3 data were augmented with data from the 2012-2013 Area Health Resource File (AHRF). The respondents' data were linked using their Federal Information Processing Standard (FIPS) county code to include information about their community characteristics. The AHRF is a publicly-available database of health-related data at the county and state level.<sup>21</sup> Each respondent's NSPO3 data was linked to AHRF county-level information on patient demographics, as well as primary care shortage areas, from the county in which the organization is located.

## **Research Objectives**

This dissertation used a mixed methods design<sup>22</sup> to examine factors influencing physician organizations' adoption of CMPs for chronic conditions. Within the dissertation, three distinct studies were conducted.

The first study (Chapter 2 of this dissertation) described inter-organizational patterns in adoption of CMPs and examined how CMP adoption choices are sequenced. Item response theory was used to explore patterns in adoption among physician organizations in the NSPO3

data set. Mokken scale analysis explored whether adoption choices were linked by disease focus or CMP type, and whether a consistent ordering of adoption choices was present. The second study (Chapter 3) examined factors associated with NSPO3 physician organizations' adoption of at least one CMP, as well as factors associated with higher levels of CMP adoption in physician organizations adopting at least one CMP. Building from the earlier studies, the third and final study (Chapter 4) identified factors associated with non-adoption of CMPs for diabetes and used them to identify "positive deviants," i.e., organizations that had adopted at least one diabetes CMP despite having organizational characteristics associated with non-adoption in the NSPO3. Diabetes CMPs have the highest rates of uptake compared to the other conditions,<sup>19,20</sup> and were identified as the best candidates for this study based on findings in Chapter 2. Comparative case studies of two non-adopting and two positive deviant organizations explored the adoption decision at these sites. These results contribute to the current literature on the milieu of factors influencing adoption choices of evidence-based practices.

The findings from this dissertation describe the adoption of these CMPs by the nationally representative sample of physician organizations that participated in this survey wave, which illustrate the adoption dynamics of evidence-based practices more broadly. These broader dynamics are depicted in the theoretically-informed conceptual model, below.

### **Conceptual Model**

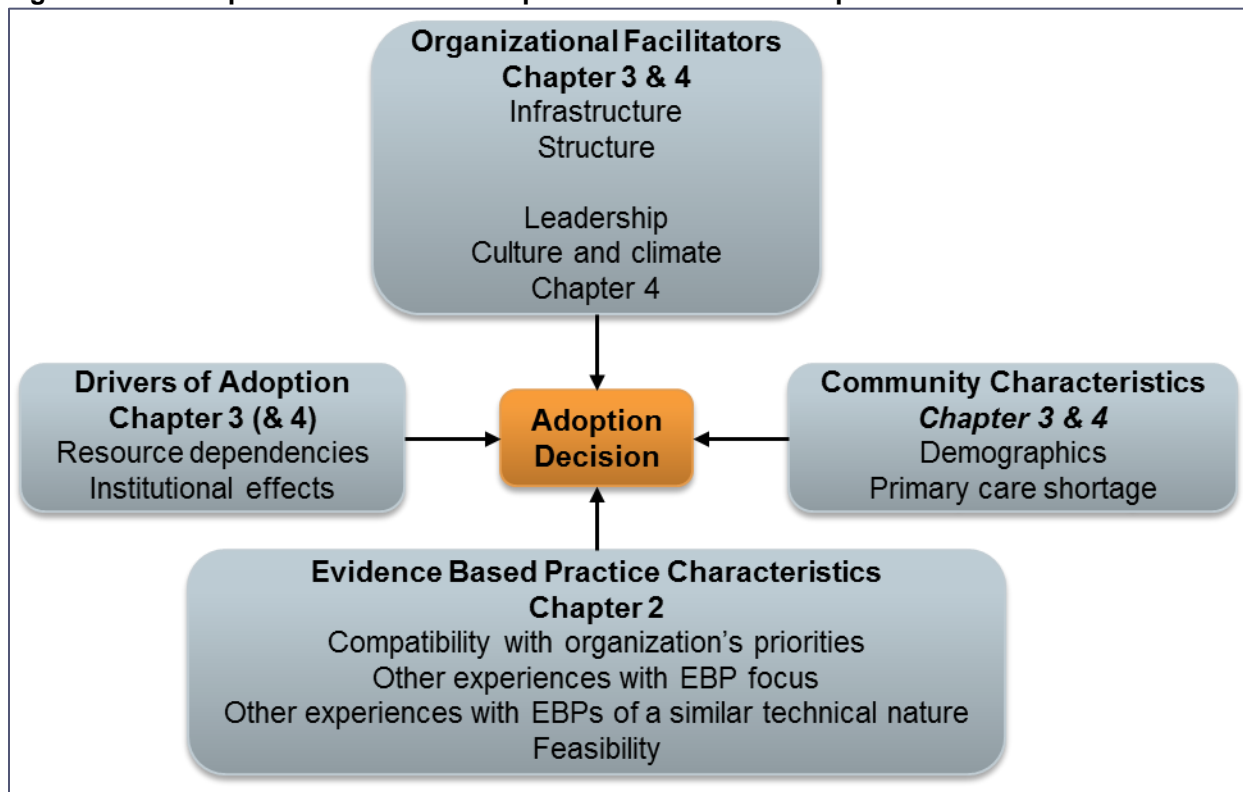
The Chronic Care Model identifies basic elements that health systems can use to improve care for patients with chronic conditions. However, it does not capture how and why physician organizations may choose to adopt recommended practices. One theory helpful in understanding the adoption of CMPs and other evidence-based practices is Rogers's Diffusion of Innovations theory.<sup>23</sup> The "innovation" could be a well-known and common idea or practice, but it would need to be perceived as new to the potential adopter. So although CMPs are

evidence-based practices, familiar in the healthcare marketplace, and likely used in many organizations, they are still considered innovations in the context of this model.

Diffusion of Innovations theory suggests that the spread of evidence-based practices follows an S-shape adoption curve, with innovators and early adopters among the first 16% to adopt an evidence-based practice, and late adopters among the last 16% to adopt.<sup>23</sup> Diffusion of Innovations theory also suggests that adopters of any evidence-based practice have distinct characteristics based on where along the adoption curve they fall. For example, compared to innovators and/or early adopters, late-adopters tend to have greater skepticism for change, and may be less connected to other organizations. Theory and prior literature, including institutional theory and resource dependence theory, have also identified a number of other contextual and organizational factors that can affect the rate at which evidence-based practices spread in health care organizations. These include characteristics of the organizations making the adoption decision, how the evidence-based practice is perceived, and the extent to which contextual factors from the community and other organizations incentivize or discourage adoption.<sup>23-26</sup>

To explore the factors relevant to adoption of evidence-based practices, a theoretically-informed conceptual model was developed from a synthesis of literature (Figure 1.2).<sup>26-28</sup> Relevant factors are organized into four major domains, each briefly described in more detail below.

Figure 1.2. Conceptual model for the adoption of evidence-based practices



### **Domain 1. Evidence-based Practice Characteristics**

Evidence suggests that prior exposure to or experience with one evidence-based practice may make organizations more receptive to adopting other new practices.<sup>27,28</sup> Less clear is the type of experience that matters: topical experience in providing evidence-based care for a specific condition (e.g., implementing one practice guideline for diabetes care is associated with adopting other evidence-based practices for diabetes care) or experience with offering a specific type of practice (e.g., implementing a registry for diabetes care is associated with adopting registries for other conditions). It also may be that practices are easily adopted because of their characteristics, such as lower complexity, or more flexibility, that are described by Diffusion of Innovations.<sup>23,24,27</sup> Similarly, a disease perceived as posing less of a threat to patients might be adopted after a disease perceived as more dangerous, or a disease that organizations feel more familiar with might be adopted before those that are less familiar. In these cases, the more popular disease focus may have higher compatibility with organizations' needs and interests.<sup>23,27</sup> The role of traits of the evidence-based practices in adoption are explored in Chapter 2.

### **Domain 2. Organizational Facilitators**

Organizational facilitators are explored in Chapters 3 and 4 and include measures of infrastructure, structure, leadership, and culture and climate. Strong infrastructure can promote adoption by reducing resources needed for adoption,<sup>28</sup> and could include use of electronic medical records,<sup>11</sup> use of quality improvement systems,<sup>1,19</sup> and investments in personnel or technology for improving patient satisfaction or quality of care. Structural characteristics can facilitate adoption, with evidence that size of the organization, the presence of specialist providers, and ownership are associated with adoption.<sup>11,27</sup> The role of leadership, culture and climate is explored in the qualitative phase of Chapter 4 and includes organizational priorities, attributes described in Diffusion of Innovations literature like traditional views and interactions



with outside organizations,<sup>23</sup> as well as domains of culture and climate like work pressure and pace, communication, and office standardization of procedures.<sup>29</sup>

### **Domain 3. Drivers of Adoption**

Drivers of adoption include resource dependencies and institutional effects, and are the focus of Chapter 3, with some further exploration in Chapter 4. Resource dependencies, as well as coercive isomorphism, can be experienced when external organizations control key resources and exert pressures on the organization to adopt.<sup>26,30</sup> When adoption is a social norm reinforced by participation in aligned professional societies and programs institutional effects like normative isomorphism come into effect.<sup>30</sup>

### **Domain 4. Community Characteristics**

Characteristics of the community could also facilitate adoption or create burdens that discourage adoption, such as a primary care provider shortage that could overburden primary care providers and decrease resources for adoption. Community demographics, like low technological literacy, could limit the receptiveness to information technology-based interventions. These wider environmental factors' relationship with adoption choices are supported by limited evidence,<sup>27</sup> and are included in Chapter 3 and Chapter 4 analyses as control variables.

Table 1.1 outlines the specific proxies from the NSPO3 and AHRF data sets for the quantitative analyses in Chapters 3 and 4 and describes the hypothesized effects for the factors within the three domains of organizational facilitators, drivers of adoption, and community characteristics.

**Table 1.1. Table of measures for the adoption of evidence-based practices**

Factor and relationship with adoption	Measure	Measure construction
<b>Domain 2. Organizational Facilitators (NSPO3)</b>		
<p>Infrastructure: Strong existing infrastructure can promote adoption by reducing resources needed for adoption. <sup>28</sup></p>	Use EMR	<p>1: Organization uses electronic medical records                      0: Organization uses part electronic and part paper medical records, or all paper medical records</p>
	Use QI system	<p>1: Routinely uses formal methods for QI: Plan-Do-Study-Act (PDSA), Lean production techniques, Six Sigma, Quality improvement learning collaboratives, or other                      0: None</p>
	Personnel/technology for quality of care	<p>New or additional investments in personnel or technology targeted specifically at improving patient satisfaction or experience and/or your quality of care:                      Chapter 3:                      1: Small investment, moderate investment, or large investment                      0: No investment                      Chapter 4:                      1: Moderate investment or large investment                      0: No investment or small investment</p>
<p>Structure: Structural characteristics can facilitate adoption: larger organizations and those owned by large entities tend to be more likely to adopt. <sup>11,27</sup></p>	Ownership	<p>Chapter 3:                      1: Owned by physicians (physicians in practice, large medical group, non-physician managers), receives a significant proportion of patients through an independent practice association (IPA) or a physician hospital organization (PHO)                      2: Owned by physicians (physicians in practice, large medical group, non-physician managers), does not receive a significant proportion of patients through an independent practice association (IPA) or a physician hospital organization (PHO)                      3: Owned by larger entity (hospital/system or HMO/insurance company) or Federally qualified and other community health centers                      Chapter 4: groups 1 and 2 combined as 1, group 3 as 0</p>
	Size	<p>Chapter 3:                      Approximately what is the total number of physicians working in your medical group across all its locations, including both full and part-time physicians                      1: 1-2 MDs                      2: 3-7 MDs                      3: 8-19 MDs                      4: 20+ MDs                      Chapter 4: groups 1 and 2 combined as 1, groups 3 and 4 combined as 0</p>

	Includes specialist provider(s)	Approximately how many of the physicians in your medical group are cardiologists, endocrinologists, or pulmonologists? 1: > 0 0: none
<b>Domain 3. Drivers of Adoption (NSPO3)</b>		
<p>Resource dependencies: External organizations controlling key resources may pressure an organization to adopt.<sup>26,30</sup></p> <p>Institutional effects: Adoption is a social norm that is reinforced by participation in aligned professional societies or programs.<sup>30</sup></p> <p><i>Note: Although these concepts are distinct, the proxies are overlapping</i></p>	Evaluated by external entity	1: Evaluated by external entities such as health insurance plans on measures of patient satisfaction, experience, or clinical quality, or data on patient satisfaction and/or experience are publicly reported by health plans or other external entities 0: none
	Rewarded by external entity	1: have the opportunity to receive additional income from health plans or other external entities for scoring well on measures of clinical quality, such as HEDIS and/or on measures of patient satisfaction and/or experience; rewards physicians with bonus income from external entities based on adoption of use of information technology; receive additional income from health plans or other external entities for scoring well on measures of efficient utilization of resources 0: none
	PCMH accreditation	1: received recognition as a Patient-Centered Medical Home from the National Committee for Quality Assurance (NCQA) or another organization 0: none
	ACO participation	1: applied to CMS to become an accountable care organization (ACO) or have a signed agreement with a private health insurance plan to become an ACO 0: none Note: This measure is combined with PCMH accreditation for Chapter 4, with 1 as 1 for either and 0 as 0 for both
	Outside assistance with feedback	1: Any of the health insurance plans that insure your patients, an IPA, or PHO provides data to your medical group's individual physicians and/or to your practice as a whole on the quality of their care for patients with chronic conditions 0: None
	Outside assistance with education/management	1: Any of the health insurance plans that insure your patients, an IPA, or PHO make available non-physician staff (for example, health educators, dieticians, or nurses) or nurse care managers who are specially trained and designated to educate patients in managing their illness or 0: None

	Outside assistance with patient reminders/registries	1: Any of the health insurance plans that insure your patients, an IPA, or PHO routinely send reminders for preventive or follow-up care directly to a majority of your patients or maintain an electronic registry or list of patients with chronic illness 0: None
<b>Domain 4. Community Characteristics (AHRF)</b>		
Primary care shortage: A shortage may strain resources and reduce slack for change.	Primary care provider shortage area	Health provider shortage area for primary care: 1: No shortage in county 2: Whole county 3: One or more parts of the county
Demographics: Community needs may require tailoring of an EBP, making adoption less likely.	Percent in poverty	Percent of persons in county in poverty
	Percent graduated high school	Percent of persons age 25 years or older with high school diploma or more education in county
	Unemployment rate	Unemployment rate among persons age 16 years or older in county
	Percent non-English speaking	Percent foreign born population in county
	Median age	Median age in county

**CHAPTER 2: RANDOM OR PREDICTABLE?: THE SEQUENCING OF ORGANIZATIONAL ADOPTION OF  
CHRONIC CARE MANAGEMENT PRACTICES**

## ABSTRACT

### Background

Despite evidence that care management practices (CMPs) are helpful in managing chronic illness, there is still uneven adoption by physician organizations. The objective of this paper is to describe inter-organizational patterns in adoption of care management practices and to understand better how these adoption choices are sequenced.

### Methods

We assessed a cross-section of national survey data from physician organizations reporting on use of 20 CMPs (5 each for asthma, congestive heart failure, depression, and diabetes). Item response theory was used to explore patterns in adoption, first considering all 20 CMPs together, and then by subsets according to disease focus or CMP type. Mokken scale analysis explored whether adoption choices were linked by disease focus or CMP type, and whether a consistent ordering of adoption choices was present.

### Results

The Mokken scale for all 20 CMPs demonstrated medium strength ( $H = 0.43$ ), but no consistent ordering. Scales for subsets of CMPs sharing a disease focus had medium strength ( $0.4 < H < 0.5$ ), while subsets sharing a CMP type had high strength ( $H > 0.5$ ). Scales for CMP type consistently ranked diabetes CMPs as most adoptable, and depression as least adoptable. Within disease focus scales, patient reminders were ranked as the most adoptable CMP, while clinician feedback and patient education were ranked the least adoptable.

### Conclusions

Patterns of adoption indicate that innovation characteristics can influence adoption. CMP dissemination efforts may be strengthened by encouraging traditionally non-adopting organizations to focus on more adoptable practices first, and then describing a pathway for the

adoption of subsequent CMPs. Clarifying why certain CMPs are “less adoptable” may also provide insights into how to overcome CMP adoption constraints.

## BACKGROUND

A major focus in current healthcare reform discussions is improving chronic illness care given about half of American adults have one or more chronic conditions with an annual economic burden in the hundreds of billions of dollars.<sup>1-3,13,31</sup> The Chronic Care Model assumes that our healthcare delivery system was designed to handle acute episodes of care, and not well-suited for patients with chronic illness. It puts forth a comprehensive framework to address the complexities of chronic conditions, including community and health systems factors that support productive interactions between informed, activated patients and prepared, proactive practice teams.<sup>5-9</sup> Care management practices (CMPs) refer to a set of evidence-based guidelines, care management systems, and disease management programs based on the Chronic Care Model. CMPs include sending patients reminders for preventive or follow-up care related to their condition, educating patients about their condition, using reminders to alert providers of guideline-concordant care needs at the time of an appointment, providing feedback to providers about their quality of care, and maintaining a registry of patients with a particular chronic condition.<sup>5,7</sup> These specific CMPs can be applied to any number of chronic conditions, and have consistently been shown to improve quality of care and clinical outcomes for a number of chronic conditions.<sup>5,7,10</sup>

Four highly prevalent chronic conditions that account for a significant percentage of national expenditures are asthma, diabetes, depression, and congestive heart failure (CHF).<sup>13-17</sup> Given their contribution to the overall burden of chronic disease in the U.S., these diseases have been the focus of many systems' CMP efforts, resulting in positive outcomes.<sup>5,7,10</sup> For example, in a meta-analysis of interventions incorporating CMPs and targeted on these four chronic conditions, interventions targeting diabetes resulted in a pooled effect size of -0.19, which translates to a reduction in hemoglobin A1c of 0.30 to 0.47 percent.<sup>7</sup> The same publication also reported a small but favorable overall effect on quality of life outcomes across



all four conditions. Pooled data from 24 studies with various quality of life outcomes resulted in a statistically significant standardized effect size of 0.11 (95% CI: 0.02 – 0.21).

Despite evidence that CMPs are helpful in managing chronic illness, there is still uneven adoption of CMPs by physician organizations.<sup>1</sup> Variable diffusion particularly impacts organizations serving populations with high levels of socioeconomic vulnerability, as they tend to fall behind in adoption efforts.<sup>11</sup> To better understand differential adoption of CMPs, researchers have identified organizational characteristics such as organization size, ownership, and receipt of financial rewards for quality that are associated with CMP usage.<sup>1,19</sup>

Rogers' theory of Diffusion of Innovations posits that, in addition to characteristics of the adopting organization, characteristics of the innovation itself can affect uptake.<sup>23</sup> Some key traits of an innovation that have been identified include: compatibility with an adopter's routines, beliefs, and priorities; relative advantage, complexity, trialability, and observability.<sup>24,26,27,32</sup> Depending on these characteristics, an innovation may be more or less attractive to a potential adopter, whether at the individual or organizational level.

Past work has not systematically analyzed innovation traits across CMPs to determine how these traits may contribute to differential adoption. However, given the low number of organizations adopting the full roster of CMPs,<sup>1</sup> a better understanding of how these characteristics may be linked to adoption is warranted. Several descriptive patterns have emerged that support further inspection. For example, analysis of national physician organization data revealed that in 2006, the average organization had adopted roughly twice as many CMPs for diabetes as for depression.<sup>1</sup> Between 2000 and 2006, the use of disease registries that enabled organizations to identify patients with a particular disease grew faster than other types of CMPs.<sup>19</sup> Differential adoption for subsets of the CMPs, such as the relatively high adoption of diabetes CMPs and disease registries, suggests the choice of which CMP to adopt may be related to certain characteristics of the CMPs in question.

Because all CMPs are based on the Chronic Care Model,<sup>6</sup> the choice to adopt any specific CMP may be related to the choice to adopt other CMPs. This reflects the hypothesis that certain organizations may be adopters of the overarching Chronic Care Model, regardless of individual CMP traits, and others may be more selective in their adoption of CMPs. In this study, we also hypothesize that CMPs with similar disease foci or types may share key innovation characteristics that inhibit or encourage their adoption. If, for instance, an organization is looking to tackle asthma as a key issue, all the CMPs focusing on asthma would be perceived as compatible with the organization's priorities and thus more likely to be adopted than CMPs for other chronic conditions. Similarly, the analogous technical expertise required to implement all disease registries might make an organization that adopted a disease registry for diabetes more likely to adopt registries for other chronic conditions. In addition to testing the extent to which CMPs can be grouped by shared traits, we examine within these trait groups to determine the sequencing of CMP adoption. Within each group – the overarching Chronic Care Model group including all CMPs, the disease focus groups, and the CMP type groups – we explore whether there is consistent ordering in the adoption of the specific CMPs across physician organizations.

To understand this milieu of adoption decisions, we conducted examination of adoption choices made by physician organizations based on a national survey. Specifically, we utilize item response theory techniques to compare and contrast the adoption of multiple CMPs with shared characteristics (e.g., disease focus, CMP type).<sup>33,34</sup> Item response theory is beneficial in determining the strength of shared characteristics, or latent traits, as well as any ordering present, based on these traits. The objectives of this study are to describe organizational patterns in adoption of care management practices and to understand better how these adoption choices are sequenced.

## METHODS

We assessed national survey data from physician organizations reporting on use of CMPs for asthma, CHF, depression, and diabetes. In these data, we used item response theory to explore patterns in adoption of CMPs, since this analytic approach considers how strongly adoption choices are linked by shared traits and establishes whether any consistent ordering of CMP adoption is present. Three shared traits were explored: overarching Chronic Care Model, disease focus, and CMP type.

### Data Source

The third wave of the National Survey of Physician Organizations (NSPO3) (2012-2013) was used for the analysis. NSPO3 is a nationally representative survey of physician organizations caring for patients with chronic conditions including asthma, CHF, depression, and diabetes. A total of 1,398 participant organizations responded, yielding an overall adjusted response rate of 50 percent.<sup>11</sup> Additional information regarding the survey's methodology is available elsewhere.<sup>11,20</sup>

### Measures

To assess adoption patterns, we examined the adoption of five CMP types for four key chronic diseases (asthma, CHF, depression, and diabetes) – patient education, provider feedback, provider reminders, patient reminders, and disease registries – for a total of 20 CMPs. We constructed CMP measures as dichotomous variables of the presence or absence of each CMP type, described below.

***Patient education.*** If organizations responded “yes” to “Does your [organizations] have any non-physician staff, for example, nurses, dieticians, or health educators, who have time set aside to meet with and/or call patients to help educate them about managing their [disease]?” they were considered an adopter of the education CMP type.

**Provider feedback.** If organizations responded “less than half,” “half or more,” or “all” to “Approximately what proportion – if any – of your physicians who care for patients with [disease] receive data from your medical group on the quality of their care for patients with [disease]?” they were considered an adopter in the feedback CMP type. If organizations responded “none” they were considered non-adopters.

**Provider reminders.** If organizations responded “less than half,” “half or more,” or “all” to “Please consider the extent, if any, that your group provides physicians with guideline-based reminders – that they see at the time they are seeing the patient – for services the patient should receive. An example would be a pop-up within an electronic medical record or an appropriate reminder attached to the front of the chart each time that they see the patient” they were considered an adopter in the provider reminder CMP type. If organizations responded “none” they were considered non-adopters.

**Patient reminders.** If organizations responded “less than half,” “half or more,” or “all” to “To approximately what proportion, if any, of the patients with the following diseases does your [organization] routinely send reminders for preventive or follow-up care [for disease]?” they were considered an adopter in the patient reminder CMP type. If organizations responded “none” they were considered non-adopters.

**Disease registries.** If organizations responded “yes” to “For a majority of the patients in your [organization] with [disease]... does your [organization] maintain an electronic registry?” OR “does your [organization] maintain a list of patients?” they were considered an adopter in the registry CMP type.

## **Analyses**

To describe patterns of CMP adoption, we considered the full set of 20 CMPs, and then looked at subsets of CMPs based on similarity in disease focus or CMP type. We first examined the extent to which CMP use was correlated, and then used Mokken scale analysis to

determine: (a) whether adoption of CMPs depended on one of three latent traits, and (b) whether there is a consistent ordering of adoption choices within a given latent trait. Mokken scale analysis is a nonparametric probabilistic technique developed from the principles of item response theory.<sup>33,35</sup>

Bivariate analyses explored pairwise correlations within the full set of 20 CMPs.<sup>36</sup> When looking at the matrix of correlation coefficients, we expected that all CMPs would be positively correlated, because they are all part of the Chronic Care Model and as such have common theoretical underpinnings and implementation requirements. Within subsets of CMPs, we expected each CMP to be more strongly correlated with other CMPs sharing a disease focus or the same type (e.g., both CMPs focused on diabetes or both CMPs for patient education) than CMPs that did not share these traits. A correlation coefficient of 0.3 to 0.5 is considered low, 0.5 to 0.7 is considered moderate, 0.7 to 0.9 is considered high, and 0.9 or higher was considered very high.<sup>37</sup> Groups of stronger correlations are useful in indicating the appropriateness of Mokken scale analyses.

We then conducted a series of analyses using Mokken scale analysis. As with other item response theory techniques, Mokken scale analysis assesses a series of items to determine whether responses to these items depend on a latent trait.<sup>35</sup> In our analyses, the items are the CMPs, and we examined three types of latent traits reflecting different combinations of CMPs: (1) an overarching Chronic Care Model including all 20 CMPs; (2) shared disease focus for the four sets of CMPs related to asthma, CHF, depression, and diabetes; and (3) shared type for the five sets of CMPs involving patient education, provider feedback, provider reminders, patient reminders, and patient registries. Sets of items are considered to be scales if they all increase along with the underlying trait, and meet the three assumptions of: unidimensionality for the latent trait, local stochastic independence, and monotonicity.<sup>34,35,38</sup> In the Mokken scale procedure, items are broken into as many scales as necessary if all items being examined do not meet these assumptions for one unifying scale. Scales with a Loevinger's H coefficient of

scalability at or above 0.5 are considered strong, at or above 0.4 are considered medium, above 0.3 are considered weak, and 0.3 and lower are not considered to be scales.<sup>33</sup> For our analyses, we compare and contrast the strength of the scales of CMPs to determine if certain shared traits among CMPs connote stronger relationships than others.

A crucial feature of the Mokken scale procedure is that within sets of CMPs that form a scale, the CMPs can be ordered by “difficulty” – in our case, difficulty being synonymous with “adoptability.”<sup>35</sup> To order CMPs by adoptability, the scale must also satisfy the additional assumption necessary to demonstrate consistent ranking of CMPs for all respondent organizations.<sup>39</sup> Applied to our dataset, CMPs that are “more adoptable” will be adopted by all organizations adopting any “less adoptable” CMP. For example, given the information technology infrastructure required to implement these CMPs, we might expect that any organization that has adopted provider feedback for diabetes will also utilize provider reminders for this condition, but not vice versa. Thus, in this scenario, provider feedback may be considered a less adoptable CMP than provider reminders. This second phase of the Mokken scale procedure will allow us to see if there is a ranking or ordering of CMPs in the overarching Chronic Care Model scale, in scales of CMPs with the same disease focus, or in scales of CMPs using the same CMP type.

We used Stata (version StataSE 14) to conduct our analyses, using the `msp` and `loevh` commands presented by Hardouin and colleagues for Mokken analyses.<sup>34,38-40</sup> We used the `pairwise` option for all analyses to retain as much information as possible. All Mokken scale analyses had no missing values (n=1,398).

## **Ethics**

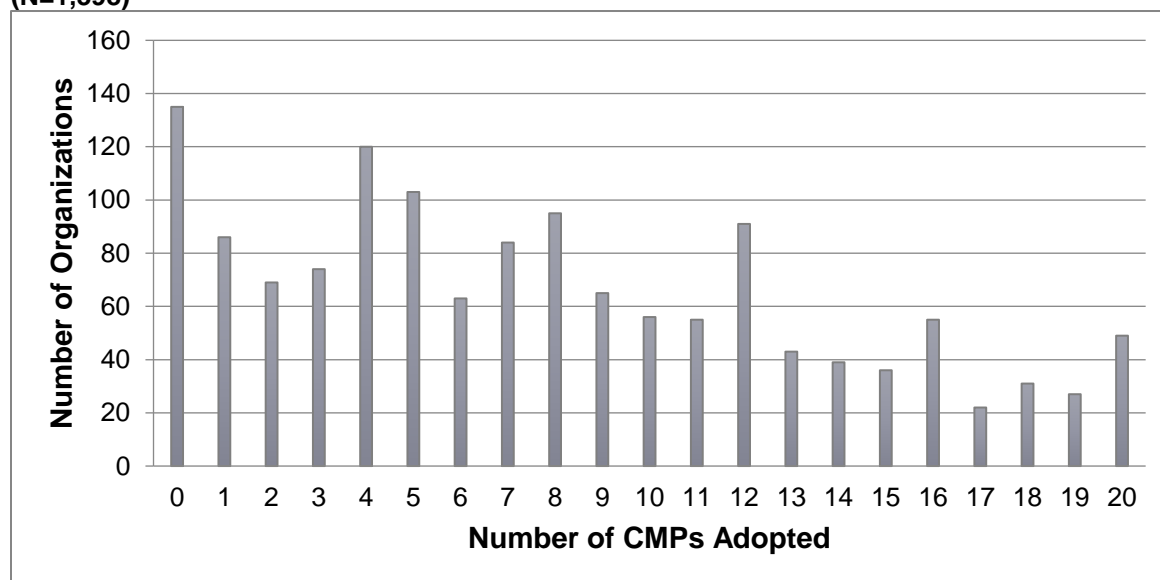
This study was reviewed and approved by the University of California, Berkeley Committee for the Protection of Human Subjects. The University of California, Los Angeles Office of the Human Research Protection Program agreed to a memorandum of understanding

resulting in reliance on the University of California, Berkeley Committee for Protection of Human Subjects for study review and approval.

## RESULTS

Of the 1,398 responding organizations, only one hundred thirty-five (9.7%) had not adopted any care management practices (see Figure 2.1). Organizations varied in the number of CMPs they adopted, with an average of 7.84 (standard deviation (SD)= 5.71) adopted CMPs per organization. The majority of organizations had adopted fewer than eight CMPs, but forty-nine organizations (3.5%) had adopted all 20 CMPs.

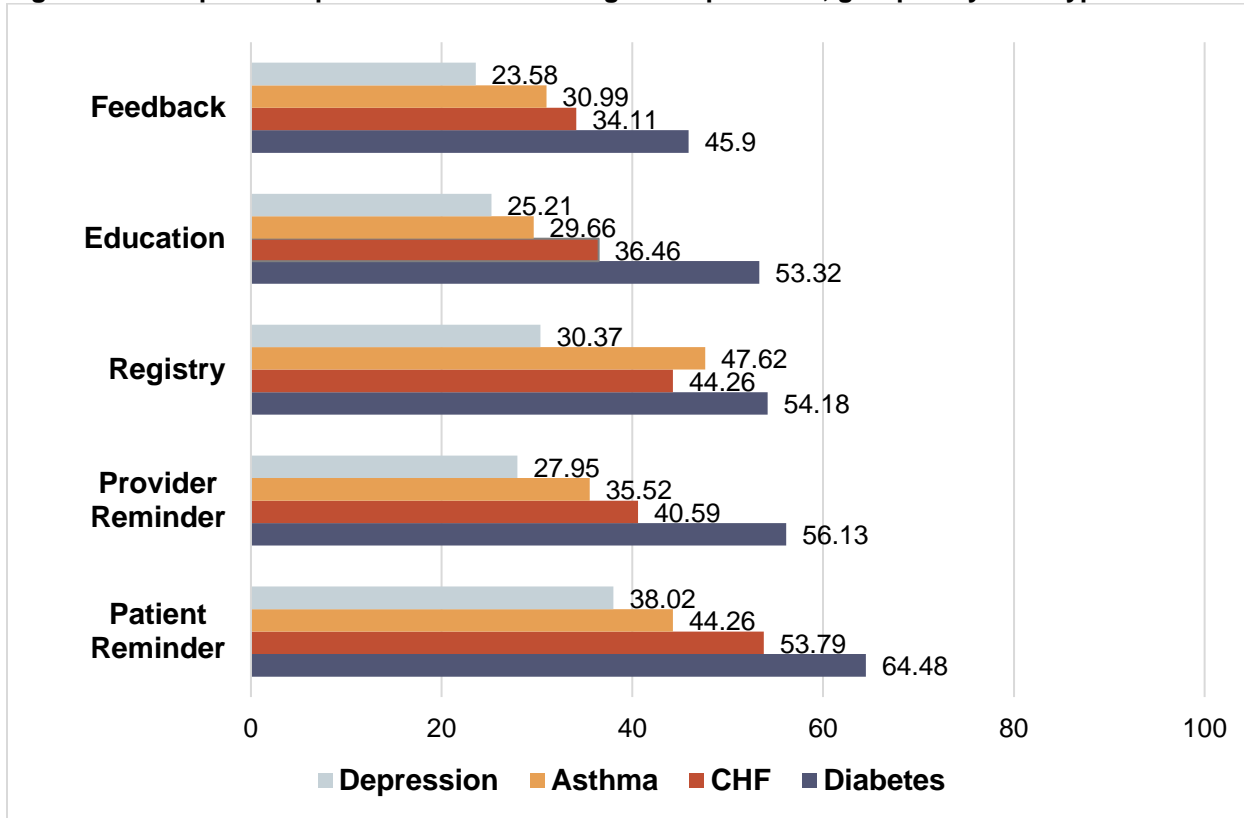
**Figure 2.1. Overall distribution of care management practice adoption by physician organizations (N=1,398)**



Of the 1,263 physician organizations with at least one CMP adopted, adoption of individual CMPs varied (see Figure 2.2). Feedback for depression was the least adopted CMP, adopted by less than one quarter (23.6%) of organizations, and patient reminder for diabetes was the most adopted CMP, adopted by just under two thirds (64.5%) of organizations. The five least adopted CMPs were all for depression, and the five most adopted CMPs were all for diabetes. Similarly, the feedback CMPs are usually less adopted than other CMPs for the same

disease, whereas patient reminders tend to be adopted more often compared to other CMPs for the same disease.

**Figure 2.2. Adoption frequencies for care management practices, grouped by CMP type**



As shown in Table 2.1, correlation coefficients for all 20 CMPs were positive and statistically significant ( $p \leq 0.01$ ). The correlation coefficients ranged from 0.21 to 0.95, with an average of 0.50. Within CMP pairs sharing the same disease focus, the average correlation coefficient was higher than the overall average at 0.55. Disease concordant CMP pairs with education as one of the CMPs tended to have correlations in the low range, whereas all other disease concordant CMP pairs had mostly moderate correlations. CMP pairs of the same type (e.g., both education or both registries) had even higher correlations than disease focused pairs, with an average correlation coefficient of 0.88. The highest value for any correlation coefficient in the matrix was for asthma and diabetes feedback ( $\rho = 0.95$ ), a very high correlation. The



range of correlation values in the CMP type concordant group was high to very high. These findings suggest Mokken scale analysis is appropriate in our pre-specified groupings.

1 **Table 2.1. Care management practice tetrachoric correlation results**

		Asthma					CHF					Depression					Diabetes					
		Registry	Provider <sup>a</sup>	Feedback	Patient <sup>a</sup>	Education	Registry	Provider <sup>a</sup>	Feedback	Patient <sup>a</sup>	Education	Registry	Provider <sup>a</sup>	Feedback	Patient <sup>a</sup>	Education	Registry	Provider <sup>a</sup>	Feedback	Patient <sup>a</sup>	Education	
Asthma	Registry	1.00																				
	Provider <sup>a</sup>	<b>0.51</b>	1.00																			
	Feedback	<b>0.54</b>	<b>0.69</b>	1.00																		
	Patient <sup>a</sup>	<b>0.53</b>	<b>0.66</b>	<b>0.58</b>	1.00																	
	Education	<b>0.37</b>	<b>0.46</b>	<b>0.46</b>	<b>0.44</b>	1.00																
CHF	Registry	<i>0.87</i>	0.42	0.42	0.41	0.31	1.00															
	Provider <sup>a</sup>	0.36	<i>0.87</i>	0.54	0.45	0.32	<b>0.55</b>	1.00														
	Feedback	0.41	0.53	<i>0.89</i>	0.39	0.31	<b>0.58</b>	<b>0.74</b>	1.00													
	Patient <sup>a</sup>	0.40	0.52	0.40	<i>0.87</i>	0.29	<b>0.56</b>	<b>0.70</b>	<b>0.61</b>	1.00												
	Education	0.27	0.27	0.32	0.25	<i>0.86</i>	<b>0.45</b>	<b>0.49</b>	<b>0.50</b>	<b>0.51</b>	1.00											
Depression	Registry	<i>0.84</i>	0.44	0.44	0.49	0.37	<i>0.87</i>	0.38	0.34	0.44	0.25	1.00										
	Provider <sup>a</sup>	0.45	<i>0.89</i>	0.59	0.55	0.40	0.43	<i>0.87</i>	0.55	0.55	0.28	<b>0.58</b>	1.00									
	Feedback	0.42	0.61	<i>0.93</i>	0.50	0.45	0.42	0.61	<i>0.90</i>	0.46	0.35	<b>0.51</b>	<b>0.75</b>	1.00								
	Patient <sup>a</sup>	0.39	0.52	0.46	<i>0.91</i>	0.35	0.37	0.47	0.38	<i>0.89</i>	0.25	<b>0.52</b>	<b>0.67</b>	<b>0.64</b>	1.00							
	Education	0.35	0.32	0.39	0.34	<i>0.87</i>	0.30	0.30	0.28	0.28	<i>0.81</i>	<b>0.46</b>	<b>0.48</b>	<b>0.48</b>	<b>0.47</b>	1.00						
Diabetes	Registry	<i>0.84</i>	0.48	0.51	0.47	0.31	<i>0.84</i>	0.35	0.39	0.40	0.21	<i>0.89</i>	0.45	0.47	0.44	0.37	1.00					
	Provider <sup>a</sup>	0.38	<i>0.91</i>	0.59	0.44	0.31	0.37	<i>0.85</i>	0.51	0.41	0.23	0.35	<i>0.90</i>	0.55	0.41	0.29	<b>0.59</b>	1.00				
	Feedback	0.42	0.55	<i>0.95</i>	0.35	0.30	0.41	0.51	<i>0.89</i>	0.29	0.26	0.33	0.50	<i>0.94</i>	0.32	0.31	<b>0.62</b>	<b>0.70</b>	1.00			
	Patient <sup>a</sup>	0.44	0.58	0.48	<i>0.92</i>	0.34	0.43	0.43	0.39	<i>0.84</i>	0.25	0.43	0.54	0.45	<i>0.92</i>	0.35	<b>0.67</b>	<b>0.68</b>	<b>0.60</b>	1.00		
	Education	0.31	0.34	0.41	0.32	<i>0.87</i>	0.29	0.24	0.29	0.23	<i>0.76</i>	0.30	0.32	0.36	0.27	<i>0.85</i>	<b>0.43</b>	<b>0.44</b>	<b>0.43</b>	<b>0.50</b>	1.00	

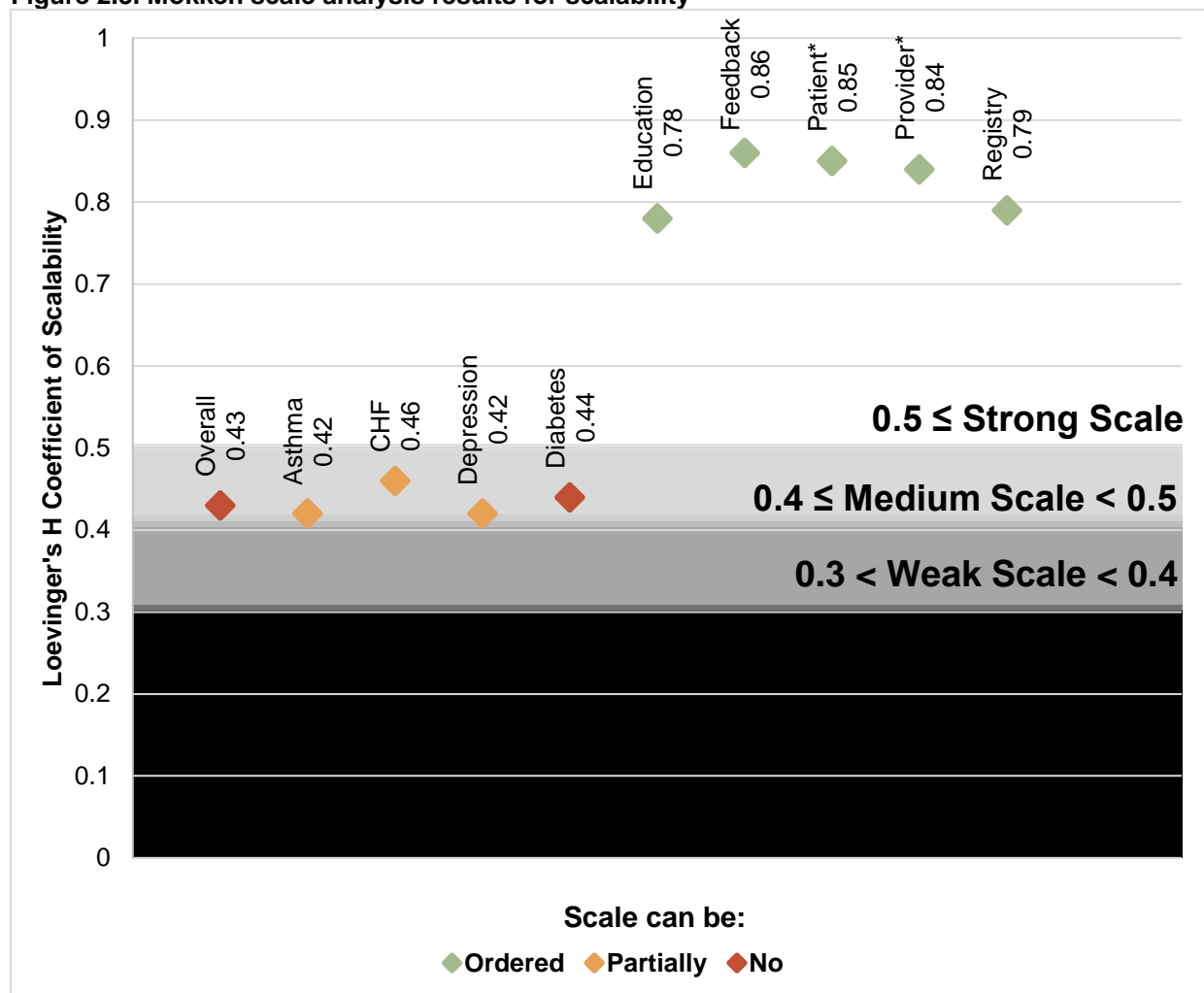
2 <sup>a</sup>reminder; Cells with bolded text and light blue background are correlations between CMPs for the same disease; Cells with italicized text and  
3 orange background are correlations between CMPs for the same CMP type; all correlation coefficients are statistically significant at the 0.01 level  
4 or lower.

## Scale Analyses

### Overall scale

The Mokken scale for all 20 CMPs had medium scalability (Loevinger's H coefficient of scalability = 0.43, see Figure 2.3). This scale did not meet the additional assumption necessary for ranking CMPs, with all criteria values above the threshold. Thus, this medium scale was detecting a latent trait shared by all 20 CMPs, but a consistent ranking or ordering of CMPs did not emerge.

Figure 2.3. Mokken scale analysis results for scalability



\*Reminders

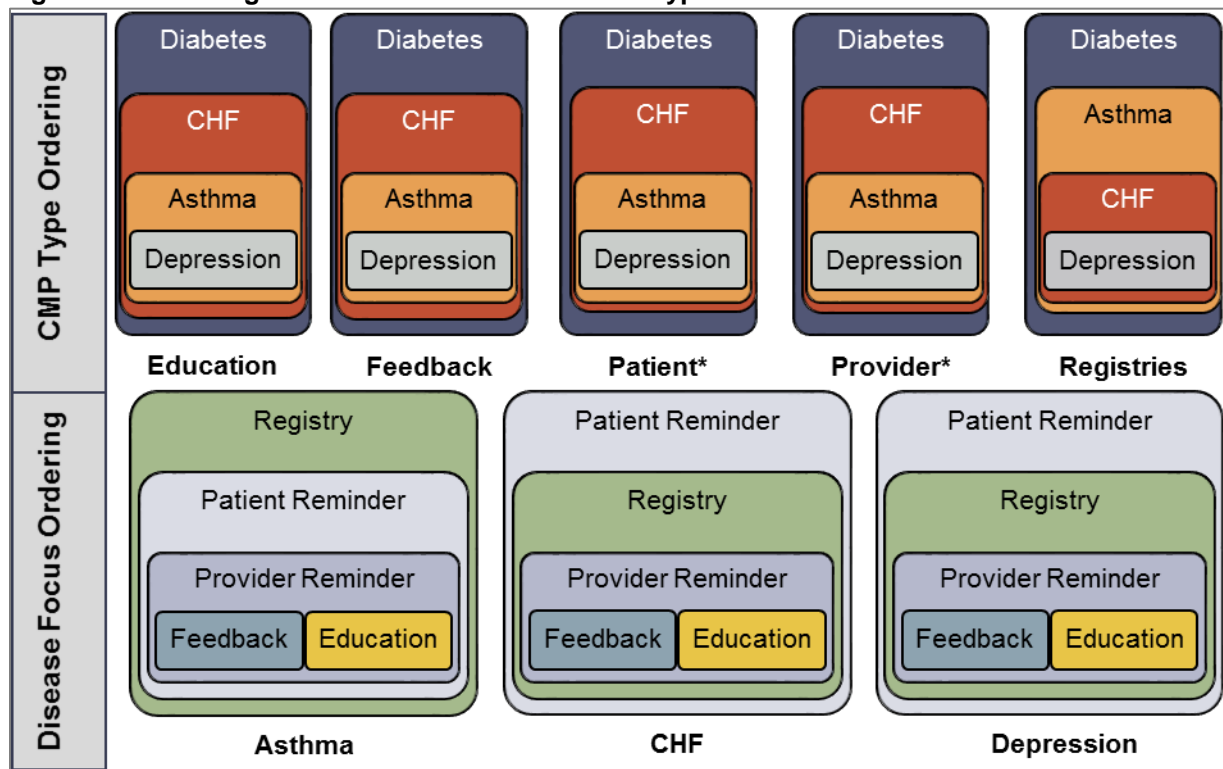
### **Disease focused scales**

Scales for subsets of CMPs sharing a disease focus all had medium scalability (Loevinger's H coefficient of scalability between 0.4 and 0.5 for all). However, in all scales, at least two CMPs had borderline values on inclusion criteria, making it less clear if the assumption for ranking was met. Within the diabetes scale, education, provider reminders, and registries had high values, indicating that there was a lack of ordering present for this scale. For the asthma, CHF, and depression scales, feedback and education were the two CMPs with borderline criteria values, potentially demonstrating a lack of ordering.

When these scales for asthma, CHF, and depression were tested with either feedback or education CMPs included in the analyses, the scales still retained medium scalability, and the ranking assumption was met. This result confirmed that the other CMPs within these scales were appropriate for ranking and sequencing. Figure 2.4 depicts the ordering for all scales that could be ordered (excluding the diabetes scale and the overall scale). For asthma, the disease registries were the most adoptable CMP, followed by patient reminders and then provider reminders. For CHF and depression, patient reminders was most adoptable, followed by registry and then provider reminders. For all three disease scales, patient education ranked least adoptable when included, as did feedback when the patient education CMP was replaced by the provider feedback CMP.

According to these scales, organizations adopting provider reminders for asthma, CHF, or depression will have also adopted patient reminders and registries for that same condition. For these conditions, all these CMPs will have been adopted before either education or feedback are adopted.

**Figure 2.4. Ordering within disease focus and CMP type scales**



\*Reminders

Note: Diabetes scale and overarching scales not in figure given their lack of ordering present. Each scale's most adoptable practices is in the largest box and least adoptable in the smallest. For disease focused scales, feedback and education were both the least adoptable practices when run in separate scales, and thus have equal rankings.

### **Shared CMP type scales**

All scales including CMPs of the same type had strong scalability (Loevinger's H coefficient of scalability > 0.5 for all) and satisfied the additional assumption allowing for ranking of CMPs within these scales (see Figure 2.3). For education, feedback, patient reminder, and provider reminder CMP groups, diabetes was the most adoptable CMP, followed by CHF, then asthma, and finally depression (see Figure 2.4). The one exception was for the registry CMPs, which ordered asthma as more adoptable than CHF.

These scales suggest that organizations that have adopted depression patient education have also adopted patient education for asthma, CHF, and diabetes. Organizations only adopting diabetes patient education will not have adopted patient education for any other

disease. These scales are not consecutive, however, since the overall scale including all 20 CMPs did not meet the assumption necessary for ranking, so organizations are adopting CMPs across disease categories and CMP types without completing the first scale. For instance, an organization might adopt two CMPs from the patient reminder scale, diabetes and CHF, but then also adopt provider reminders, a registry, and education for diabetes as well. Here, four scales have the most adoptable CMP adopted, with one scale having the second most adoptable CMP adopted and one having no CMPs adopted.

## **DISCUSSION**

To our knowledge, our study is the first to examine empirically the sequencing and patterns of CMP adoption choices within physician organizations. Our findings confirm that innovation characteristics such as the disease focus of the CMP and the type of CMP matter when organizations make adoption decisions.<sup>1,19</sup> Findings also indicate that when faced with multiple adoption choices, physician organizations order the implementation of CMPs in a consistent fashion. Although the validation of the overarching Chronic Care Model scale suggests that all CMPs do share a common trait, the order in which organizations rank CMPs is best defined in terms of disease focus within CMP type scales, with diabetes CMPs consistently ranked as most adoptable and depression CMPs consistently emerging as the least adoptable. For rankings of CMP types within disease-focused scales, patient reminders and registries were found to be more adoptable, while feedback and education were identified as less adoptable. Below, we review the relevance and practical implications from each set of scale analyses, beginning with the overarching Chronic Care Model scale, then discussing the disease focus scales, and finally describing the CMP type scales.

The Chronic Care Model and its components have always shared conceptual links, but it is now also defensible to discuss these CMPs as empirically and operationally linked, since the Mokken scale procedure produced medium scalability for the full set of 20 CMPs, rather than

breaking the overarching Chronic Care Model scale into smaller subscales. That said, there was a lack of ordering when considering all 20 CMPs within the overall Chronic Care Model scale. This was not concerning, as ranking the overall scale restricts any variation in adoption to one set sequence across the population of physician organization, which is highly unlikely in a natural diffusion scenario.

For disease-focused scales, scalability was also medium, and the sequencing of CMPs was possible, with some caveats. Within CMP type scales, diabetes was the most adoptable CMP, followed by either CHF or asthma; depression was consistently the least adoptable CMP. In mapping CMP characteristics to innovation traits described in the Diffusion of Innovations literature, several potential explanations for the adoption sequencing seem plausible. First, the high prevalence and cost associated with diabetes compared to the other three chronic diseases,<sup>13-17</sup> suggests that physician organizations may consider the fit with organizational priorities when deciding which CMPs to adopt. However, disease prevalence alone may not be sufficient to drive the adoption decision. It is possible that physician organizations' experiences with adopting diabetes CMPs may shape their sequencing preferences for subsequent CMP adoption. Diabetes CMPs also have the distinction of an extensive evidence base,<sup>5,7</sup> which may make diabetes CMP adoption more attractive, because the relative advantage of these CMPs is borne out in the evidence. In this study, depression CMPs were consistently identified as the least adoptable even though depression is more prevalent than CHF<sup>16,17</sup> and there is a stronger evidence base for the effectiveness of depression CMPs than for CHF CMPs.<sup>18</sup> This discrepancy may be attributed to lower innovation-task fit of depression in primary care, as physician organizations struggle to realign primary care professionals' roles to incorporate behavioral and mental health care.<sup>41</sup> and/or to normative pressures within primary care that limit primary care providers' motivation for investing in and/or otherwise developing expertise in depression care.<sup>42-44</sup> Finally, findings indicated that diabetes was the only disease-focused scale in which CMPs were not adopted in a specific order.

When comparing the different CMP types, strategies like patient reminders and registries, the two most adoptable CMPs, appear to be less complex to implement compared to the others, as they require relatively less maintenance or investment from the physician organization once implemented. Provider reminders, patient education, and physician feedback, in contrast, incentivize providers to action. For CMP types such as patient education and provider feedback, the additional complexity of a human resource and/or interpersonal interaction component may make these CMPs not only less adoptable, but more difficult to implement and sustain.<sup>18</sup> Unlike registries and automated reminders, which require high up-front costs to design and adopt, but are relatively low-cost to maintain, CMPs such as provider feedback require ongoing resource investment in the form of data analysis, management, and clinician time.

### **Limitations**

Our data source has some inherent limitations. Because we used cross-sectional data, we were not able to conduct analyses focused on the time sequencing of adoption decisions or capture exnovation.<sup>18</sup> In addition, the NSPO3 respondents reflect the reports of one informant, although the informant is the most knowledgeable individual in the organization to answer questions related to organizational structure and resources. It is possible that the respondent sample may differ in unmeasured ways from non-respondents that could change how they approach care management adoption decisions.

Because we focused on the specific set of CMP types and diseases included in the NSPO3, these analyses do not factor in other adoption choices being made by organizations at the same time. We were also unable to integrate organizational factors into this type of analysis. Prior work has shown characteristics like organizational size to be linked to CMP adoption,<sup>1</sup> but item response theory approaches like Mokken scale analysis do not allow for this type of respondent characteristic to be integrated. Later chapters in this dissertation explore these characteristics and their relationship with CMP adoption.



Finally, Mokken scale analysis is typically used to assess scalability of questions within a survey or diagnostic tool designed specifically to measure specific, underlying traits. Thus, the medium to strong scalability of our scales represent fairly strong findings for real world data. However, because Mokken scale analysis methods do not allow for survey weighting, findings may not generalize to the physician organizations present in the larger population, since respondents to this survey could have differences from the larger population and those physician organizations declining to participate.

### **Implications**

Better understanding of care delivery innovation patterns may allow for more effective strategic implementation and dissemination efforts that are customized based on the organization's current progress and the ordering they are likely to follow. For example, in an organization with no care management practices looking to make initial investments, a good introduction would be to begin with diabetes related CMPs. Once some CMPs have been adopted, dissemination efforts could seek to expand upon this progress by promoting adoption of CMPs in the same CMP type, following the disease sequence we observed: diabetes, CHF, asthma, and finally depression. A quick diagnostic would allow a facilitator to adapt a plan for care management practice uptake, using the sequencing we describe as a template.

This empirical assessment does address what physician organizations experience as less adoptable care management practices, but more work is needed to better understand why "less adoptable" CMPs may pose challenges or barriers for organizations. It may be that CMPs like provider feedback and patient education are less adoptable because they require human resources, expertise, and greater interpersonal communication, or that they take more effort to sustain on an ongoing basis. With more comparative work looking at the relative advantages and challenges of the various CMPs, it would be possible to better understand why these adoption choices are being made, and how the two characteristics in this study relate to the

innovation characteristics described by Rogers and others.<sup>23,24,26,27,32</sup> In addition, later chapters in this dissertation seek to explore how characteristics of physician organizations factor into adoption decisions.

As rapid innovation in healthcare continues, organizations will be faced with a steady stream of decisions to adopt innovations and evidence-based practices. Rather than viewing each of these choices in isolation, the reality of these environments suggests that these adoption decisions are not made wholly independent of one another. Findings from our study demonstrate that shared traits between care management practices can provide a predictable ordering of adoption choices.

## **CONCLUSIONS**

Organizations are adopting CMPs in a consistent pattern: diabetes is ranked most adoptable, and depression is ranked least adoptable. When looking within CMPs sharing a disease focus, patient reminders are ranked most adoptable, and feedback and education are ranked as both being least adoptable. Our study provides empirical evidence of sequencing of adoption choices, and builds from prior theory suggesting that characteristics of an innovation influence adoption decisions. A better understanding is needed of why certain CMPs are less adoptable, so that better dissemination efforts and support can be administered for these adoption decisions. The findings from this study may guide dissemination efforts by providing more adoptable strategies for non-adopter organizations to implement, while also describing a pathway to sequencing so that innovations and evidence-based practices can be more effectively implemented and sustained within physician organizations.

**CHAPTER 3: PHYSICIAN ORGANIZATIONS' ADOPTION OF CHRONIC CARE MANAGEMENT**

**PRACTICES: IDENTIFYING KEY DRIVERS OF INITIATING ADOPTION AND FURTHER ADOPTION**

## **ABSTRACT**

### **Background**

Little empirical research has explored how the decision to adopt at least one care management practice (CMP) may differ from the decision to adopt multiple CMPs once the initial adoption choice has been made. Diffusion of Innovations theory suggests that late- and non-adopting organizations may have differing organizational characteristics, drivers of adoption (including technical assistance provided), and community characteristics than adopters.

### **Objective**

To examine factors associated with adoption of at least one chronic disease CMP and with number of CMPs adopted among adopters.

### **Design**

Cross-sectional analysis of survey data from the third wave of the National Survey of Physician Organizations (NSPO3). Logistic regression examined factors associated with adoption of at least one CMP in the full NSPO3 sample while zero-truncated negative binomial regression examined factors associated with number of CMPs adopted in the sample of organizations adopting at least one CMP.

### **Participants**

Physician organizations (N= 1,398) with an adjusted response rate of 50%.

### **Main measures**

Three domains of measures were analyzed with respect to organizations' CMP adoption choices: organizational characteristics, drivers of adoption, and community characteristics.

## **Key Results**

Organizational use of electronic medical records, patient-centered medical home accreditation, and participation in an accountable care organization were associated with adoption of at least one CMP as well as number of CMPs adopted. Use of quality improvement systems and support from external entities were only associated with number of CMPs adopted.

## **Conclusions**

Provision of financial incentives and other supports by external entities may help effect change in physician organizations that have not yet adopted any CMPs (i.e., complete non-adopters). Other mechanisms intended to facilitate adoption, such as use of quality improvement systems, may be more appropriate at enhancing adoption in organizations that have already begun to adopt at least some CMPs.

## INTRODUCTION

Evidence-based practices are often slow to diffuse from the settings in which they were initially developed.<sup>45</sup> Differential adoption rates can result in significant variation in how care is delivered, which in turn may contribute to disparities in the quality and costs of care provided.<sup>46,47</sup> For example, prior research indicates that evidence-based processes tailored to the needs of patients with chronic illness, hereafter referred to as chronic care management practices (CMPs),<sup>7</sup> can improve quality of care and clinical outcomes for a variety of chronic conditions.<sup>5,7,10</sup> However, uptake of CMPs among organizations serving more vulnerable patient populations remains low.<sup>11</sup>

Rogers's Diffusion of Innovations theory suggests that the spread of new practices may follow an S-shape, with almost one-fifth (16%) of organizations being late- or non-adopters.<sup>23</sup> Key to closing the gap in adoption is understanding why late or non-adopting organizations choose not to adopt. This theory also describes late adopters as having unique organizational characteristics, including fewer resources and higher risk aversion, that make them less likely to adopt new practices, regardless of their evidence base.<sup>25,27</sup> Structural characteristics can facilitate adoption. For example, larger organizations and system-owned organizations have been shown to adopt more CMPs.<sup>11,27</sup> Strong infrastructure reduces resources needed for adoption and can thus facilitate adoption; use of electronic medical records or quality improvement systems may allow CMPs to integrate with existing systems.<sup>28</sup> Contextual factors in the population may also play a role:<sup>27</sup> older patients or those with less access to technology may not benefit from CMPs that require information technology literacy, such as automated reminders sent via text message or email. Drivers of adoption like isomorphism – in which professional societies or groups of similar organizations pressure participation through normative, mimetic, or coercive means – and resource dependencies, when key resources are controlled by external entities pressuring potential adopters, can also sway organizations to uptake practices like CMPs.<sup>26,30</sup> This category of factors may be key in formulating programs or

policy that impact CMP adoption, since they act as levers for change on which outside organizations can push. If, as Diffusion of Innovations theory suggests, late- and non-adopter organizations have unique traits setting them apart from earlier adopters, these organizations warrant special consideration in analyses.

Although some physician organizations have not adopted any CMPs, they have not been parsed out in analyses of CMP adoption. In separating non-adopters from adopter organizations, we are better able to understand the dynamics of adoption choices across the spectrum. This study addressed two research aims: first, we identified organizational characteristics, drivers of adoption, and community characteristics correlated with adoption of any CMPs. Second, we examined factors associated with adoption of a higher number of CMPs among organizations that had adopted at least one CMP.

## **METHODS**

### **Data Source and Sample**

The National Survey of Physician Organizations (NSPO3) collected data in 2012-2013 from a national sample of physician organizations with a significant proportion of primary care providers caring for patients with one or more of four chronic conditions. These chronic conditions – asthma, congestive heart failure, depression, and diabetes – are of particular interest to organizations managing care, and have often served as the targets for CMPs.<sup>7</sup> The NSPO3 had a total of 1,398 surveyed organizations, with an adjusted response rate of 50 percent. Of the 1,398 organizations in the full NSPO3 sample, a total of 1,263 (90%) had adopted at least one CMP.

Additional information on community characteristics were obtained by merging in data from the 2012-2013 Area Health Resources File (AHRF). The AHRF is a publicly-available database of health-related data at the county and state level.<sup>21</sup> County-level information on patient demographics and regarding whether the physician organization was located in a

primary care shortage areas were obtained by linking NSPO3 data to AHRF data using the Federal Information Processing Standard county code. Each physician organization was linked to a single AHRF county. Additional information regarding NSPO3 and AHRF survey methodology are available elsewhere.<sup>11,20,21</sup>

## **Measures**

### **Dependent variables**

Two CMP adoption measures were constructed: (1) adoption of any CMPs, and (2) number of CMPs adopted. Adoption of any CMPs was a binary measure set =1 if physician organizations reported adopting any of 20 CMPs (5 CMPs for each of 4 disease conditions: diabetes, asthma, CHF, and depression). Number of CMPs adopted was a continuous measure reflecting total number of CMPs adopted.

### **Independent variables**

We identified three measures within the NSPO3 dataset relevant to infrastructure: whether the organization used electronic medical records (EMRs); whether the organization used formal and systematic quality improvement (QI) systems; and whether the organization had made new or additional investments in personnel or technology for improving patient satisfaction or experience and/or quality of care. Another three variables measured structural characteristics: whether the organization was owned by physicians and received a significant proportion of patients through an independent practice association (IPA) or physician hospital organization (PHO), owned by physicians and did not receive a significant proportion of patients through an IPA or PHO, or owned by a larger entity such as a hospital, health maintenance organization (HMO), or community health center; number of physicians both full or part time at all locations; and whether specialists were included in the organization.

We identified seven measures within the NSPO3 dataset assess important drivers of adoption of evidence-based practices. Although conceptually resource dependencies and



institutional effects are distinct, the proxies identified here often relate to both: whether the organization is evaluated by external entities or participated in public reporting; whether the organization received financial incentives from external entities; whether the organization had been recognized as a patient centered medical home (PCMH); whether the organization had applied to become accredited as an accountable care organization (ACO); whether the organization received assistance from an outside entity with performance feedback; whether the organization received assistance from staff at an outside entity related to chronic illness management or education; and whether the organization received assistance from an outside entity with registries or patient reminders.

Six county-level measures from the AHRF were linked relating to community characteristics: percentage of population in poverty; percentage of population that graduated high school; unemployment rate; percentage non-English speaking; and median age. One final measure was included related to community characteristics from the AHRF which measured if the whole county was designated as a primary care provider shortage area, one or more parts of the county were designated as a shortage area, or if none of the county was designated as a shortage area. The construction of all measures and their expected relationship with adoption is documented in Table 1.1.

## **Analyses**

We examined the extent to which organizational characteristics, drivers of adoption, and community characteristics were associated with two separate outcomes related to adoption: adopter status and higher amounts of adoption among adopter organizations. We first compared all unadjusted measures between non-adopters and adopters, using chi-square tests for all organizational characteristic and drivers of adoption measures, as well as for the primary care provider shortage measure. The remaining community characteristic measures were compared using two-sample t-tests.

For the first research aim describing the role of organizational characteristics, drivers of adoption, and community characteristics in being an adopter versus a non-adopter, we used a logistic regression model with our binary adopter variable as the dependent variable and all independent variables described above. The logistic regression was conducted on the full sample of physician organizations (N=1,398).

Given the skewed distribution of the variable measuring the total number of CMPs adopted, a zero-truncated negative binomial regression was used to examine organizational characteristics, drivers of adoption, and community characteristics related to adopting more CMPs among adopter organizations (N=1,263) in the second research aim. The alpha coefficient and the results of a likelihood-ratio chi-square test of the alpha indicated that overdispersion was present and that the zero-truncated negative binomial would perform better than a zero-truncated poisson model.<sup>48</sup> For this model, we used the same set of independent variables, but used the number of CMPs adopted, within the adopter sample, as our dependent variable.

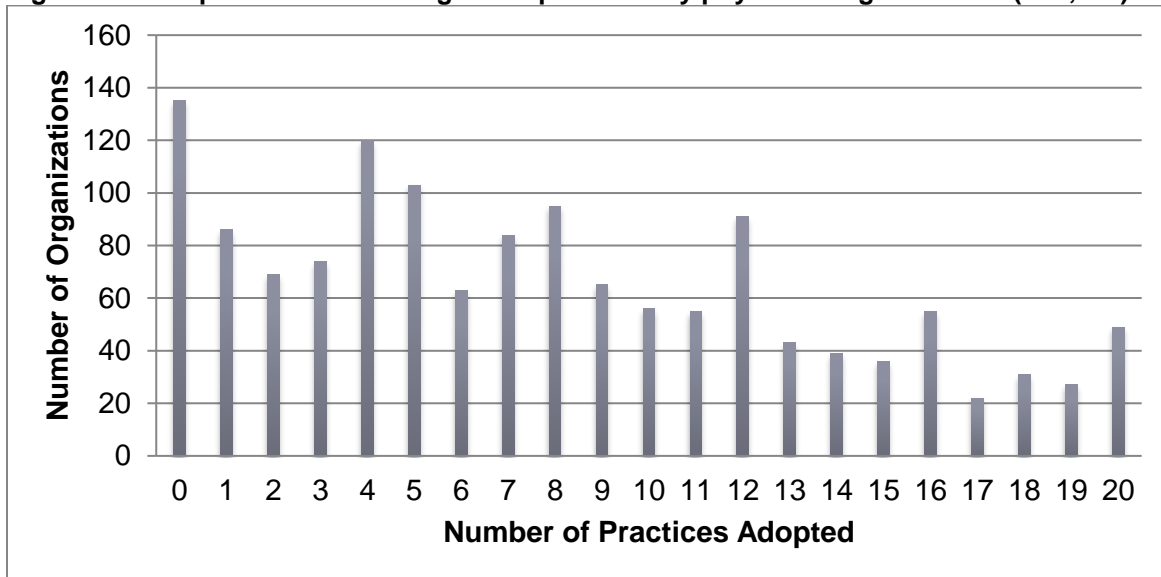
All statistical analyses were conducted in Stata (version StataSE 14),<sup>40</sup> using the svy commands for regression models to employ population ratio-adjusted weights, determined based on sampling probabilities with post-stratification adjustments.<sup>11,20</sup> Pairwise bivariate correlations between independent variables were all less than 0.5, and variance inflation factors (VIF) were for all measures were under 10, which is the threshold above which multicollinearity may be a concern.<sup>49</sup> This study was reviewed and approved by the University of California, Berkeley Committee for the Protection of Human Subjects. This review and approval was accepted by The University of California, Los Angeles Office of the Human Research Protection Program as a University of California memorandum of understanding reliance.

## RESULTS

### Care Management Practice Adoption

One hundred thirty-five organizations (9.7%) were non-adopters (see **Error! Reference source not found.**). Adopters adopted about nine CMPs on average, with only 49 organizations (4.5%) adopting all 20 CMPs. This count of practices did not follow a normal distribution, and had a higher proportion of zeros than any other value, both weighted and unweighted.

**Figure 3.1. Adoption of care management practices by physician organizations (n=1,398)**



### Description of Physician Organizations

Table 3.1 describes the 1,398 participating physician organizations, both overall and categorized as either non-adopters (n=135) or adopters (n=1,263). In general, about one third of organizations included a specialist provider. The majority of organizations were affected by a primary care shortage, either in all or parts of their county. County averages across percentage of population in poverty (15.2% overall), percentage of adults graduated from high school (87.8% overall), unemployment rate (8.6% overall), and percentage non-English speaking (9.8%

overall) also did not differ statistically when organizations were broken into adopter and non-adopter groups.

All drivers of adoption had statistically significant relationships with adopter status; non-adopters were less engaged with drivers of adoption compared to adopters. Of note, very few non-adopters had PCMH accreditation (1.5%) or ACO participation (7.4%). Similarly, electronic medical record use, quality improvement, investments, ownership type, and size all had statistically significant relationships with adopter status. Non-adopters were less engaged with electronic medical records, quality improvement, and investments in personnel or technology for quality of care or patient satisfaction. They tended to be smaller, owned by physicians and affiliated with IPAs or PHOs.

In contrast, roughly a quarter of adopter organizations had PCMH accreditation (27.0%) or ACO participation (26.1%). In the adopter group, 46.2 percent engaged with quality improvement and 85.1 percent made investments in personnel or technology for quality of care or patient satisfaction, compared to 8.9 percent and 48.9 percent of non-adopters, respectively. Adopters also tended to be bigger and were more often owned by a large entity. These differences suggested that inspecting the adopters separately from non-adopters would yield more accurate information on factors related to amount of adoption within the adopter subgroup.

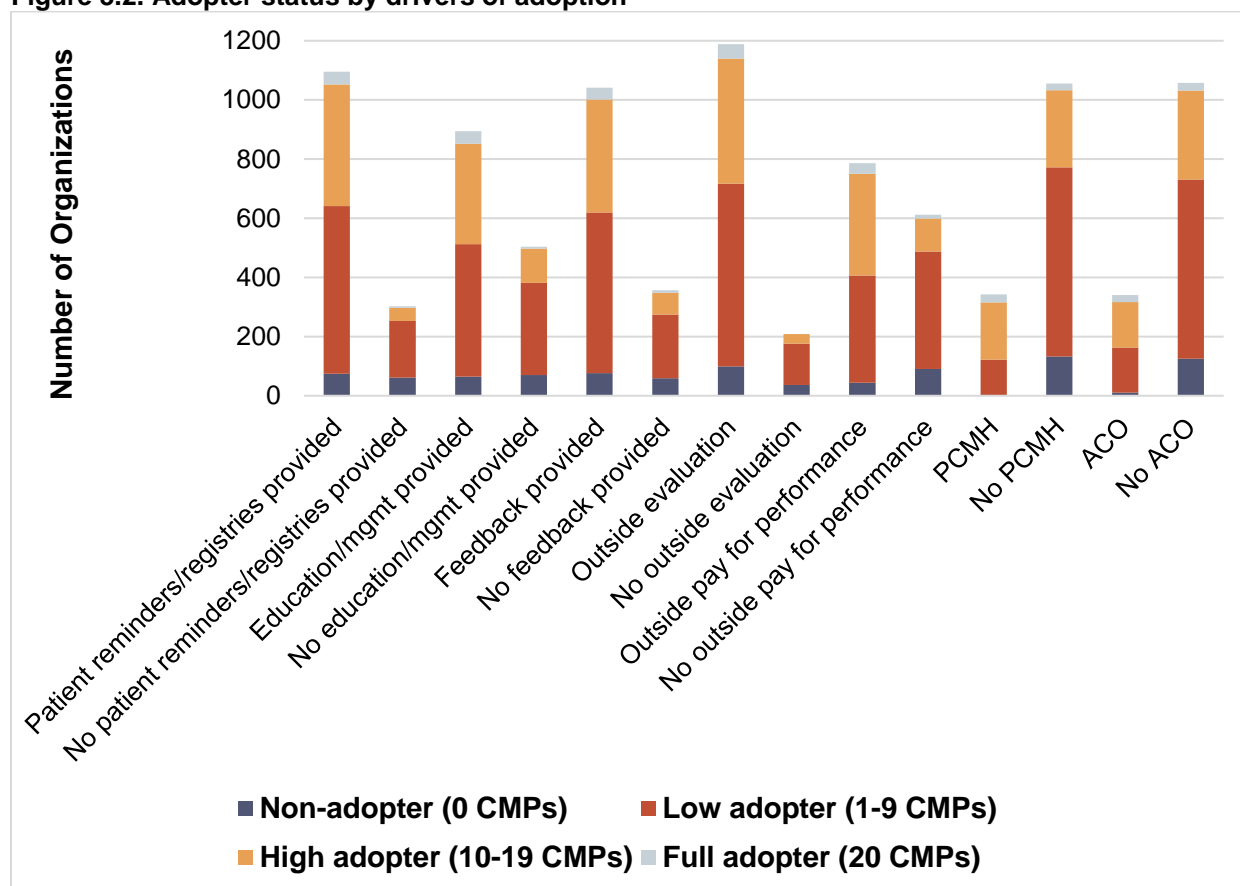
**Table 3.1. Physician organization characteristics by adopter status and overall**

	Overall Sample (N=1,398)	Adopter subsamples		
		Non-Adopters (N=135)	Adopters (N=1,263)	p-value
<b>Infrastructure Characteristics</b>				
Use EMR	52.4%	34.8%	54.3%	0.00
Use QI system	42.6%	8.9%	46.2%	0.00
Personnel/technology for quality of care	81.6%	48.9%	85.1%	0.00
<b>Structural Characteristics</b>				
<i>Ownership</i>				<i>0.00</i>
MD owned, affiliated	57.4%	77.8%	55.2%	
MD owned, unaffiliated	13.5%	8.2%	14.1%	
Large entity owned	29.1%	14.1%	30.7%	
<i>Size</i>				<i>0.00</i>
1-2 MDs	42.0%	61.5%	39.9%	
3-7 MDs	27.7%	23.0%	28.2%	
8-19 MDs	12.5%	11.1%	12.6%	
20+ MDs	17.9%	4.4%	19.3%	
Includes specialist provider(s)	34.0%	31.1%	34.4%	--
<b>Drivers of Adoption</b>				
Evaluated by external entity	85.1%	73.3%	86.4%	0.00
Rewarded by external entity	56.2%	32.6%	58.8%	0.00
PCMH accreditation	24.5%	1.5%	27.0%	0.00
ACO participation	24.3%	7.4%	26.1%	0.00
Outside assistance with feedback	74.5%	56.3%	76.4%	0.00
Outside assistance with education/management	64.0%	48.2%	65.4%	0.00
Outside assistance with patient reminders/ registries	78.3%	54.8%	80.8%	0.00
<b>Community Characteristics</b>				
<i>Primary care provider shortage area</i>				<i>--</i>
No shortage in county	7.4%	7.4%	7.4%	
Whole county	36.6%	39.3%	36.3%	
One or more parts of the county	56.0%	53.3%	56.3%	
Mean percent in poverty	15.2 (SD: 5.2)	14.7 (SD: 5.3)	15.3 (SD: 5.2)	--
Mean percent graduated high school	87.8 (SD: 4.5)	88.0 (SD: 4.5)	87.8 (SD: 4.5)	--
Mean unemployment rate	8.6 (SD: 1.9)	8.4 (SD: 1.7)	8.7 (SD: 2.0)	--
Mean percent non-English speaking	9.8 (SD: 7.8)	9.6 (SD: 7.6)	9.8 (SD: 7.8)	--
Mean median age	37.7 (SD: 3.4)	38.4 (SD: 3.6)	37.7 (SD: 3.4)	0.01

When grouped by drivers of adoption, non-adopters and low adopters (those organizations adopting 9 CMPs or less) were disproportionately included in those groups without drivers of adoption compared to those groups with drivers of adoption (see Figure 3.2).

Organizations participating in a PCMH or with ACO accreditation had the smallest proportions of non-adopters. The highest proportions of full adoption appeared to be when organizations had patient reminders or registries provided by outside entities, education or management provided by outside entities, feedback provided by outside entities, or outside evaluation by outside entities. In these cases, the outside entities were Independent Practice Associations or Physician Hospital Organizations with which the physician organizations were affiliated.

**Figure 3.2. Adopter status by drivers of adoption**



**Research Aim 1: Factors Associated with Adoption of at Least One CMP**

Two organizational characteristics were associated with adopter status in the logistic regression (see

Table 3.2). All else equal, organizations that used electronic medical records had 1.7 times larger odds of being an adopter compared to organizations without electronic medical records ( $p < 0.01$ ), while organizations making investments in personnel or technology for quality of care or patient satisfaction had 7.6 times greater odds of being an adopter compared to organizations not making investments ( $p < 0.01$ ).

**Table 3.2. Adjusted relationship between organizational characteristics, drivers of adoption, and community characteristics with care management practice adoption choices**

	Aim 1: Adopter Status OR (95% CI) <sup>a</sup>	Aim 2: CMP Adoption (IRR) <sup>b</sup>
<b>Infrastructure Characteristics</b>		
Use EMR	1.74** (1.22-2.48)	0.89
Use QI system	1.12 (0.44-2.83)	1.41**
Personnel/technology for quality of care	7.85** (2.82-21.92)	0.94
<b>Structural Characteristics</b>		
<i>Compared to MD owned, unaffiliated</i>		
MD owned, affiliated	0.42 (0.13-1.34)	1.08
Large entity owned	0.23 (0.04-1.42)	0.81
<i>Size-compared to 1-2 MDs</i>		
3-7 MDs	0.50 (0.18-1.39)	1.07
8-19 MDs	0.80 (0.39-1.67)	1.53**
20+ MDs	2.78 (0.43-18.11)	1.15
Includes specialist provider(s)	2.47 (0.83-7.41)	0.93
<b>Drivers of Adoption</b>		
Evaluated by external entity	0.38** (0.24-0.60)	1.01
Rewarded by external entity	1.42* (1.02-1.97)	0.98
PCMH accreditation	23.80** (2.24-254.06)	1.28**
ACO participation	20.35** (2.48-165.10)	1.44**
Outside assistance with feedback	0.60 (0.17-2.04)	1.07*
Outside assistance with education/ management	1.04 (0.70-1.54)	1.31**
Outside assistance with patient reminders/ registries	4.15** (1.81-9.67)	1.38**
<b>Community Characteristics</b>		
<i>Primary care provider shortage area (compared to no shortage area)</i>		
Whole county	0.27* (0.08-0.94)	0.97
One or more parts of the county	0.37 (0.13-1.09)	0.97
Percent in poverty	1.12** (1.04-1.20)	0.99
Percent graduated high school	1.08* (1.00-1.17)	0.99
Unemployment rate	0.94 (0.86-1.01)	1.02**
Percent non-English speaking	1.05* (1.00-1.09)	1.00
Median age	0.99 (0.90-1.09)	0.99

\*  $p < 0.05$ ; \*\*  $p < 0.01$ , <sup>a</sup> Results from a logistic regression model, <sup>b</sup> Results from a zero-truncated negative binomial regression model

PCMH accreditation, ACO participation, outside assistance with feedback, patient reminders and registries, and financial incentives from external entities were all strongly associated with being an adopter of CMPs (OR: 23.8, 20.35, 4.15, 1.42 respectively,  $p < 0.01$  for all but the latter  $p < 0.05$ ). Organizations with PCMH accreditation or ACO participation, in



particular, had much greater odds of being adopters compared to organizations without these affiliations. In contrast, organizations evaluated by external entities had 62 percent lower odds of being adopters ( $p < 0.01$ ).

Higher levels of three community characteristics were associated with greater odds of being an adopter of CMPs: percent of population in poverty (1.12,  $p < 0.01$ ), percent of adult population graduated from high school (1.08,  $p < 0.05$ ), and percent of population that is non-English speaking (1.05,  $p < 0.05$ ). Compared to organizations in counties with no primary care provider shortage, organizations where the whole county had a primary care provider shortage had 73 percent lower odds of being adopters (0.27,  $p < 0.05$ ).

## **Research Aim 2: Factors Associated with Higher Levels of CMP Adoption in Organizations Adopting at least one CMP**

In the analysis of adopters, two different organizational factors were associated with higher amounts of CMPs getting adopted in the zero-truncated negative binomial regression model. Use of quality improvement was associated with a rate of adoption 1.41 times higher compared to organizations without quality improvement systems (1.41,  $p < 0.01$ ), while being larger or mid-sized was associated with a higher rate of adoption as well, compared to small organizations with only one or two physicians (1.53,  $p < 0.01$ ).

PCMH accreditation, ACO participation, and outside assistance with patient reminders were also positively associated with higher CMP adoption among adopters. ACO participation was associated with a higher rate of adoption compared to non-participants (1.44,  $p < 0.01$ ), as was PCMH accreditation (1.28,  $p < 0.01$ ). Outside assistance with patient reminders was associated with 1.38 time higher rates of adoption ( $p < 0.01$ ), outside assistance with education or disease management was associated with a similar higher rate (1.31,  $p < 0.01$ ), and outside assistance with performance feedback for providers was also significant in this model, and was

associated with a slightly higher rate compared to organizations without this assistance as well (1.07,  $p < 0.05$ ).

Only one community characteristic, unemployment rate, was statistically significant in the model examining higher levels of adoption among adopter organizations. A higher unemployment rate was associated with higher CMP adoption rates (1.02,  $p < 0.01$ ).

## **DISCUSSION**

Adopters of CMPs differ from non-adopters, particularly in organizational characteristics and drivers of adoption. These differences were not statistically significant in the adjusted analysis, however, except for use of EMR and investments in personnel or technology for quality of care. CMPs like automated reminders for patients and providers or registries of patients with a particular chronic condition leverage EMR use, and the positive relationship between EMR and CMP uptake has been documented.<sup>11</sup> A similar rationale may be applicable to the association between new or additional investments in personnel or technology for improving patient satisfaction or quality of care and being a CMP adopter. These investments could support infrastructure necessary for CMP adoption, such as hiring additional staff for patient education. Although statistically significant in the logistic regression model, community characteristics were not meaningfully different between adopter and non-adopter organizations in their values, with the small exception of average median age being roughly one year older in non-adopters.

In the adopter sub-sample, the use of quality improvement systems was associated with increased levels of adoption, but not with adopter status more generally. This might indicate that quality improvement initiatives may be better targeted at adopters with low levels of CMP uptake to increase their CMP adoption, rather than non-adopters, since even among adopters quality improvement systems were not widely adopted.

Across both regression models, many drivers of adoption were strongly associated with being an adopter and with higher levels of adoption in adopters, raising the possibility of successful programming to increase uptake through policy. ACO participation, PCMH accreditation, and assistance with patient reminders and registries, in particular, showed positive associations with adoption of CMPs in both models. Drivers of adoption like these could potentially affect change in non-adopters, since they are not yet taking advantage of these programs. It is important to note that programs like ACOs and PCMHs may require CMP use as pre-requisites, so the causality in these cases may actually be reversed. However, when contrasting the similar programs of financial incentives compared to evaluation without compensation by outside entities, the former performed in a positive way while the latter did not. Thus, financial incentives might be considered rather than evaluation without reward in efforts to encourage non-adopting organizations to adopt.

Implications of findings from this study are attenuated by important limitations. These cross-sectional analyses cannot address causality; interpretations of independent variables' effect on adoption must be made with caution. While these findings may suggest potential next steps in the effort to increase CMP adoption, they do not offer the proof of effectiveness a trial could offer. A crucial consideration, especially for ACO participation and PCMH accreditation, is that involvement in these programs may require CMP use as a pre-requisite. There may be some reverse causality associated with these measures.

In addition, the small proportion of non-adopters in the sample for the logistic regression resulted in small cell sizes for some of the comparisons. The large confidence intervals in the logistic regression are likely related to this issue, but we were able to identify statistically significant findings. Lastly, all analyses reflect the responses of particular organizations, and may not be generalizable to those organizations that did not participate in the survey. Survey weights were employed in both regression models to help mitigate this issue, but sampling bias may limit external validity of the findings.

In developing strategies to combat the burden of chronic illness in the United States, increasing CMP use has been shown to be effective. There appear to be some outside drivers of adoption that are universally positive regardless of adopter status, including PCMH accreditation, ACO participation, and outside support for patient reminders and registries. However, promoting CMPs may involve tailored strategies, with the unique characteristics of complete non-adopters requiring consideration. Some factors may be differentially helpful to adopters, such as increasing use of quality improvement systems by physician organizations and providing education and disease management support through outside entities. And while adopters did not show strong associations with either evaluations or financial incentives and increased CMP uptake, these seemingly similar programs had opposite associations when considering adoption status, with public reporting or evaluation by external entities without financial incentives actually taking on a negative value. Even though there was a small sample of non-adopters in survey, the role of laggards in the adoption of evidence-based practices is important to clarify if efforts to decrease variation in care and care disparities are to succeed.

**CHAPTER 4: DEFYING EXPECTATIONS FOR DIABETES CARE MANAGEMENT PRACTICE UPTAKE: A  
MIXED METHODS ANALYSIS OF POSITIVE DEVIANTS IN A NATIONAL SAMPLE OF PHYSICIAN  
ORGANIZATIONS**

## **ABSTRACT**

Different strategies may be required to support uptake of diabetes care management practices (CMPs) in late- and non-adopting physician organizations, which are often quite different from the early adopters typically described in the literature. Quantitative analyses conducted on survey data from the National Survey of Physician Organizations (NSPO3, 2012-2013; n=1,328) were used to identify “positive deviants,” i.e., organizations that had adopted at least one diabetes CMP despite having organizational characteristics associated with non-adoption. Comparative case studies of two non-adopting and two positive deviant organizations revealed that positive deviants had identified primary care as an organizational priority aligned with diabetes management and were able to leverage external support for CMP uptake. Lessons learned from positive deviants may be key in building strategies to combat variations in care, and more attention to these organizations is warranted.

## INTRODUCTION

Recognizing that the current delivery system is better equipped for acute care episodes than for proper chronic care prevention and management, the Chronic Care Model is a framework designed to improve care management of chronic diseases through redesign that focuses on building capacity for the ongoing nature of chronic diseases.<sup>9</sup> Interventions designed with the principles of the Chronic Care Model have been successful at reducing health care costs and producing better health outcomes in multiple systematic reviews.<sup>5,7</sup> These are referred to as care management practices (CMPs), and include sending patients reminders for preventive or follow-up care related to their condition, educating patients about their condition, using reminders to alert providers of guideline-concordant care at the time of an appointment, providing feedback to providers about their quality of care, and maintaining a registry of patients with a particular chronic condition.<sup>5,7,10</sup> In one meta-analysis of CMPs for diabetes, the pooled effect size ( $-0.19$ ) for hemoglobin A1c indicated a lower hemoglobin A1c in the intervention group at follow-up when compared to the control group, which is equivalent to a reduction in hemoglobin A1c of  $-0.30\%$  to  $-0.47\%$ .<sup>7</sup>

However, these positive results are not experienced in the broader public when evidence-based practices are often slow to diffuse from the context in which they were initially developed.<sup>45</sup> Differential adoption rates among physician organizations can result in variations in how these physician organizations provide care, which in turn can magnify disparities in the quality and costs of care provided to their patient populations.<sup>46,47,50</sup> CMPs for diabetes illustrate this dynamic, as they are currently in the process of diffusing in physician organizations across the United States.<sup>19</sup> While 84.5 percent of physician organizations have adopted at least one of the five CMPs for diabetes, only 21.1 percent have adopted all five, and 19.7 percent have not adopted any.

In trying to decrease these disparities it is important to note that CMPs as they are originally conceived may not be well equipped to spread to other organizations.<sup>24,51</sup> Contextual

factors in the communities, health care system at large, or individual organizations may hinder uptake.<sup>5,27</sup> Since interventions are usually developed and tested in innovative organizations,<sup>51</sup> the lessons learned from initial implementation may not be directly applicable to organizations later in the adoption process, that might behave very differently from those early innovators.

To spread evidence-based practices to these later organizations, adoption experiences more relevant to their contexts will be salient and could offer valuable information. To better understand these adoption behaviors, this study used a positive deviance approach to engage with both non-adopters and adopters that share the traits of later adopters (i.e., positive deviant). The term positive deviant refers to an entity voluntarily enacting positive behavior in a departure from the norm, or having exceptionally high performance in comparison to peers with similar contexts.<sup>52,53</sup> For this study, organizations who had adopted at least one diabetes CMP despite having characteristics of a non-adopter served as the positive deviants. As is recommended in positive deviance analyses,<sup>52,54</sup> these deviants were compared to a matched group of non-adopters to examine the relationship between the adoption of diabetes care management practices and key drivers of adoption.

Findings from Chapter 2 in this dissertation suggest that CMPs for diabetes are the most adoptable, as well as the most adopted. In thinking about applying a positive deviance approach to CMPs, diabetes CMPs offer the opportunity to study a set of non-adopters that are falling behind on the most widely adopted CMPs. These are the organizations most truly representing the concept of later adopters. In addition, diabetes is both highly prevalent and costly to treat in the United States.<sup>55</sup> Complications can include blindness, amputation, and kidney failure when diabetes is left untreated.<sup>56</sup> Early detection, prevention, and management can prevent these and other serious issues, but high numbers of Americans are still undiagnosed or not receiving proper treatment for their diabetes.<sup>9,57-59</sup>



## **New contribution**

There is a need to identify strategies for promoting uptake of CMPs that will be effective among traditionally non-adopting organizations. Differences in organizational characteristics mean that strategies for increasing CMP uptake among innovators may differ from those that are effective with later adopters. Research tends to emphasize innovators and early adopters, creating a dearth of information on later adopters.<sup>60-62</sup> This study addresses this gap by using an explanatory sequential mixed methods design<sup>22</sup> to examine factors affecting adoption of CMPs in a sample of positive deviants, i.e., organizations that look similar to non-adopters but still adopted at least one CMP. The use of positive deviance in health services research is still relatively new.<sup>52,53,61</sup> In combination with a mixed methods approach, positive deviants may uncover strategies promoting uptake of diabetes CMPs that are compatible with the contexts of later- and non-adopting physician organizations.

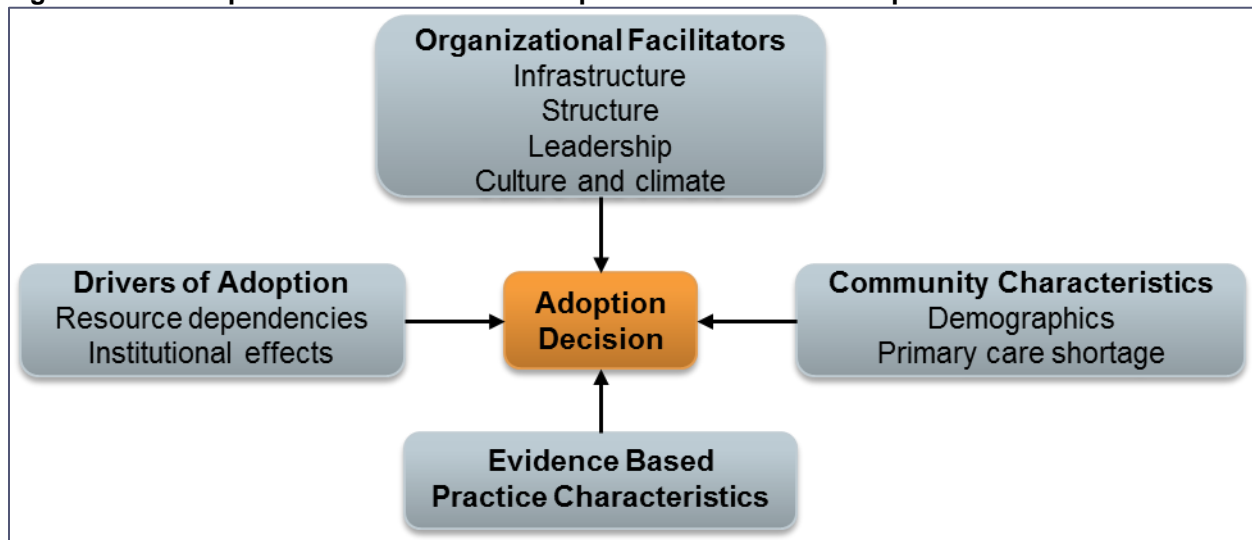
## **CONCEPTUAL FRAMEWORK**

Rogers's Diffusion of Innovations theory<sup>23</sup> describes laggards, or late adopters, as having greater skepticism for change, being less connected to other organizations, and emphasizing a traditional or historical perspective when compared to innovators and early adopters. These characteristics apply to the last 16 percent of individuals or organizations to adopt an innovation. The "innovation" could be a well-known and common idea or practice, but it would need to be perceived as new to the potential adopter. Although CMPs are evidence based and familiar to the healthcare marketplace, they are still considered innovations to the non-adopters in this framework.

Literature including prior Diffusion of Innovations work identifies a number of factors that may affect the rate at which CMPs spread in health care organizations, such as the characteristics of those organizations making the adoption decision, how the innovation is perceived, and the extent to which contextual factors from the community and other

organizations incentivize or discourage adoption.<sup>23-26</sup> To guide analyses in this study, a theoretically-informed conceptual framework was developed from a synthesis of literature (Figure 4.1).<sup>26-28</sup> The conceptual framework for “adoption, implementation, and continuance of evidence-based practices” served as a structural foundation,<sup>26</sup> but was simplified to focus on adoption. This abridged model was then augmented to incorporate insights from the comprehensive “conceptual model for determinants of diffusion, dissemination, and implementation of innovations in health service delivery and organization, based on a systematic review of empirical research studies”<sup>27</sup> as well as with findings from a qualitative study exploring the factors influencing the adoption of diabetes registries,<sup>28</sup> which is especially salient given that this is one of the CMPs included in this current study. The construction of all measures and their expected relationship with adoption is documented in Table 1.1.

**Figure 4.1. Conceptual framework for the adoption of evidence-based practices**



### **Organizational Facilitators**

Organizational facilitators include measures of infrastructure, structure, leadership, and culture and climate. Strong infrastructure can promote adoption by reducing resources needed for adoption,<sup>28</sup> and can include use of electronic medical records (EMRs),<sup>11</sup> use of quality improvement (QI) systems,<sup>1,19</sup> and investments in personnel or technology for improving patient

satisfaction or quality of care. Structural characteristics can facilitate adoption, with evidence that size of the organization, the presence of specialist providers, and ownership are associated with adoption.<sup>11,27</sup>

The role of leadership, culture and climate were explored in the qualitative phase of the study. These included organizational priorities, attributes described in the Diffusion of Innovations literature including traditional views and interactions with outside organizations,<sup>23</sup> as well as domains of culture and climate developed to measure medical office culture including work pressure and pace, communication, and office standardization of procedures.<sup>29</sup>

### **Drivers of Adoption**

Drivers of adoption include resource dependencies and institutional effects. Resource dependencies are experienced when external organizations control key resources and exert pressures on the organization to adopt.<sup>26,30</sup> When adoption of the CMP is a social norm reinforced by participation in aligned professional societies and programs institutional effects are being engaged. Evidence of drivers of adoption often overlap, and may include getting evaluated or rewarded financially by an external organization, conforming to normative pressures of an accountable care organization (ACO) or patient centered medical home accreditation (PCMH) program, or receiving assistance with CMP provision directly from an outside organization such as an independent practice association (IPA) or physician hospital organization (PHO).

### **Community Characteristics**

Characteristics of the community could also facilitate adoption or create burdens that discourage adoption. Barriers could include a primary care provider shortage or community demographics like large non-English speaking community, less educated patient base, poverty levels, unemployment rates, or older population. These wider environmental factors are

supported by limited evidence,<sup>27</sup> and will be included in analyses as control variables rather than primary areas of interest.

### **Evidence-based Practice Characteristics**

By limiting this study to one set of evidence-based practices focused on one common purpose, diabetes management, this study reduced variability of the characteristics of the CMPs in question. Other analyses looking at the traits of CMPs and their relationship with adoption are described in Chapter 2.

### **Differentiating Positive Deviants**

This conceptual model focuses on the differences between non-adopters and adopters in order to classify positive deviants as similar to non-adopters. It may be the case, however, that some of these characteristics may also be distinct between positive deviants and non-adopters, contributing to their aberrant adoption. Particularly close attention was paid to differences in drivers of adoption and cultural characteristics, including organizational priorities. Potential differences between positive deviants and non-adopters in regards to drivers of adoption offer outside organizations and policy makers potential avenues to influence adoption choices, whereas a better understanding of cultural characteristics may suggest ways in which traditional interventions crafted for innovative sites can be effectively tailored for acceptance in these late adopter organizations.

## **METHOD**

### **Design**

The study was conducted as an explanatory mixed method study<sup>22</sup> consisting of statistical analyses of cross-sectional survey data supplemented with semi-structured interviews conducted with key stakeholders (i.e., primary care provider, nurse, administrator) in a purposive sample of positive deviant and non-adopter organizations. Quantitative data were

analyzed to identify organizational characteristics and drivers of adoption associated with adoption of CMPs for diabetes. The qualitative component provided insights on a specific set of organizational traits not collected in the survey and built from the quantitative findings to explore the adoption decisions among non-adopter and positive deviant interviewees. Interviews focused on organizational priorities, leadership, and organizational culture.

## **National Survey**

### **Data source**

National Survey of Physician Organizations (NSPO3) (2012-2013) is a nationally representative survey of physician organizations caring for patients with chronic conditions including diabetes. Additional information regarding the survey's methodology is available elsewhere.<sup>11,20</sup> A total of 1,398 participant organizations responded, yielding an overall adjusted response rate of 50 percent. A subset of 1,329 participants reported on diabetes CMPs, and served as the sample for the regression analyses in this study. The respondents' data were then linked to a second data source, the 2012-2013 Area Health Resources File (AHRF), using their Federal Information Processing Standard (FIPS) county code to include information about their community characteristics. The AHRF is a publicly-available database of health-related data at the county and state level.<sup>21</sup> Each organization was linked to its respective AHRF county in a many-to-one match. Multiple organizations could be in a single county, but each organization was assigned to one county where the organization is based.

### **Measures**

#### **Non-adopter status**

To determine non-adopter status, we created a binary measure comparing any adoption of one or more diabetes CMPs to no adoption. In the NSPO3 survey, a total of five CMPs could be adopted by each organization relating to diabetes: sending patients reminders for preventive or follow-up care related to their diabetes, educating patients about their diabetes management,

using reminders to alert providers of guideline-concordant care at the time of an appointment, providing feedback to providers about their quality of care, and maintaining a registry of patients with diabetes. Each of these was included in this measure.

### Organizational facilitators and drivers of adoption

We identified twelve measures within the NSPO3 dataset relevant to factors that might affect adoption of CMPs. The construction of all measures and their expected relationship with adoption is documented in Table 1.1. These included organizational facilitators or drivers of adoption identified in the conceptual framework: (1) whether the organization used EMRs; (2) whether the organization used formal and systematic QI systems; (3) whether the organization had made new or additional investments in personnel or technology for improving patient satisfaction or experience and/or quality of care of a moderate or large amount (compared to none or small amount); (4) whether the organization was owned by physicians or owned by a larger entity such as a hospital, health maintenance organization, or community health center; (5) number of physicians both full or part time at all locations; (6) whether the organization included specialist providers; (7) whether the organization was evaluated by external entities or participates in public reporting; (8) whether the organization received financial incentives from external entities; (9) whether the organization had either been recognized as a PCMH and/or whether the organization had applied to become accredited as an ACO; (10) whether the organization received assistance from an outside entity with performance feedback; (11) whether the organization received assistance from staff at an outside entity related to chronic illness management or education; and (12) whether the organization received assistance from an outside entity with registries or patient reminders. In addition, because we drew our qualitative sample from California, we included a variable measuring whether the physician organization was in California.

### Community characteristics

Six county-level measures from the AHRF were linked relating to community characteristics identified in the conceptual framework: percentage of population in poverty; percentage of population that graduated high school; unemployment rate; percentage non-English speaking; median age; and whether the county was designated as a primary care provider shortage area. The final variable was operationalized as a categorical variable denoting: if the whole county was designated as a primary care provider shortage area, one or more parts of the county were designated as a shortage area, if none of the county was designated as a shortage area.

### Statistical analyses

We examined the extent to which organizational facilitators were associated with non-adopter status. We first compared all unadjusted measures between non-adopters and adopters, using chi-square tests for all organizational facilitator measures, as well as for the primary care provider shortage measure. The remaining community characteristic measures were compared using two-sample t-tests.

To describe the role of organizational facilitators in being a non-adopter, we used a logistic regression model with our binary non-adopter variable as the dependent variable and all independent variables described above. We employed population ratio-adjusted weights, which were determined based on sampling probabilities with post-stratification adjustments.<sup>11,20</sup> All statistical analyses were conducted in Stata (version StataSE 14).<sup>40</sup>

### Sampling frame for qualitative analyses

To select the sample for the qualitative portion of the study, we first identified all survey respondents with non-adopter status in California. We then found positive deviant adopters by first identifying all adopter organizations in California, and then used factors identified in the prior analysis as statistically significant to limit the sample to organizations with similar characteristics to non-adopters using step-wise addition of criteria. Criteria were added until the

sample size was restricted to roughly the number of organizations we were intending to interview, with additional organizations to allow for non-response. Combinations of selection criteria were explored to maximize the number of criteria used in selecting the sampling frame.

## **Semi-structured Interviews**

### **Participants**

Our purposive sample of non-adopter and positive deviant organizations identified in the quantitative data were mailed an initial introductory letter with the option to opt out of phone contact. Organizations were then called to schedule interviews during a site visit at the organization. For each organization, we sought interviews with a primary care provider, nurse, and an administrator/manager.

### **Procedure and instrument**

During the site visit, we conducted semi-structured, face-to-face interviews with each participant in a private setting after informed consent had been obtained. One participant requested a phone interview. The interviews were audio recorded with respondents' permission, and were later transcribed by a professional service. The domains for these interviews were the organization's use of champions, organizational priorities, leadership involvement in the adoption process, perceived patient needs, and organizational culture (i.e., work pressure and pace, office standardization, communication, organizational learning). These domains are drawn from the Agency for Healthcare Research and Quality (AHRQ) Medical Office Survey on Patient Safety Culture.<sup>29</sup> Prior to interviews with the participants the interview guide (see Appendix A) was piloted with a primary care physician. All interviews were conducted by the first author, an experienced interviewer with qualitative methodology training.

### **Qualitative data analysis**

We analyzed interview transcripts using content analysis with a directed approach.<sup>63</sup> Qualitative content analysis is a systematic process that uses codes and identifies themes or



patterns in the classification and interpretation of data. We used a directed approach to our analysis since our aim was to further explore the role of culture and organizational characteristics in non-adoption, and this approach uses existing theory and research to guide the early analysis process (e.g., development of preliminary codes and categories), while allowing for identification of new extensions to prior work.<sup>63,64</sup> Using directed content analysis for these data allows for integration of theory and quantitative findings into the code development, which united the two methods in a synergistic approach towards the understanding of non-adoption of diabetes CMPs. All qualitative analyses were conducted using Atlas.ti (Windows version 7.5).<sup>65</sup>

Preliminary codes were developed from the interview guide domains described above and from descriptions of Diffusion of Innovations adopter traits, with iterative subcategorization and refinement to reflect nuances in the data (see Appendix B for final code list). The first two authors coded each transcript independently and met to reconcile any discrepancies between codes. Findings are reported for particularly salient themes within and between codes and in cases where particular combinations of codes generated insights.

## **Ethics**

This study was reviewed and approved by the University of California, Berkeley Board for the Protection of Human Subjects. This review and approval was accepted by The University of California, Los Angeles Office of the Human Research Protection Program as a University of California memorandum of understanding reliance.

## **RESULTS**

### **Description of National Physician Organization Characteristics**

Table 4.1 describes the 1,398 participating physician organizations, both in the full sample and categorized as either diabetes CMP adopters (n=1,123) or non-adopters (n=206).

Given that 15.5 percent of the sample were non-adopters, this proportion of non-adoption aligned with the proportion Rogers's Diffusion of Innovations theory describes when the majority has adopted and laggards are the remaining group.<sup>23</sup> There were no statistically significant differences between groups when examining unadjusted outcomes for community characteristics. However, all organizational structure, infrastructure, and drivers of adoption did show statistically significant differences when comparing non-adopters to adopters ( $p < 0.01$  for all comparisons).

**Table 4.1. Physician organization characteristics by diabetes adopter status and overall**

	Overall Sample (n=1,398)	Diabetes adopter subsamples <sup>a</sup>	
		Non-Adopters (n=206)	Adopters (n=1,123)
<b>Organizational Facilitators</b>			
<i>Infrastructure</i>			
Use EMR	52.4%	42.7%	54.5%*
Use QI system	42.6%	15.5%	48.6%*
Moderate or large investments in personnel or technology for quality of care	50.8%	32.5%	54.5%*
<b>Structural characteristics</b>			
MD owned	70.9%	81.6%	67.6%*
Size			*
1-2 MDs	42.0%	48.1%	41.5%
3-7 MDs	27.7%	26.7%	26.5%
8-19 MDs	12.5%	14.6%	11.7%
20+ MDs	17.9%	10.7%	20.3%
Includes specialist provider(s)	34.1%	47.1%	27.6%*
<b>Drivers of Adoption</b>			
Evaluated by external entity	85.1%	75.2%	88.5%*
Rewarded by external entity	56.2%	35.9%	62.6%*
In a PCMH and/or ACO	37.6	14.1%	43.4%*
Outside assistance with feedback	74.5%	57.3%	78.8%*
Outside assistance with education/management	64.0%	49.5%	67.1%*
Outside assistance with patient reminders/ registries	78.3%	59.7%	83.6%*
<b>Community Characteristics<sup>b</sup></b>			
Primary care provider shortage area			
No shortage in county	7.4%	10.7%	6.9%
Whole county	36.6%	37.9%	36.1%
One or more parts of the county	56.0%	51.5%	57.1%
Mean percent in poverty	15.2 (SD: 5.2)	15.0 (SD: 5.6)	15.2 (SD: 5.2)
Mean percent graduated high school	87.8 (SD: 4.5)	87.6 (SD: 4.9)	87.9 (SD: 4.4)
Mean unemployment rate	8.6 (SD: 1.9)	8.5 (SD: 1.9)	8.7 (SD: 2.0)
Mean percent non-English speaking	9.8 (SD: 7.8)	9.7 (SD: 7.7)	9.7 (SD: 7.8)
Mean median age	37.7 (SD: 3.4)	37.8 (SD: 3.4)	37.7 (SD: 3.3)

<sup>a</sup>diabetes adoption values missing for 69 physician organizations (4.9%); <sup>b</sup>in county; \*p<0.01

## Adjusted Analyses for National Sample

A number of organizational facilitators were statistically significantly associated with lower odds of non-adopter status for diabetes CMPs in a multivariate logistic regression (Table 4.2). Organizations using electronic medical records had lower odds of being a non-adopter (OR: 0.81; 95% CI: 0.68 - 0.97), as did organizations using quality improvement systems (OR: 0.52; 95% CI: 0.35-0.76). Similarly, organizations making moderate to large investments in personnel or technology for quality of care had 61 percent lower odds of being a non-adopter compared to organizations making small to no investments in personnel or technology for quality of care (95% CI: 0.22-0.68).

Participation in an accountable care organization or seeking patient centered medical home accreditation was also associated with lower odds of non-adoption (OR: 0.40; 95% CI: 0.28-0.57). Finally, organizations receiving outside assistance with patient reminders or registries had 66 percent lower odds of being a non-adopter of diabetes CMPs compared to organizations not receiving this assistance (95% CI: 0.25-0.46). The statistical significance of these characteristics led to their inclusion as candidates for sampling criteria in the qualitative phase.

Two factors were associated with higher odds of non-adopter status for diabetes CMPs. Organizations that were physician owned had 1.97 times larger odds of being a non-adopter than organizations owned by larger entities or community health clinics (95% CI: 1.39-2.81). Organizations in California, like those in the qualitative component of this study, had 2.12 times higher odds of being a non-adopter than organizations from other parts of the United States (95% CI: 1.45-3.11). These factors were also considered for sampling criteria in the qualitative phase.

Two control variables were significantly related to non-adopter status: organizations in counties with some primary care shortage areas had higher odds of non-adoption compared to those with no shortage (OR: 1.30; 95% CI: 1.08-1.57), while increases in the percentage of the

non-English population in the county were associated with lower odds of an organization being a non-adopter (OR: 0.94; 95% CI: 0.92-0.96).

**Table 4.2. Adjusted relationship between organization characteristics with adopter status for diabetes care management practices**

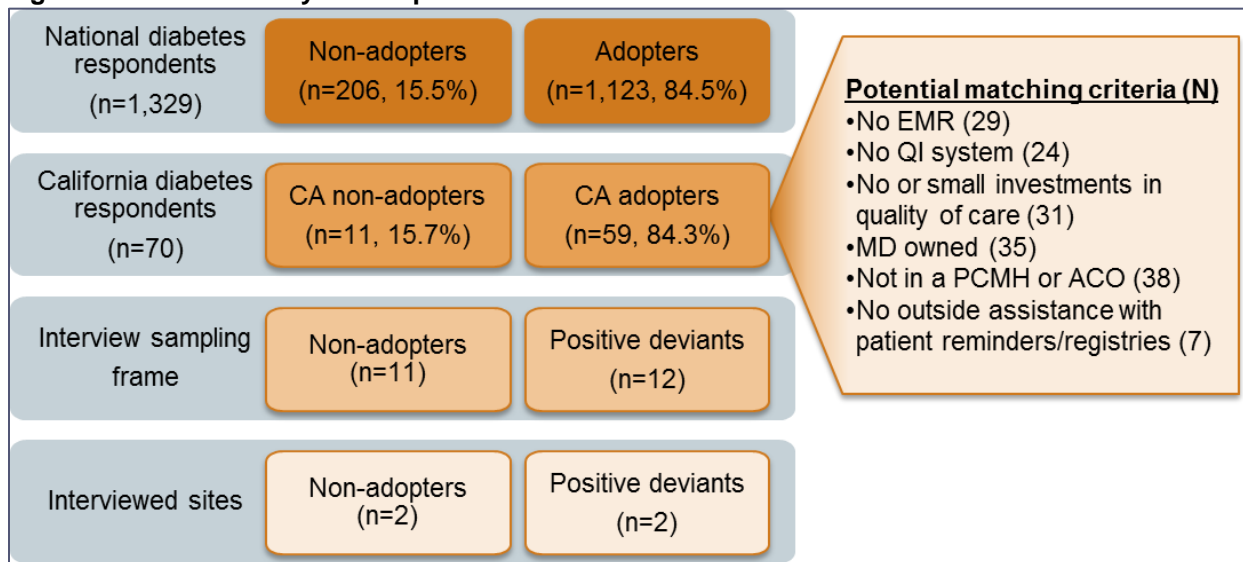
	Non-Adopter OR (95% CI)
<b>Organizational Facilitators</b>	
<b>Infrastructure</b>	
Use EMR	0.81 (0.68 - 0.97)*
Use QI system	0.52 (0.35 - 0.76)**
Moderate or large investments in personnel or technology for quality of care	0.39 (0.22 - 0.68)**
<b>Structural characteristics</b>	
MD owned	1.97 (1.39 - 2.81)**
Size: 7 MDs or less	1.21 (0.40 - 3.65)
Includes specialist provider(s)	1.30 (0.37 - 4.53)
<b>Drivers of Adoption</b>	
Evaluated by external entity	0.94 (0.37 - 2.36)
Rewarded by external entity	0.90 (0.41 - 1.98)
In a PCMH and/or ACO	0.40 (0.28 - 0.57)**
Outside assistance with feedback	1.05 (0.34 - 3.21)
Outside assistance with education/ management	0.86 (0.66 - 1.13)
Outside assistance with patient reminders/ registries	0.34 (0.25 - 0.46)**
In California	2.12 (1.45 - 3.11)**
<b>Community Characteristics<sup>b</sup></b>	
<i>Primary care provider shortage area (compared to no shortage area)</i>	
Whole county	1.51 (0.84 - 2.74)
One or more parts of the county	1.30 (1.08 - 1.57)**
Mean percent in poverty	0.94 (0.88 - 1.00)
Mean percent graduated high school	0.97 (0.95 - 1.01)
Mean unemployment rate	1.06 (0.99 - 1.14)
Mean percent non-English speaking	0.94 (0.92 - 0.96)**
Mean median age	1.01 (0.97 - 1.06)

<sup>b</sup>in county; \* p<0.05; \*\* p<0.01

## **Semi-Structured Interview Participant Flow**

In the national sample we identified 206 non-adopters of diabetes CMPs and 1,123 adopters (see Figure 4.2). On average, adopter organizations had adopted 3.25 CMPs for diabetes, from a total of five. Within California, the subsample from which interview participants were drawn, there were 11 non-adopters and 59 adopters. The proportion of non-adopters in this sample was equivalent to that of the national sample. Of the seven organizational facilitators and drivers of adoption that were statistically significant, we were able to include five. We focused on physician owned organizations in California that did not use QI systems or EMRs. Lastly, they could make no more than small investments in personnel or technology for quality of care. Given limited numbers of eligible positive deviants, we chose to match on the organizational facilitators. After combining these criteria, the positive deviant sample was limited to 12 organizations. The two additional drivers of adoption criteria identified above – involvement in a patient centered medical home or accountable care organization and receiving outside assistance with patient reminders or registries – could not be incorporated without eliminating all but one potential organization. In this sample of 12 positive deviant organizations, the average number of CMPs adopted for diabetes was the same as the overall sample of adopters: 3.25 (range: 1-5). For non-adopters, the sample was limited to California, but no further restrictions were made since this one criterion limited the sample to 11 organizations.

**Figure 4.2. Flow of analysis samples**



Of the 23 eligible organizations identified (12 positive deviants and 11 non-adopters), four agreed to participate in the study, resulting in an interview sample comprised of two positive deviant and two non-adopter organizations who agreed to participate and schedule site visits. During initial mail-based recruitment, two non-adopters and one adopter were not able to be contacted. During telephonic recruitment two adopters declined to participate, one reported that the organization was “not interested” and the other office manager described being too busy, saying the doctor is “a workaholic and makes me a workaholic.” Two adopters as well as two non-adopters initially agreed to participate, but were subsequently non-responsive to scheduling requests. An additional five organizations in each group were completely non-responsive to multiple contact attempts.

### **Interviewed organizations**

Descriptive information from the quantitative phase for each organization that participated in the interviews is detailed in Table 4.3, as well as the individual interviewees from that organization. Descriptions of each organization from the qualitative phase are detailed below.

**Table 4.3. Demographics for interview participant organizations**

	Positive Deviant (Site A)	Positive Deviant (Site B)	Non-adopter (Site C)	Non-adopter (Site D)
<b>Organizational facilitators with statistical significance in adjusted analyses</b>				
Use EMR	No	No	No	Yes
Use QI system	No	No	No	No
Investments in personnel or technology for quality of care	None	Small	Small	Small
MD owned	Yes	Yes	Yes	Yes
In a PCMH and/or ACO	Neither	Neither	Neither	Neither
Outside assistance with patient reminders /registries	Yes	Yes	No	No
In California	Yes	Yes	Yes	Yes
<b>Diabetes CMPs adopted in survey</b>				
Education for patients	No	Yes	No	No
Feedback to physicians on quality of care	Yes	Yes	No	No
Patient reminders	Yes	Yes	No	No
Provider reminders	Yes	Yes	No	No
Registry of patients	Yes	No	No	No
<b>Qualitative phase</b>				
Interviewees	Doctor, Administrative assistant	Office manager, doctor, medical assistant	Nurse/ office manager	Office manager, doctor, medical assistant

**Positive Deviant, Site A**

This organization was established in the mid-1960s, and at the time of the interview the original physician owner was semi-retired and practicing six to eight hours a week. The new physician owner purchased the practice five years ago, and she declined to participate in the interviews. She also withdrew other staff from the interview process, resulting in one partial interview with the administrative assistant and no nurse interview. The practice also had one full-time and three part-time female support staff, including one nursing student, one nurse assistant, and office administrators. As a primary care organization they served primarily elderly Asian patients.



### **Positive Deviant, Site B**

The two physician owners of this organization began working together in the mid-1970s, and were part of a larger organization that has downsized over the years. In addition to the two male physicians, six female support staff also worked at the practice, including the office manager, medical assistants, and a receptionist. The practice was predominantly cardiology, but did have primary care patients as well. They served an older Medicare population, with at least some patients with lower English literacy levels.

### **Non-adopter, Site C**

This site had one male cardiologist, an ultrasound technologist, and a female support staff member, who described her duties as “everything... I just do the front office and back office and checking in, checking out, prescriptions, and vitals.” She had worked at the practice for about nine years, and said the doctor had been in practice for a while before that. Their patient population was older, with a majority being white.

### **Non-adopter, Site D**

The final organization had eight doctors and over 20 staff, including six medical assistants. Five of the doctors were partners in the partnership corporation, while the other three were employees. They were strictly a cardiology clinic, and had been in practice at over 20 years. Their patient population was older and racially mixed.

## **Themes from interviews**

In order to better understand the organizational culture, leadership, and organizational priorities in these sites, we looked for commonalities shared across all sites and within positive deviant and non-adopter sites. We also describe when these themes had site level heterogeneity. Because these are data from a small number of organizations, what is described are the findings for each theme with the most consistency across practices or, when comparing sites, what difference was most salient.

**Theme shared by all sites: laggard culture and physician autonomy**

All four sites shared similarities in culture that resembled the laggard characteristics described by Diffusion of Innovations. All sites, and the physicians in particular, displayed some levels of aversion to change. This was noticeable in their descriptions of their use of EMRs. In discussing the use of electronic medical records, all practices had begun the process of shifting to this new technology, however no practice had fully implemented them throughout the entire organization. These qualitative data give more nuance to a key predictor of diabetes CMP non-adoption, expanding from the binary responses included in the survey data from a few years prior. The physician at Site A described his perspective on staying paper-based as:

*“Not me. [The staff and other doctors] do it... I just did the old fashioned way... I feel over the years and my experience, I think it’s all garbage... you forget the patients. You pay attention to the record... The screen.”*

The medical assistant at Site D described their practice’s arrangement, saying:

*“A few doctors work out of the computers... The doctor that I work for likes paper work. I print out everything for him... you get in your routine”*

The third practice, Site B, started the adoption process, but this didn’t include any changes in the physician’s workflow, described by the medical assistant:

*“They didn’t make the change or the transition because the doctors have been in practice for quite a while...The closest they’ve gotten to it is that now our medical records from a certain date on have been stored, and we’re able to pull them up online off an EMR site... [the doctors are] all paper.”*

The final practice, Site C, demonstrated another variation on partial implementation of EMRs, and the site’s support staff also shared her perspective about physician non-adoption:

*“We’re half and half. We do the notes. We do the vitals. We do all the medications electronically. Doctor does all his plan—stuff like that... I think that if they were given the option, most of these doctors that have been practicing so long, they probably wouldn’t have done it. They just don’t like change. I think now that they have changed and they see how easy it’s going, they like it. I think it’s really scary. Just like, ‘Oh my gosh!’ Then now it’s better.”*

The descriptions from Sites A, B, and C also highlighted other shared characteristics across all four sites: the long time these physicians had been in practice and individual

physician autonomy. Even in the sites where the practice had been established in the last couple decades, the physicians had been practicing for decades prior. In addition, each physician at every site was able to decide how they wanted to practice with high levels of autonomy and, in some cases, variation within site.

**Themes differentiating positive deviants and non-adopters: organizational priorities and outside support**

The main differences between non-adopter and positive deviant sites was if they considered diabetes to be within the purview of the practice's specialty and if they described support from outside organizations with CMPs. When asked how diabetes patients were managed, the Site C support staff described deferring responsibility to primary care, with their role as cardiology specialists being to pass information along:

*"...if they get blood work done and we notice that they're not on medication and their blood sugar's high, he'll ask 'em if they've ever taken anything before or anything like that and quiz 'em. Then he'll tell me, "Send this over to this doctor and let them be aware of what's goin' on."*

Similarly, Site D also identified as a cardiology clinic and the office manager said that patients "are strongly encouraged to get a primary care doctor" as opposed to relying on their practice for general health needs.

In contrast, Site B, which was mostly cardiology with a small proportion of primary care patients, factored diabetes care management into their responsibilities. The medical assistant described their typical patients and their issues:

*"he sees cardiac and internal med patients... although they try and give him a specialty field, he oversees, just as far as the continuity of care for his internal med patients, he sees most of them because they're seniors, and health issues, and the way things progress, and risk factors. Most of them are patients that are diabetic, or have some type of cardiac risk...Basically, mostly like diet and nutrition, because of ailments diagnosis, and then also I would probably say being compliant with their medication."*

Site A was entirely primary care focused, and described having mostly older adult patients with multiple chronic conditions. Taking responsibility for continuity of care expanded

the scope of this provider's responsibilities to include diabetes care management, providing some explanation as to why these positive deviants may have had motivation to adopt CMPs for diabetes, while the non-adopters may not have seen diabetes CMPs as priorities for their cardiology practice.

Only positive deviants mentioned using resources from outside organizations to support CMP capabilities. The hospital across the street from Site A had good educational support for patients with diabetes. In comparing this to the adoption information from the quantitative analyses, patient education is the only CMP Site A had not adopted. However, this physician did not describe employing CMPs in his care for patients with diabetes, with no mentions of registries or the other CMPs this site had indicated they use.

The IPA in which Site B was enrolled had educational resources and patient follow-up for patients with diabetes. The medical assistant described the education:

*"...schools that do dietary counseling for diabetics and education, so that those that it's a new diagnosis for, and those that have been dealing with it for a long time, but just don't understand it and need the reinforcement..."*

The physician described the follow-up component provided by the IPA:

*"...so quarterly we do get a memo from the IPA, and they will ask if they are able to contact the patient...so they will send them like a kit or an order...if there has been some noncompliance that they've noticed through the health plan, following their medication refills, and everything, so yes [the patients get contacted between their appointments]"*

In Site B, the outside supports overlapped with the CMPs they reported providing in the survey, however they did not mention any CMP use, aside from medical assistants' provision of patient education.

### **Themes with individual site variation: leadership styles**

All sites were physician owned, and major decisions were always decided by these physicians. However, each practice had a different approach to decision making, ranging from formal to very informal. The largest practice, Site D, also had the most formal arrangement, with monthly board meetings facilitating any decisions for the practices. The office manager

described the arrangement with most of the staff: “Usually things channel through me and into the board meeting.” The physician, who was one of the partners, added that:

*“It’s a corporation so we have a corporate meeting every month and we discuss [any change]... we have doctors that are employees, newer doctors, and they participate... We have an office manager that participates at the meetings. The only people that have voting rights are the partners.”*

Sites B and C were more informal democracies, with each person having high levels of autonomy to make changes within their scope of responsibilities. For Site C, the dynamic was described as:

*“Yeah, well, it’s basically me and the doctor. If it’s patients and stuff like that, he tells me to take care of everything. If there’s something I absolutely cannot take care, then I’ll ask him... I don’t ask him unless I absolutely have to.”*

In Site B, a similar dynamic was present, even though they had more personnel. The medical assistant described the dynamic:

*“[The doctors are] both open to any idea... As far as doing things systematically in the office? That’s really difficult because he gives me complete autonomy, and so I’m not usually going to him, he usually come to me.”*

The physician confirmed this, calling the office “more autonomous, but we are aware of—I’m aware of what my partner’s doing and vice versa.”

Site A had a clear division of power, giving the retiring physician autonomy but excluding him from the decision making:

*“Remember, so you’ll understand, I’m auxiliary. I come. I just see some of my old patients. That’s about it really. I don’t get involved with the administration... They don’t usually invite me... they know what I’m doing, and cuz I use her—all of these people here are her employees... As you notice, I’m here in this cubbyhole.”*

This autonomy allowed him to continue being paper-based, when the rest of the practice had moved to electronic records, but he was also not included in decision-making. This was confirmed in the interview process, when the owner shut down the administrator interview in under two minutes after the retiring physician had arranged for the interview.

## DISCUSSION

Quantitative findings highlight key factors associated with non-adopter status for diabetes CMPs, including lack of EMR and QI use, small or no investments in personnel or technology for quality of care, physician ownership, being in California, no PCMH or ACO participation, and no outside assistance with patient reminders and registries CMPs. We then conducted interviews with a sample of organizations meeting all but the last criteria, which was discussed in the interviews, including both non-adopter organizations and positive deviants who shared these traits while adopting CMPs for diabetes. These findings suggest positive deviants may share laggard characteristics, but in qualitative analyses positive deviants' organizational priorities seemed to be better aligned with adoption and in addition they received support from outside organizations for CMPs. Despite saying that they had adopted CMPs in the survey data, interviewees described little to no CMP use in interviews. Combined with the partial implementation of the EMRs within sites, decoupling or exnovation of CMPs seems likely.<sup>18,66</sup>

Outside assistance with diabetes CMPs was associated with lower odds of non-adopter status in the quantitative analyses, suggesting that these supports do not replace adoption efforts, and may encourage adoption. During sample selection for the qualitative interviews all but six California adopters had responded "yes" to receiving outside assistance, so this is a critical factor that may be better addressed in a larger, national sample. In addition, both positive deviant sites mentioned using outside organizations in educating or monitoring patients, and had adopted other CMPs for diabetes, suggesting that this outside support may be vital in supporting the adoption of CMPs.

Future work examining individual and organizational-level adoption status within organizations is needed to explore decoupling and exnovation.<sup>18,66</sup> Given the individual autonomy of the providers at these sites, researchers may need more than one informant per organization to explore partial implementation of CMPs. A larger exploration of positive deviants

in a national sample, as mentioned previously, could explore some key characteristics (e.g., outside assistance) in a broader adopter sample.

A key question raised by the cardiology specialty of the non-adopters is whether these late adopters need to adopt diabetes CMPs to perform their core functions. Linking adoption status to quality metrics could be key in determining whether late adopters are poor performers, or strategically avoiding adoption of practices that would not support their core functions. This also raises the policy issue of whether cardiologists, as well as other subspecialists, are prepared to support diabetes care management. Many patients see their cardiologists as serving the role of primary care provider through the ongoing nature of their relationship.<sup>67,68</sup> The results of these interviews highlight the contrast between the functional role these cardiologists may be playing for some patients and the more bounded expectations these specialty providers have relating to their scope of practice.

## **Limitations**

This study has several limitations that must be considered when interpreting the findings. The quantitative analyses used a cross-sectional survey, and cannot establish causation between the factors described and their effect on adoption of diabetes CMPs. In addition, CMPs for other conditions, as well as other evidence-based practices more broadly, may interact with the implementation context of physician organizations differently. While weights were deployed to minimize sampling bias, respondents to the survey could still vary in ways that make their responses less representative of the national population of physician organizations, creating issues for generalizability.

In the qualitative phase, the semi-structured interviews had a small sample due to low response from potential interviewees, demonstrating the challenge of recruiting late adopters and adopters sharing similar characteristics. At two sites, some interviewees declined interviews, leading to potential bias in the data for these sites. To better understand physician

organizations with late adopter characteristics, researchers may need new strategies to reduce the burdens of traditional interview methods or may need to increase benefits for the participants to incentivize participation. Because timing of qualitative component was a few years after the survey, rather than concurrently, the factors being studied may have changed in the interim. Finally, interviewer bias in the interviews was a concern since quantitative data had been explored. Best efforts were taken to avoid treating positive deviants and non-adopters differently, and the interview guide framed adoption questions within a typical care scenario, rather than tying these questions to responses from the survey data. In addition, the research team was not aware of the site's adoption status at the time of the interview, nor were they during the coding process.

## **CONCLUSIONS**

Using multiple factors to identify positive deviant organizations worked to identify adopter organizations that shared many similarities with non-adopter organizations, including characteristics of the laggard as described by Rogers's Diffusion of Innovations theory. These organizations, whether positive deviants or non-adopters, were Californian, physician owned, and without some of the hallmarks of innovative or early adopter sites like electronic medical records, quality improvement systems, and resources invested in quality of care or patient satisfaction. Positive deviants had outside support for certain diabetes CMPs, as well as a primary care scope of practice that aligned organizational priorities with diabetes CMP uptake. This small-scale study could serve as the foundation for a larger study on a national scale to better tease apart the role of factors identified in the quantitative analysis, as well as to see if larger samples of positive deviants and non-adopters are able to confirm or expand upon findings in the cases we report. In particular, learning more about how external entity support for diabetes CMPs influences adoption choices, both for the CMP being supported as well as for the other CMPs the organization is adopting, could contribute to the development of future



dissemination strategies. Because the leadership styles of the four sites varied, a larger sample may also be able to find themes between sites that our sample was not equipped to identify. Having a better grasp of the unique characteristics of late adopter organizations will be key in building strategies to combat variations in care and inappropriate practices in the field, and findings from this study could apply to the adoption of other evidence-based practices as well.

## CHAPTER 5: CONCLUSIONS

Despite extensive expenditures of money and effort in the healthcare industry, evidence-based practices are often slow to diffuse from the settings in which they were initially developed.<sup>45</sup> Differential adoption rates can result in significant disparities in the quality and cost of care provided.<sup>11</sup> This dissertation employed an explanatory sequential mixed methods design to examine factors influencing physician organizations' adoption of evidence-based care management practices for chronic conditions. Cumulatively, this dissertation provides insights into the patterns of adoptability of CMPs, the organizational characteristics and drivers of adoption associated with adoption choices, the characteristics of non-adopter and positive deviant organizations, and the role of organizational culture and priorities in CMP adoption.

Chapter 2 described the patterns in adoption choices by disease focus and CMP type to understand physician organizations' strategies when facing multiple adoption decisions. Item response theory was used to explore whether adoption choices were linked by disease focus or CMP type, and whether a consistent ordering of adoption allowed CMPs to be ranked by adoptability. The strong patterns of adoption that emerged indicate that innovation characteristics like disease focus and CMP type can influence adoption. Strategic dissemination efforts may be more successful when encouraging organizations to focus on more adoptable practices first, and then describing a tailored rollout for the adoption of subsequent CMPs based on early experiences. Future work clarifying why certain CMPs are "less adoptable" may also provide insights for how to overcome CMP adoption constraints.

In Chapter 3 the non-adopter physician organizations were parsed out in a set of analyses examining CMP adoption choices. The relationship between infrastructure for CMP adoption, organizational structure, and drivers of adoption with CMP adoption was examined for both any adoption choice compared to no adoption, as well as for increased CMP adoptions in organizations with at least one CMP adopted. Provision of financial incentives and other supports by external entities may help initiate CMP uptake in non-adopters. Other mechanisms

intended to support adoption, such as use of QI systems, may be more appropriate at enhancing adoption in organizations that have already begun to adopt at least some CMPs. Engagement with patient centered medical homes and accountable care organizations seem to facilitate adoption for physician organizations for both types of adoption decisions, but are subject to concerns about reverse causality. Next steps will need to focus on understanding how to integrate these findings into physician organizations' practice environments.

Focused on CMPs for diabetes, Chapter 4 identified typical non-adopter traits and positive deviant organizations that shared these key traits but had adopted at least one diabetes CMP. Highlighting the mixed methods facet of the dissertation, this study used quantitative data analyses to identify traits and organizations, and then employed comparative case studies on two non-adopting and two positive deviant organizations in the qualitative component of the study. These interviews revealed that positive deviants had identified primary care as an organizational priority aligned with diabetes management and were able to leverage external support for CMP uptake. Lessons learned from positive deviants may be key in building strategies to combat variations in care, and more attention to these special organizations is warranted.

The findings of this dissertation suggest that tailoring dissemination strategies for chronic care management practice uptake may be possible. These strategies may sequence CMPs in order of adoptability, provide opportunities for engagement with patient centered medical homes or accountable care organizations, support dissemination with provision of some CMPs by outside entities, and could adapt to suit the organizational priorities and cultural context in organizations that may not fit the innovator profile. Emphasizing CMP adoption may combat the gap in chronic care quality that contributes to variations in care and inappropriate practices in the field.

## Limitations

Findings from the quantitative phase of this dissertation are attenuated by important limitations. Because we used cross-sectional data, we were not able to conduct analyses focused on the time sequencing of adoption decisions or capture exnovation,<sup>18</sup> and our analyses cannot address causality. Since we focused on the specific set of CMP types and diseases included in the NSPO3, these analyses do not factor in other adoption choices being made by organizations at the same time. When generalizing these findings outside of the CMPs studied, other evidence-based practices may interact with the implementation context of physician organizations differently. Lastly, all analyses reflect the responses of particular organizations, and may not be generalizable to non-respondents. Survey weights were employed where possible to help mitigate this issue, but sampling bias may limit external validity of the findings. In addition, some factors, like organizational slack, are conceptually important and may play a role in adoption decisions,<sup>23</sup> but are difficult to measure either quantitatively or qualitatively.

In the qualitative phase, the semi-structured interviews had a small sample due to low response from potential interviewees, demonstrating the challenge of recruiting physician organizations with late- and non-adopter characteristics. Because timing of qualitative component was a few years after the survey, rather than concurrently, the factors being studied may have changed in the interim.

While the adoption outcomes used in the quantitative analyses are binary, the realities of adoption and implementation of CMPs are not simply “yes” or “no” in most situations. Many of the measures included in quantitative analyses have been aggregated in ways that reduce the natural variability in responses, such as using a CMP for most, all, some, or none of the patients with a particular condition, as opposed to just using or not using that CMP. This aggregation was necessary for use in these analyses, and qualitative analyses were used to explore variation among the subset of interview participants.

## **Future work**

Each of these studies highlights opportunities for future work. Expanding our understanding of the reasoning behind the adoptability patterns found in Chapter 2 may allow for more general evidence-based practice traits that could apply to a broader set of interventions and be helpful in sequencing adoption decisions across a full roster of choices an organization may be facing. Determining how to implement the drivers of adoption highlighted by Chapter 3 requires more research, but this knowledge is necessary to translate the findings into actionable change. Having successfully tested the identification of positive deviants within a sample of physician organizations, Chapter 4 demonstrates the value these organizations could have in an expanded investigation into adoption strategies tailored to late- and non-adopter organizations.

## **Implications**

Many evidence-based practices have the potential to ameliorate the heterogeneous quality of care delivered to the United States population; chronic care management practices are one such case. Lessons from CMP adoption may be helpful in considering the myriad adoption choices facing physician organizations in the current practice environment. While groundbreaking interventions and technology could improve care for those eager to adopt, the real innovation may be understanding the context of non-adopters and spreading fundamental evidence-based practices.

## APPENDIX A. INTERVIEW GUIDE

[ADAPTED FROM MEDICAL OFFICE SURVEY, AHRQ PATIENT SAFETY CULTURE]

### Introduction

Today I'd like to talk to you about how chronic care management for diabetes works in your medical office, and how chronic care management for diabetes fits into your organization's priorities. Healthcare organizations may use certain types of practices to help provide care for patients with diabetes, including nurse care managers, automated reminders for patients or care providers, registries, or educational materials.

As you are answering questions, please keep in mind that I don't need specific people's names, but rather their roles or positions within the organization. For instance, saying the primary care physician in my team, rather than Dr. Smith, is preferable.

The interview, of course, is voluntary. I would like your permission to audio record this interview so that it can be transcribed and analyzed. This recording would be for research purposes only, and will not be shared with anyone outside the research team. The data, will be stored on a secure, password protected computer. Coded and identifiable information will be encrypted. In papers and reports we will only use aggregate data, so readers will not be able to identify who made individual comments.

Do you have any questions? Do I have your permission to record the interview? [TURN ON RECORDER AND INDICATE PERMISISON HAS BEEN GRANTED]

### 1. Background Information on Interviewee and Office

Throughout this interview, think about the way things are done in your medical office and provide your opinions on issues that affect the delivery of chronic care management for diabetes in your medical office.

- How long have you worked in this office? Typically, how many hours per week do you work in this office? Please describe the positions you have held since you began working here. What is your current position or positions?
- How many people work in your office? How many providers (e.g., physicians, nurses, physician assistants)? How many staff or administrative personnel? With whom do you typically work?
- Please describe the types of patients your office usually sees (e.g., demographics, common diagnoses, etc.). What are some of the biggest challenges with this patient population? What are their most important health needs?
- On average, how many patients do you see in a typical day?

## 2. Typical Chronic Care Management Scenario

Now I'd like to walk through a typical appointment with a patient with diabetes. I'd like to hear what the process is like, both what happens for the patient and what happens behind the scenes in the office.

Main prompt

Let's walk through a typical appointment step-by-step, starting with how appointments get made.

Probes

- How does a patient know when they are due for an appointment?
- Does the office contact patients between appointments? If so, how and how often?
- Does an outside organization, like a health plan, contact patients between appointments?
- How often does the office get really busy? Are there enough staff/providers to handle the work?
- To what extent do coworkers help each other out?
- How smoothly does this process usually go?
- How much of the patient's visit is captured in an electronic health record? On paper?
- What information, if any, do patients receive upon completion of their visit?
- During hand-off of patient care responsibilities, how do staff and providers communicate? [clarifying probe: patient care handoffs can occur because of planned or unplanned situations, e.g., a sick call, shift changes, practice demands, etc.]
- Do you have an example of a problem handoff that happened in this practice over the past year? How long did the patient have to wait?

Now thinking about ways that patients get their health care needs met outside of clinical encounters (visits), what does your practice currently do?

- To what extent do clinicians and staff offer patients telephone appointments that are pre-planned instead of in-person visits? How does this work for patients with diabetes?
- Does your practice offer other resources for patients between appointments for patients with diabetes? For example, community exercise programs, online materials, cell phone apps) that this office promotes for chronic care management?
- To what extent are these resources used by your patients?
- Are there common issues in this process that negatively affect patients with diabetes? If so, what are they?

## 3. Issue/Idea Scenario

IF COMMON ISSUE IDENTIFIED: Thinking about [common issue described at end of last scenario], what ideas do you have for a solution?

IF NO COMMON ISSUE IDENTIFIED OR NOT SOLUTION IDENTIFIED: Now imagine you discovered a problem, and have spent some time thinking up a solution. Let's say, hypothetically, that the issue is that patients are confused about how to adjust their diet to be compliant with their diabetes care plan. You think that a combination of provider training and patient education will help.

Main prompt

How would you try to get your solution adopted?

Probes

- Who would you talk to about your solution? Why did you choose that person/those people?
- Do certain providers or staff serve as champions or advocates for better meeting patient needs?
- Are there certain colleagues who help push new initiatives forward? Colleagues who mentor other colleagues?
- How does staff and provider training work at your office?
- Does your organization have any resources that can be used to try out new ideas (e.g., to hire a nurse care manager or create educational materials)?
- Who can exert the most influence on adopting new ideas in your office?
- How often does this office adopt new care practices? What would cause a change? What strategies has this office used in the past to improve quality of chronic care? Which strategies were more or less successful, and why?

#### 4. Organizational Priorities and Leadership

Main prompt

What would you say are the highest priorities for this office? Who makes decisions regarding what your organization's priorities are?

Probes

- Who makes decisions about what practices to adopt or not adopt?
- How much input do providers and staff have into these decisions?
- Who else is heavily involved in determining the type of care delivered for diabetes at this office?
- To what extent and in what ways does your office involve patient and families in their care?

Main prompt

Who would you consider to be part of the leadership in this office? Is it a team? One person? Does this include care providers? Administration?



## NON-LEADERSHIP

- Are you and your colleagues encouraged to share ideas and alternative viewpoints about how things work in your office? Why or why not?
- If you see a mistake being made, what do you do? Who can you tell?
- If leadership becomes aware of a problem or mistake, do they try to correct it? Why or why
- not?

## LEADERSHIP

- Do you find provider and staff are helpful in identifying and solving problems in your office? Why or why not?
- If you see a mistake or issue in your office, what do you do?
- How easy is it to get the rest of the office on board with changes that need to be made?
- How often do you discuss issues with the full office? Are there particular individuals who serve as resources in this type of situation? If yes, what makes these certain individuals helpful?

Is there anything else you would like to share about chronic care management at your office?

Thank you so much for taking the time to talk with me, I really appreciate your insight. Please feel free to contact me with any questions, comments, or concerns at [email].

## APPENDIX B. FINAL CODE LIST

1. AHRQ Patient Safety Culture domains
  - a. Work pressure/pace codes
    - i. Office busy -
    - ii. Office busy +
  - b. Office standardization codes
    - i. Roles flexible/overlapping
    - ii. Roles segmented
    - iii. Defining quality
  - c. Communication codes
    - i. Patient communication
    - ii. Team communication
  - d. Other culture codes
    - i. Leadership styles/office culture
    - ii. Organizational priorities
  - e. Patient needs codes
    - i. Patient as ambiguous role
    - ii. Patient as part of solution
    - iii. Patient as problem
    - iv. Patient centered, not
    - v. Patient centered, ambiguous
    - vi. Patient centered, positive
2. Diffusion of Innovations codes
  - a. Innovative/learning practices/mindset
  - b. Traditional/historical practices/mindset
  - c. Outside org influences
3. Organization descriptive codes
  - a. Demographics
  - b. Typical patient/process

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