



Delivering Across Boundaries: Social and Structural Features of Service Integration

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**Delivering across Boundaries:
Social and Structural Features of Service Integration**

A dissertation presented

by

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to

The Committee on Higher Degrees in Health Policy

in partial fulfillment of the requirements

for the degree of

Doctor of Philosophy

in the subject of

Health Policy

Harvard University

Cambridge, Massachusetts

April 2018

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ABSTRACT

The ability to integrate services across settings and time is increasingly important for healthcare delivery organizations. This dissertation explores the organizational structures and social behaviors that enable service integration in chronic disease care. Its findings can inform practitioners and policymakers that aim to improve care and lower cost, and they lend insight to organizational research on cross-boundary teamwork.

In **Chapter One**, I quantitatively examine the relationship between structural features of medical groups and care integration for elderly patients with multiple chronic illnesses. My coauthors and I develop and administer a survey to over 12,000 Medicare beneficiaries to measure care integration from the patient's perspective, and we combine their responses with data on structural features of medical groups. We find that measures of patient-perceived integration are not consistently related to structural features of medical groups that are commonly referred to as promoting integrated care, such as centralized ownership and large size. Our findings suggest caution at a time of great policy interest in the potential for structural integration to yield patient benefits.

In **Chapter Two**, I explore the conditions associated with effective collaboration among clinical and community-based organizations for chronic disease management

programs. I develop and administer a novel survey to a sample of 247 nonprofit organizations that collaborate with clinics on a diabetes program. I find that group learning across organizations is significantly associated with performance, that learning is positively associated with perceptions of respect among community organization members, and that this relationship is moderated by communication behaviors. Complementing past studies that have focused on incentives and resources in such collaborations, my findings suggest that social behaviors may be important in service integration, particularly for their role in enabling learning across organizations.

In **Chapter Three**, I use a multi-method approach to develop and test theory about teamwork in cross-boundary process innovation. I draw on 76 interviews across 14 teams of clinical and community organization staff, and I collect survey data on 307 similar clinic-community teams. Qualitatively, I identify and describe a joint problem-solving orientation on teams as a key social factor that may enable integration across expertise and organizational boundaries when teamwork is fragmented by membership fluidity. Quantitatively, I develop a valid measure of joint problem-solving orientation, and I find that it is significantly associated with team effectiveness. These findings suggest that teams operating with fluidity and boundaries can make progress through a joint problem-solving orientation, even when opportunities to develop familiarity remain limited.

TABLE OF CONTENTS

ABSTRACT	III
TABLE OF CONTENTS	V
LIST OF TABLES AND FIGURES.....	VII
ACKNOWLEDGEMENTS	XI
BACKGROUND. INTEGRATING SERVICES ACROSS BOUNDARIES	1
ABSTRACT	1
I. INTRODUCTION	1
II. DEFINING INTEGRATION	2
III. STRUCTURAL FEATURES OF INTEGRATION	5
IV. SOCIAL FEATURES OF INTEGRATION	6
V. DISSERTATION OVERVIEW	9
VI. EMPIRICAL APPROACH	9
VII. CHAPTER 1 SUMMARY	10
VIII. CHAPTER 2 SUMMARY	11
IX. CHAPTER 3 SUMMARY	12
X. SIGNIFICANCE AND FUTURE DIRECTIONS	14
CHAPTER 1. INTEGRATED CARE FROM THE PATIENT’S PERSPECTIVE AND ITS RELATIONSHIP TO MEDICAL GROUP ATTRIBUTES	15
ABSTRACT	15
1.1 INTRODUCTION	16
1.2 METHODS	18
1.2.1 <i>Survey instrument</i>	18
1.2.2 <i>Sample</i>	18
1.2.3 <i>Study variables</i>	20
1.2.4 <i>Statistical analyses</i>	22
1.2.5 <i>Limitations</i>	23
1.3 FINDINGS.....	24
1.3.1 <i>Survey responses by integration domain</i>	24
1.3.2 <i>Relationships with organizational characteristics of medical groups</i>	25
1.4 DISCUSSION	28
1.5 CONCLUSION.....	31
CHAPTER 2. CONDITIONS ENABLING CLINIC-COMMUNITY COLLABORATION.....	32
ABSTRACT	32
2.1 INTRODUCTION	33
2.2 INTRAGROUP LEARNING IN INTER-ORGANIZATIONAL WORK	34
2.3 PERCEPTIONS OF RESPECT AND INTRAGROUP LEARNING	36
2.4 COMMUNICATION BEHAVIORS IN INTER-ORGANIZATIONAL GROUPS.....	37
2.5 CONCEPTUAL MODEL.....	39
2.6 METHODS.....	40
2.6.1 <i>Research site and sample</i>	40
2.6.2 <i>Construct development</i>	41

2.6.3 Survey administration	47
2.6.4 Control measures	49
2.6.5 Analyses	50
2.7 FINDINGS	50
2.8 DISCUSSION	52
2.9 PRACTICAL IMPLICATIONS	55
2.10 LIMITATIONS	55
2.11 CONCLUSION	56
CHAPTER 3. JOINT PROBLEM-SOLVING IN CROSS-BOUNDARY TEAMS	57
ABSTRACT	57
3.1 INTRODUCTION	58
3.2 CHALLENGES IN CROSS-BOUNDARY WORK	61
3.3 TEAM EFFECTIVENESS AND FLUIDITY	62
3.4 INTEGRATING RESEARCH ON CROSS-BOUNDARY WORK AND FLUID TEAMS	64
3.5 EMPIRICAL APPROACH	65
3.6 STUDY 1: AN INDUCTIVE FIELD STUDY OF CROSS-BOUNDARY TEAMS	67
3.7 STUDY 1 FINDINGS	70
3.8 STUDY 1 DISCUSSION	77
3.9 STUDY 2: TESTING A MODEL OF JOINT PROBLEM-SOLVING ORIENTATION IN CROSS- BOUNDARY TEAMS	78
3.10 STUDY 2 FINDINGS	85
3.11 DISCUSSION	88
3.12 LIMITATIONS AND FUTURE RESEARCH	92
3.13 CONCLUSION	94
REFERENCES	95
APPENDICES	111
APPENDIX A: SUPPLEMENTARY MATERIALS FOR CHAPTER 1	111
<i>Appendix A.1 Survey refinements, scale development and psychometrics</i>	<i>111</i>
<i>Appendix A.2 Bivariate relationships</i>	<i>114</i>
<i>Appendix A.3 Responses by item</i>	<i>115</i>
<i>Appendix A.4 Robustness checks</i>	<i>118</i>
<i>Appendix A.5 Note on significance</i>	<i>120</i>
<i>Appendix A.6 Adjustment for multiple comparisons</i>	<i>120</i>
APPENDIX B: SUPPLEMENTARY MATERIALS FOR CHAPTER 2	122
<i>Appendix B.1 Sample geographic distribution</i>	<i>122</i>
<i>Appendix B.2 Survey items</i>	<i>122</i>
<i>Appendix B.3 Response distribution</i>	<i>123</i>
<i>Appendix B.4 Correlations among items and measures</i>	<i>124</i>
<i>Appendix B.5 Control measure correlations</i>	<i>125</i>
<i>Appendix B.6 Regressions excluding early-stage collaborations (less than 1 month)</i>	<i>126</i>
<i>Appendix B.7 Regressions with winsorized referral number</i>	<i>127</i>
<i>Appendix B.8 Regressions with one collaboration per respondent</i>	<i>128</i>
APPENDIX C: SUPPLEMENTARY MATERIALS FOR CHAPTER 3	129
<i>Appendix C.1 Construct items</i>	<i>129</i>
<i>Appendix C.2 Response distributions</i>	<i>130</i>
<i>Appendix C.3 Item correlations</i>	<i>131</i>
<i>Appendix C.4 Sensitivity analyses</i>	<i>132</i>

LIST OF TABLES AND FIGURES

BACKGROUND

Table i.1: Features of social integration

CHAPTER 1

Table 1.1: Respondent and medical group characteristics

Table 1.2: Association between structural integration characteristics of medical groups and domains of patient-perceived integrated care

Figure 1.1: Survey item response distributions by domain

CHAPTER 2

Table 2.1: Quantitative Sample

Table 2.2: Communication behaviors

Table 2.3: Association between intragroup learning and number of referrals

Table 2.4: Association between respect and learning, and the moderating role of communication behaviors

Figure 2.1: Conceptual model of learning in clinic-community collaboration

CHAPTER 3

Table 3.1: Challenges in fluid cross-boundary teamwork

Table 3.2: Qualitative sample

Table 3.3: Quantitative sample

Table 3.4: Means, standard deviations, and correlations

Table 3.5: Relationship between joint problem-solving orientation and referral number

Table 3.6: Relationship between joint problem-solving and perceived effectiveness

Table 3.7: Learning as a mediator between joint problem-solving and team performance

Table 3.8: Joint problem-solving as a mediator between intergroup trust and learning

Figure 3.1: Coding scheme

Figure 3.2: Conceptual model of joint problem-solving on teams

Figure 3.3: Confirmatory factor analysis for joint problem-solving orientation

APPENDIX A

Table A.1: Bivariate relationships between organizational characteristics and integrated care domains

Table A.2: Provider Knowledge of the Patient Response Distributions

Table A.3: Staff Knowledge about the Patient's Medical History Response Distributions

Table A.4: Support for Self-Directed Care Response Distributions

Table A.5: Specialist Knowledge About the Patient's Medical History Response Distributions

Table A.6: Support for Medication and Home Health Management Response Distributions

Table A.7: Test result communication Response Distributions

Table A.8: Index of Transition Following a Hospitalization Response Distributions

Table A.9: OLS Results

Table A.10: Ordered logistic regressions including groups with fewer than 5 responses

Table A.11: Correlations across integration domains

APPENDIX B

Table B.1: Item response distributions for respect, learning and boundary spanning communication behaviors

Table B.2: Perceived respect item correlations

Table B.3: Learning item correlations

Table B.4: Boundary spanning communication item correlations

Table B.5: Measure correlations

Table B.6: Control measure correlations

Table B.7: Relationship between referral number and learning excluding early-stage collaborations (less than 1 month)

Table B.8: Respect, learning and the moderating role of boundary spanning communication behaviors excluding early-stage collaborations (less than 1 month)

Table B.9: Distribution of referral number variable

Table B.10: Relationship between referral number (winsorized at 95th percentile) and learning

Table B.11: Relationship between referral number and learning with one collaboration per respondent

Table B.12: Respect, learning and the moderating role of boundary spanning communication behaviors with one collaboration per respondent

Figure B.1 Survey sites by size and state diabetes prevalence

APPENDIX C

Table C.1: Item response distributions for joint problem-solving, trust and learning

Table C.2: Joint problem solving orientation item correlations

Table C.3: Trust item correlations

Table C.4: Learning item correlations

Table C.5: Negative binomial models with number of referrals in prior year as outcome using one collaboration per respondent

Table C.6: Ordered logit models with perceived effectiveness as outcome using one collaboration per respondent

Table C.7: Negative binomial models with number of referrals in prior year as outcome using collaborations with at least 1 and no more than 3 years of duration working together

Table C.8: Ordered logit models with perceived effectiveness as outcome using collaborations with at least 1 and no more than 3 years of duration working together

Table C.9: Negative binomial models with number of referrals in prior year as outcome with number of referrals winsorized at the 95th percentile

Table C.10: Models including measure of respondent optimism

ACKNOWLEDGEMENTS

In writing this dissertation, I have relied on the wisdom, curiosity and support of many incredible people and institutions, for which I am profoundly grateful.

My dissertation committee was truly transformative, pushing where warranted, supporting when needed, and quiet when it was clear that I needed to learn by doing. My dissertation chair, Amy Edmondson, approached my work with a remarkable combination of wisdom and playfulness that helped me to see how joy in discovery can sustain the long hours of scholarly work. I am also deeply grateful for my committee member and long-time mentor Sara Singer, whose example and guidance has taught me how to thrive at the intersection of two fields that I love, healthcare and organizational behavior, and how to doggedly pursue important questions that impact practice. Jonathan Clark brought to my committee a steady hand and unparalleled versatility in research methods and topics; I have yet to find a question that stumps him. I am also grateful for Tsedal Neeley, whose virtuosic knowledge of organizational behavior scholarship both guided and inspired me throughout this dissertation.

I thank the Harvard Business School, the PhD in Health Policy Program, and the Harvard Graduate School of Arts and Sciences for their generous financial and administrative support throughout my doctoral work. I am grateful in particular for the competent, caring support of Debbie Whitney and Colleen Yout at the PhD in Health Policy Program and Jennifer Mucciarone, Marais Young, LuAnn Langan, Daria Russell, and John Korn of the HBS Doctoral Programs Office.

I am grateful for the many colleagues with whom I collaborated for my doctoral research. For Chapter Two, I collaborated with Sara Singer, Jonathan Clark, Mark

Friedgberg, Stephen Shortell, Lawrence Casalino, Patricia Ramsay, Wei Jiang, Ashley Kay Fryer and Molly Freat. For Chapters Three and Four, I collaborated with Amy Edmondson and Sara Singer. I am also deeply grateful for the staff and leadership at my field site, “HealthSource”, who were thoughtful, committed to making positive change in the world, and generous with their time.

My experience writing this dissertation would not have been the same without the many faculty, fellow students, and friends whose feedback and encouragement enhanced this work. These include Kathy Swartz, Rob Huckman, Alan Zaslavsky, and Chase Harrison. I also deeply benefited from feedback, support and hours of interesting conversations with my intelligent peers, especially Mike Lee, Patricia Satterstrom, Alicia DeSantola, Phil Saynisch, Bethany Gerstein, Michael Anne Kyle and Lauren Taylor, as well as all participants in the HBS Work, Organizations and Markets Seminar and the Health Policy Research Seminar.

Finally, a deep thank you to my loving family, especially my husband Aaron Holman, who encouraged me and made these years both fun and fulfilling; to my mother Carol for being a strong and intelligent woman whose example inspires me; to my father Paul for his unwavering love, many early morning car rides and all the hot coffees; to my sister Jasmine, for paving the way in academia as a brilliant and successful scholar who also skis, climbs and lives life to the fullest; and to my brother Morgan, my confidante, best buddy and chief strategist. I would like to dedicate this dissertation to my daughter, who was born just as I finalized this research and whose presence has reminded me daily that a better future is worth working toward in whatever way we can.

BACKGROUND. INTEGRATING SERVICES ACROSS BOUNDARIES

Abstract

This chapter describes the theoretical basis for service integration as a concept in organizational theory and provides an overview of this dissertation. Drawing on existing literature, I define service integration as the making of a unified whole from distinct and interdependent organizational components. A key insight of this work is its introduction of social integration to conceptualizations of integration in healthcare, which have predominantly focused on structural elements of integration such as common ownership. This theoretical perspective underscores that integrating processes and delivering integrated services requires individuals and teams to work and collaborate in new ways. I delineate social integration as a concept applied in healthcare to include goal integration, knowledge integration and emotional integration.

i. Introduction

Now is a promising moment for advancing theory on integration in health services. The environment for healthcare organizations has been growing more dynamic and interdependent, as care is becoming increasingly specialized, value-based payment is deepening interdependencies across providers, and increased data capabilities are driving accountability for outcomes (Shortell et al., 2000). These changes mark a significant departure in the kinds of work and partnership that will be required of healthcare

organizations (Bohmer, 2016). In response, healthcare organizations have begun to integrate in novel ways that challenge us to rethink what integration is and how it might be achieved.

In this chapter, I first define integration and describe its theoretical importance in the healthcare context. I then describe why vertically integrated structures – which have been the focus of most integration theory and research in healthcare– may not be sufficient for yielding integrated care. Finally, I explore why the social features of integration, which are elements of how individuals and teams perceive their goals, communicate knowledge and experience emotional connectedness may be a critical and understudied element of delivering truly integrated services.

ii. Defining integration

Organizational theorists have described the value of integration – the making of component organizational parts into a cohesive whole in order to achieve organizational goals – from different vantage points over many years. Lawrence and Lorsch (1967) suggested that as units within firms further differentiate in response to complex, uncertain environments, integration is required to link those units in order to achieve the organization’s overall purpose. Thompson (1967) observed that the type of coordination across segmented units within a firm depends on the degree of interdependence between them, namely that more interdependent relationships require more intensive coordination in which entities mutually adjust their work over time. Galbraith (1974) added an emphasis on information, suggesting that in the context of uncertain work, the ability to process information across a large number of interdependent roles leads organizations to

seek to either reduce the information processing required or increase their capacity to process it (e.g., through implementing information systems). The ubiquity of this focus in the organizational literature was deftly noted by Mintzberg (1979) who described the drives to integrate and specialize as two fundamental and opposing requirements of “every organized human activity – from the making of pots to the placing of a man on the moon.”

A focus on integration is central to the knowledge-based theory of the firm, which holds that the primary function of a firm is to integrate specialist knowledge (Grant, 1996). This gives rise to a focus on mechanisms of integrating individuals’ specialized knowledge through both formal (e.g., rules and task sequencing) and implicit processes (e.g., group communication). An important insight in this theory is that coordination may be difficult to achieve even in the presence of goal congruence across individuals and organizational units because knowledge must still be integrated across multiple individuals.

Scholars have applied the concept of integration to healthcare because it intensely exhibits many of these differentiation and coordination concerns, particularly for chronic disease care. Patients with chronic diseases may receive services from several care settings, professional domains, and service lines (Bohmer, 2016; Fryer et al., 2016). Much of the care across these settings and service lines is reciprocally interdependent, requiring mutual adjustment among providers, such as two specialists adjusting their own care for a patient over time to be in accordance with one another (Singer et al., 2011; Thompson, 1967). Such adjustment can be challenging, as different care settings may

have distinct missions, professional hierarchies, cultures, and systems (Ramanujam & Rousseau, 2006).

Amid this long history, the term integration has been used in many ways in healthcare. Much early scholarship focused on structural integration, such as on multi-hospital systems that arose in the 1970s (Scott et al., 2000) and on vertically owned delivery systems that emerged in the 1990s (Shortell et al., 2000). However, more recently, scholars have sought to disentangle the notion of integration itself from the component elements that aim to bring it about (of which structural integration is one) (Singer et al., 2011). Several efforts have done so by focusing on *integrated care* as an output (Klauw, et al., 2014; Singer et al., 2011; Valentijn et al., 2015). I will use Singer and colleagues' (2011) definition of integrated care as services that are coordinated across entities, continuous over time, tailored to patients' and families' needs and preferences, and based on shared responsibility between patients and caregivers.

To define the concept of integration as distinct from integrated care, I draw on Barki and Pinsonneault's (2005) definition of organizational integration as "the extent to which distinct and interdependent organizational components constitute a unified whole." However, because I conceptualize integration as inclusive not only have structures but also behaviors and processes, I define integration not as an "extent" but as a continuous act of creation. I thus define integration as the *making* of component organizational parts into a cohesive whole in order to achieve organizational goals.

This definition aligns with recent work to delineate distinct types of integration within and across healthcare organizations (Singer, Kerrissey, Friedberg, & Phillips, 2018). This recent work depicts how structural and functional integration relate to the

construction of ownership and governance structures and systems; interpersonal and normative integration refers to behaviors and beliefs; and process integration describes a set of care delivery activities such as referral management. This conceptual work points to the importance of further developing concepts related to the social features of integration (i.e., those related to beliefs and behaviors) as distinct from structural and functional elements.

iii. Structural features of integration

Structural integration refers to the existence of formal connections among organizations, and organizations are considered to be more structurally integrated when they are owned either vertically (e.g., with a hospital and physician group) or horizontally (e.g., in a multi-hospital system) (Solberg et al., 2009; Singer et al., 2011). Substantial past work on service integration in health care has focused on the role of structural integration (e.g., Gillies, Shortell, Anderson, Mitchell, & Morgan, 1993). However, despite initial optimism about integrated structures (Solberg, 2009), there is emerging evidence that more integrated organizational structures may not serve as sufficient conditions for delivering integrated care. For example, empirical results of the associations between structural characteristics and cost, quality, and patient experience have been mixed (McWilliams et al., 2013; Neprash, et al., 2015).

A challenge of relying on integrated structures is that they may be insufficient for knowledge integration across specialized domains (Grant, 1996). In a dynamic environment, a change in ownership status may not be sufficient to resolve the complex coordination and cooperation challenges posed by specialized work. In addition, efforts

to structurally merge can be complicated by cultures colliding (Buono, Bowditch, & Lewis, 1985), communication failures (Schweiger & DeNisi, 1996), and personnel issues (Zollo & Singh, 2004).

iv. Social features of integration

Organizational scholarship has long called attention to the social elements of integration. For example, in the early 1900s, organizational scholar Mary Parker Follett conceptualized integration as a *social process* of encountering, confronting, and unifying the desires of various parties in service of creating a collective mind, feeling, and will (Metcalf & Urwick, 1942). More recently, health care researchers have also begun to call for greater attention to the social features of integration efforts (Singer et al., 2018). For example, some have pointed to the importance of developing a common culture and norms that span a health system's people, processes and organizational features (Nolte & McKee, 2008; Shortell et al., 2000; Valentijn et al., 2013). However, there has been little effort to present a unified theory of social integration in healthcare services and to distinguish the features of social integration from one another and from the mechanisms that may enable it.

Social integration is the connective tissue that binds discrete organizational components and processes in service of patient care integration. It does so by aligning cognitive perceptions, emotional states and individual and group behaviors to cohesively and consistently deliver integrated services. I combine existing literature to describe three domains of social integration in healthcare services: goal integration, knowledge integration and emotional integration (summarized in Figure i.1).

Goal integration refers to a shared belief that integrated patient care is a central goal of work across organizational components. The primary function of this element of integration is to create a collective will toward care integration. Goals can vary dramatically across organizations and units; for example, Lawrence and Lorsch (1967) described how integration can be hindered when differentiated units within a firm are oriented to different goals (e.g. sales volume vs. manufacturing costs across sales and production units). A common understanding can enable coordination by providing a specific shared perspective on the task and individuals' roles within it (Okhuysen & Bechky, 2009) – and when integrated care is a focus of this shared perspective, it can help to direct attention toward activities that generate integrated services. Goal integration may be enabled by both a tangible alignment of goals through incentives and resources that consistently value integrated patient care and an organizational climate that values integration, which can be created and reinforced by leadership.

Knowledge integration refers to knowledge being communicated effectively across organizational components. This draws on the knowledge-based theory of the firm (Grant, 1996) which would imply that integrating knowledge across specialties, units and organizations is a critical part of delivering integrated care. This is particularly the case for chronic diseases that span specialties and care venues and that persist over time, and which therefore require knowledge about patients' needs, preferences and medical history to be transferred effectively (Fryer et al., 2016). Knowledge integration can be supported by formal processes when knowledge is tangible, such as rules and protocols, and by interpersonal interaction when knowledge is tacit and uncertain (Thompson, 1967).

Emotional integration refers to the extent to which people and teams feel socially integrated into one whole. Organizational research has described social integration as the degree to which an individual is psychologically linked to others in a group (O’Reilly, Caldwell, & Barnett, 1989). Emotional integration in particular has been conceptualized as critical to integration; for example, Katz and Kahn (1978) suggested that integration in social systems is more closely tied to affective factors than role requirements. Emotional integration may manifest in feelings of trust and respect, which promote teamwork and collaboration (De Jong, Dirks, & Gillespie, 2016). It can be fostered through behaviors that are exhibited throughout interactions over time. For instance, Blau (1960) suggested that individuals become integrated into cohesive social groups through exchange processes based in attraction (i.e., through provision of valued services over time).

Table i.1: Features of social integration

Feature	Description	Function	Enabling factors
Goal integration	Shared perception across organizational components that patient care integration is a central goal of organizational activities	A collective will	- Leader values and organizational climate - Incentives and resources that value patient care integration
Knowledge integration	Effective communication of knowledge across organizational components	A collective mind	- Formal: Routines, rules, work sequencing - Interpersonal: Use of teams and group decision-making
Emotional integration	Feelings of mutual trust and respect across organizational components	A collective feeling	- Behaviors exhibited throughout repeated interactions

v. Dissertation overview

This dissertation explores how social and structural features of organizations affect the delivery of integrated services across organizational boundaries. Care integration is increasingly considered a central objective in health care delivery (Singer et al., 2011), particularly for chronic diseases, which cause seven of every ten deaths and account for most of healthcare spending in the United States (Bauer, Briss, Goodman, & Bowman, 2014). Yet integrated care poses distinct organizational challenges as it requires teamwork and interoperability across numerous professional domains, functional units and expertise areas (Bauer et al., 2014; Bohmer, 2016; Shortell et al., 2000). Organizational research has shown that boundary-crossing work is fraught with challenges as different areas of knowledge, cultures and work processes collide, and our understanding of how boundaries can be effectively crossed remains nascent (Edmondson, 2012). Understanding how services for chronic diseases can be integrated across domains and over time is a critical component of improving quality, reducing cost and enhancing patient experience (Singer et al., 2011).

vi. Empirical approach

In this dissertation, I explore these issues through three multi-method empirical papers. Because I conceptualize service integration as a multi-dimensional phenomenon that arises in response to complex, boundary-crossing problems, my dissertation uses multi-method, multi-level analyses, including at the organizational and team levels. In chapter one, I administer a survey to a sample of over 12,000 Medicare beneficiaries, while in chapters two and three, I use mixed methods to both induce theory qualitatively

and test concepts quantitatively using survey data. This multi-method approach is appropriate given the nascent stage of research on service integration and teamwork in dynamic settings (Edmondson & McManus, 2007). It also enables insights that span theory and practice and that advance both organizational theory and health care research.

vii. Chapter 1 Summary

In the health care industry, structural integration among care delivery organizations (e.g., vertical ownership or merging into large horizontal groups) has garnered substantial attention as a pathway toward integrated services and improved care (Burns et al., 2013). In theory, organizations that are more structurally “integrated” may be more capable of managing care processes, coordinating across specialties and settings, and exploiting economies of scale and scope, thereby lowering costs and improving quality. However, empirical findings on the association of structural features with cost and quality have been mixed (Neprash et al., 2015), raising questions about their implied relationship to integrated service provision. This paper explores this question by developing comprehensive measures of care integration and assessing their relationships with structural features of medical groups.

With colleagues, I develop, validate and administer a novel survey to a stratified random sample of over 12,000 patients with multiple chronic illnesses and combined their responses with data on structural features of medical groups across the United States using Medicare claims. The final analytic sample included 3067 patients receiving care at 144 medical groups. An important development in this work is the measurement of service integration from the perspective of the end users – the patients – as they are

uniquely positioned to describe service delivery across professionals, settings and time. Using psychometric analysis of survey results, we identify seven domains of integration that reflect knowledge and support of, and communication with, the patient. We use ordered logistic regression models to relate these patient-perceived integration measures to five organizational features of medical groups (vertical ownership, large size, being multi-specialty vs. primary care, having sophisticated information technology systems, and using dedicated care management programs).

We find that medical group characteristics representing greater structural integration were not consistently associated with service integration as perceived by patients. Vertical ownership and technological capabilities were not associated with more integrated care in any domain, while being in a multi-specialty versus primary-only medical group was associated with an integration measure of information flow among staff ($p < .05$). For the organizational literature, these findings call attention to the importance of developing comprehensive measures of integration that enable exploration beyond structural integration proxies, and they suggest that structural integration may be insufficient for integrated service provision. For the healthcare industry, these findings suggest caution at a time of great national interest in the potential for consolidation among healthcare organizations to yield better integrated patient care.

viii. Chapter 2 Summary

As accountability for quality measures and value-based payment have grown in healthcare, clinical organizations have increasingly explored partnerships with organizations operating in lower-cost settings such as non-profit organizations that

deliver lifestyle interventions for patients at risk for chronic disease (Shortell et al., 2000). However, differences in professional domains, organizational cultures and work processes make collaborating across clinical and community organizations challenging (Axelsson & Axelsson, 2006). Understanding whether and how clinic-community collaborations can achieve shared goals despite these barriers is critical to better integrating chronic disease services.

In this paper, I examine the role of intragroup learning in clinic-community collaborations. While past literature in health services has focused on structural and functional elements of inter-organizational collaborations, such as aligned incentives, I find that intragroup learning is a significant predictor of collaborative performance, even when accounting for measures of incentives and resources. I further find that perceptions of respect are a particularly salient feature in this work due to the steep status hierarchy in health care, and that these perceptions have strong ties to learning. I find that group communication behaviors of inquiring and offering moderate the relationship between respect perceptions in healthcare. These findings point to the importance of social behaviors and perceptions in care integration, and they provide concrete guidance to managers who must cross clinic and community boundaries to implement novel chronic disease programs.

ix. Chapter 3 Summary

In this chapter, I use mixed-methods and a team perspective to examine teamwork across organizational boundaries in process innovation. As in Chapter 2, I focus on collaborations to implement new referral systems across clinical and community settings

for patients with chronic diseases. I ground this chapter in organizational theory on teams, which has recently highlighted how increasingly complex, unscripted and interconnected work has complicated traditional perspectives on team dynamics by limiting the stability and boundedness of teams (Hackman & Katz, 2010; Wageman, Gardner, & Mortensen, 2012). I use healthcare services for chronic disease as a rich context to explore dynamics on boundary-crossing teams. In particular, I focus on how teams can work together effectively when team membership fluidity and multiple boundaries limit opportunities to establish traditional features of team effectiveness.

I first report on an inductive qualitative study of fourteen teams composed of medical care providers and community-based organization staff who come together to establish novel referral systems for patients to receive chronic disease management services in community settings. I find that a team orientation focused on joint problem-solving advanced teamwork amid fluidity and knowledge boundaries. I define joint problem-solving orientation as the extent to which a team emphasizes problems as collective and solutions as requiring co-production.

In the second phase of this study, I collect data on 307 medical-community teams, develop a valid measure of joint problem solving orientation and find that a joint problem-solving orientation is strongly associated with team task performance as measured by number of patient referrals generated in the prior year. For example, I find that if a team were to have a one-point increase in its joint problem-solving orientation (out of five potential points), its rate of patient referrals would be expected to increase by a factor of 1.61, holding all other variables in the model constant ($p < .01$). This corresponds to a substantive difference: a predicted 6 referrals in the prior year at a joint

problem-solving score of 1, as compared to a predicted 42 referrals at a joint problem-solving score of 5.

Organizations that reach across boundaries in process innovation face unique challenges that call for new theoretical perspectives on team dynamics. My findings suggest that when teamwork is characterized by boundaries and fluidity, joint problem-solving can enable learning and performance, even if opportunities to establish familiarity remain limited.

x. Significance and future directions

Complex social problems like chronic diseases themselves know no organizational boundaries. As the dynamism and complexity of such problems continue to grow, understanding how to integrate services across these boundaries will become ever more critical to sustained organizational performance. The findings across this dissertation suggest that integrating services will require change in how individuals and groups perceive their work and behave together. A joint problem-solving orientation offers one approach for performance under such fluid, cross-boundary conditions because it enables learning amidst constant change. Future work can explore when and how joint-problem-solving emerges, identify other critical features of social integration, and explore how such social features of integration interact with structural features to consistently generate integrated patient services.

CHAPTER 1. INTEGRATED CARE FROM THE PATIENT'S PERSPECTIVE AND ITS RELATIONSHIP TO MEDICAL GROUP ATTRIBUTES

Abstract

Structural integration is increasing among medical groups, but whether these changes yield care that is more integrated remains unclear. This paper explores relationships between structural integration and integration perceived by patients using a validated national survey of Medicare beneficiaries with multiple chronic conditions (n=3067). Patient perceptions were measured across seven integration domains. Among domains, survey responses were most favorable with respect to test result communication and least with respect to provider support for medication and home health management. Medical group characteristics were not consistently associated with patient-perceived integration. However, patients of multi-specialty groups exhibited significantly more favorable perceptions of groups' staff and their knowledge of patient medical history. Hospital ownership, information technology and care management capabilities did not exhibit significantly positive relationships with any integration domain. Opportunities exist to improve patient care, but structural integration alone may be insufficient for delivering care that is truly integrated from the patient's perspective.

1.1 Introduction

Care integration has emerged as critical to improving health system quality and reducing costs (Blumenthal & Abrams, 2016), especially for chronically ill patients. The challenges of caring for patients with chronic illnesses are significant and intensifying (Bodenheimer, Chen, & Bennett, 2009). Forty-five percent of Medicare beneficiaries have four or more chronic conditions (Cubanski et al., 2015). Care for the chronically ill tends to be multifaceted, long-term, distributed across many providers, and complicated by socioeconomic challenges (Fryer et al., 2016). Transforming the health system to deliver care that is truly integrated has proven challenging.

Structural change among care delivery organizations has garnered attention as a pathway toward improving care coordination (Burns et al., 2013). In theory, organizations that are more structurally integrated may be more capable of managing care processes, coordinating across specialties and settings, and exploiting economies of scale and scope - thereby lowering costs and improving quality (Shortell et al., 2000). Accordingly, some practitioners have expressed enthusiasm about and made investments in both horizontal and vertical integration. *Horizontal integration* generally refers to physicians merging into large, multispecialty groups; *vertical integration* refers to physicians and hospitals merging through ownership and contractual arrangements (Solberg et al., 2009). However, empirical results of the associations between these structural characteristics and cost, quality, and patient experience have been mixed (McWilliams et al., 2013; Neprash et al., 2015).

These mixed results may stem from the notion that the structural integration of health care organizations is conceptually distinct from integrated care delivery (Singer et

al., 2011). Integrated care is coordinated across entities, continuous over time, tailored to patients' and families' needs and preferences, and based on patients' and caregivers' shared responsibility (Singer, Friedberg, Kiang, Dunn, & Kuhn, 2013). From this perspective, it is clear that structural integration may or may not lead to integrated care. Unfortunately, comprehensive measures of integrated care have not been readily available until recently, so the empirical relationship between structural integration and integrated care has remained unclear.

In this study, we refined a previously validated integrated care survey called the Patient Perceptions of Integrated Care survey (Singer et al., 2013), administered it to a national sample of Medicare beneficiaries with multiple chronic conditions, and developed a new set of measures and operational assessments of integrated care that were more detailed than existing measures. For example, whereas CAHPS focuses on integration within the medical office, the Patient Perceptions of Integrated Care Survey enables assessment across groups such as specialists and primary care. We report on the empirical relationships we observed between these measures and structural characteristics (such as size and ownership) of medical groups. We characterized structural integration in this study using measures of organizational structure (larger size, hospital ownership, and multispecialty status) and structural capabilities (more advanced information technology [IT] systems and care management processes).

In the United States, the number of large multispecialty groups has grown (Burns et al., 2013), and the percentage of physicians describing themselves as independent practice owners has declined (Health Affairs, 2016). Understanding whether and how these changes improve care integration from the patient's perspective is critical, yet in

much of the research on care integration, the patient's perspective is missing. Our survey offers a way to incorporate this perspective in assessments of care integration and to identify opportunities for health systems to improve care for patients with chronic illnesses.

1.2 Methods

1.2.1 Survey instrument

We administered the Patient Perceptions of Integrated Care (PPIC) survey, which was developed and administered to measure care integration from the patient's perspective (Singer et al., 2013). Working with the survey's authors and with input from a panel of 27 expert advisors, we refined the survey to specifically address care integration issues among high need patients, including adding several items and adapting several frequency scales that cognitive testing indicated as problematic. The refined version underwent pilot and cognitive testing and was assessed for reliability and validity. (For a description of the survey refinements, scale development and psychometrics of the revised version, please see Appendix A). The PPIC survey includes 59 questions about patients' experience of care across settings, including the primary provider's office, specialists, hospitals, and home, plus demographic items.

1.2.2 Sample

From July to October 2014, we administered the PPIC survey by mail to a national stratified random sample of 12,364 mostly elderly Medicare beneficiaries with two or more chronic conditions. We chose to sample Medicare beneficiaries with multiple chronic conditions because research has indicated that care integration is particularly important and challenging for this population of patients (Singer et al., 2011).

Stratification was based on medical group characteristics (size, ownership, specialty mix, IT capabilities, and care management processes) derived from the 2012 and 2013 National Survey of Physician Organizations (NSPO3) (Wiley et al., 2015). We randomly selected 150 medical groups from the NSPO3 sample. We linked the groups to physicians using National Provider Identifier numbers in the National Plan and Provider Enumeration System, developed by the Centers for Medicare and Medicaid Services (CMS) to assign unique identifiers to providers. Using 2011 Medicare Provider Analysis and Review claims data and the Master Beneficiary Summary File Chronic Conditions segment of from CMS, we sampled beneficiaries who had two or more chronic conditions and saw physicians affiliated with one of the selected medical groups. We attributed patients to medical groups based on a plurality of outpatient claims from a given physician. We randomly selected up to 120 beneficiaries per group, oversampling patients hospitalized in 2011 to comprise 33% of the sample.

Surveys were mailed to beneficiaries in three waves as needed. After excluding 412 beneficiaries whose letters were returned as undeliverable, who died, or who requested removal from the database, the final sample included 3,067 respondents receiving care in 144 medical groups for a response rate of 26%. This response rate is consistent with similar mail-based patient surveys, which often report rates around 30% (Bergeson, Gray, Ehrmantraut, Laibson, & Hays, 2013; Elliott, Edwards, Angeles, Hambarsoomians, & Hays, 2005; Hays et al., 1999). Our methods for addressing non-response include regression weighting for non-response and comparisons of respondents to non-respondents.

Psychometric analysis identified six dimensions of patient-perceived integration. This structure achieved good model fit, internal validity, discriminant validity, and construct validity (details available in Appendix A).

1.2.3 Study variables

Domains of integration- The six domains of integrated care identified through psychometric analysis are: (1) *Provider Knowledge of the Patient* regarding how well informed, up to date and familiar the provider is with the patient's needs and values; (2) *Staff Knowledge About the Patient's Medical History* concerns staff familiarity with the patient's current and historical medical information; (3) *Specialist Knowledge About the Patient's Medical History* addresses specialist familiarity with the patient's current and historical medical information; (4) *Support for Self-Directed Care* measures the level of help and encouragement a patient receives to enable self-care; (5) *Support for Medication and Home Health Management* covers how well providers orient patients to their medications and provide support between visits; and (6) *Test Result Communication* addresses efficacy and timing of efforts to share test result information with the patient. For each dimension, we calculated dimension scores as the unweighted average of items in the dimension for each respondent. In addition to these six dimensions, we included an index, *Transition Following a Hospitalization*, given the established theoretical importance of post-hospital care integration for patients with chronic illnesses (Wiley et al., 2015). This index was based on three survey items, completed only by respondents recently hospitalized, that pertained to contact and information exchange following hospitalization.

Patient Characteristics- The PPIC survey gathered demographic information that we converted to binary variables indicating some college education, male gender,

older age (75 and over), income over \$40,000, white race, Hispanic ethnicity, and living alone. The survey also included a control for whether the respondent had help completing the survey and a 24-point scale measuring life orientation toward optimism (Scheier, Carver, & Bridges, 1994), as optimism has been linked to better subjective wellbeing, proactive behavior and physical health (Carver, Scheier, & Segerstrom, 2010). We measured health status using number of chronic conditions.

Medical Group Characteristics- Measures of medical group characteristics were derived from the NSPO3. These measures included group size (solo, small, and large with ten or more physicians), hospital ownership, practice type (multi-specialty vs. primary care), an IT capabilities index and an index of care management processes. For example, for the IT index, one point was possible for each of nineteen questions about electronic medical record availability, access and use, e-prescribing, and electronic registries for select diseases. We defined practices as more structurally integrated if they were multi-specialty, large, and hospital-owned. Based on existing theory, we hypothesized that practices with greater structural integration and stronger IT capabilities and care management processes would be associated with higher patient-perceived integration (Tollen, 2008).

Table 1.1: Respondent and medical group characteristics

Respondent characteristics		Percentage of respondents ^a	Mean
Age 75 and older		54.1%	
Male		41.4%	
At least some college		55.2%	
Hispanic		3.7%	
White		89.2%	
Living alone		34.1%	
Higher income (over \$40,000)		41.6%	
Received help completing the survey		12.4%	
Mean number of chronic conditions			6.7
Optimism (0-24 point scale)			22.58
Medical group characteristics^b	N (%) of groups	Percentage of respondents	Mean
Size - solo (1 physician)	19 (13%)	12%	
Size - small (2-9 physicians)	62 (43%)	44%	
Size - large (10+ physicians)	63 (44%)	44%	
Multispecialty	65 (45%)	44%	
Primary care	79 (55%)	56%	
Hospital owned	72 (50%)	48%	
Not hospital owned	72 (50%)	52%	
Average group tech capabilities score (0-19)			10.07
Average group care management score (0-15)			5.04

Source/notes: SOURCE: Authors' analysis of Patient Perceptions of Integrated Care (PPIC) data. NOTES: ^a There were 3067 survey respondents. Percentages are based only on those respondents answering the question. Item non-response was less than 10% for all items, except for income, which was 23.7%. ^b Groups are those included in regression analysis (n=144); 6 groups were excluded from the original 150 due to lack of response.

1.2.4 Statistical analyses

Because domain scores were derived from categorical survey responses, we treated them as ordered categorical variables and divided patient responses into quartiles to improve interpretation. We used ordered logistic regression models to estimate the odds of patient perceived integration being associated with each medical group characteristic, controlling for the other group characteristics and patient health, optimism, and demographic factors. Ordered logistic models assume that, given a set of categorical outcomes, the relative odds associated with each possible pair of outcomes is equivalent for all pairs. A Brant test of this proportional odds assumption was non-significant,

confirming that ordered logistic regression was appropriate. Consistent with common reporting methodologies, we excluded medical groups with fewer than five respondents from analysis to minimize individual patient non-response bias. We imputed patient characteristics using mean imputation (i.e., replacing missing values with the mean of available cases), to minimize the impact of missing values (CAHPS Database, 2013).²³ We used the SVY procedure in Stata to account for the complex, multi-level sampling design and to weight for survey nonresponse. Regressions were weighted at the patient-level by the inverse probabilities of selection for the sample, a method recognized as producing estimates that resemble population statistics more closely than unweighted models (Solon, Haider, & Wooldridge, 2015). Standard errors of all regressions are clustered by medical group and are robust to heteroscedasticity, ensuring that the statistical tests are not unduly influenced by underlying relationships between the independent variables and regression residuals.

We performed robustness checks using alternative specifications, including using ordinary least squares and including medical groups with fewer than five patient respondents and found the results to be robust to these changes (see Appendix A). Adjustment for multiple comparisons did not alter interpretation of the main findings (Benjamini & Hochberg, 1995).

1.2.5 Limitations

Our study has several limitations. First, the sample is cross-sectional, which limits causal inferences. Also, because medical group data were collected in late 2012 and 2013 while patient survey data were collected in 2014, the organizational features in our study may differ from those that patients experienced if the organization changed (e.g., merged) in the interim.

Second, levels of perceived integration reported for this sample of mainly elderly patients with multiple chronic conditions may differ from younger, healthier patients who face fewer opportunities for care fragmentation and may have greater capacity to manage their own care.

Finally, while the response rate was similar to mail-based patient surveys, bias could arise from systematic differences between responders and the underlying population. In our sample, non-respondents had slightly more chronic conditions than respondents (mean of 7.2 for non-respondents vs. 6.7 for respondents; $p < .01$). As past research has shown that late survey respondents often share characteristics with non-respondents (Miller & Smith, 1983), we examined and did not find statistically significant differences in patient perceived integration when comparing first and last wave respondents (p-values from 0.07 to 0.97).

1.3 Findings

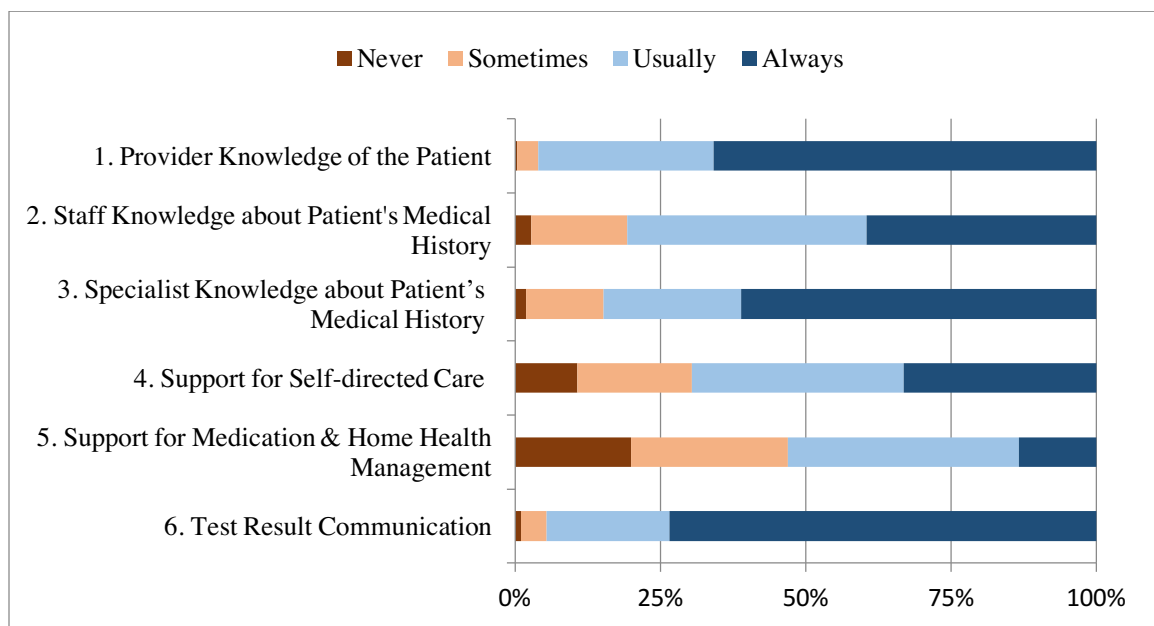
Table 1.1 presents characteristics of patient respondents and medical group characteristics. Respondents had 6.7 chronic conditions on average. Most were white and majorities were female with some college education.

1.3.1 Survey responses by integration domain

Figure 1.1 displays the response distributions for each domain of patient-perceived integration. The most consistently positive responses were exhibited in *Test Result Communication*, *Provider Knowledge of the Patient*, and *Specialist Knowledge about the Patient's Medical History*, with 73.4%, 65.8%, and 61.1%, respectively, of responses in the most favorable response category. The least favorable responses were exhibited in *Support for Medication and Home Health Management* and *Support for Self-*

directed Care, with only 13.4% and 33.2%, respectively, of responses in the most favorable category. Both also had relatively high percentages in the least favorable category - 19.9% and 10.7% respectively. Results were more mixed for *Staff Knowledge about the Patient’s Medical History and Transition Following a Hospitalization*, with about 40% of responses in the most favorable category for both (detail available in Appendix A, “Responses by item”).

Figure 1.1: Survey item response distributions by domain



Source/notes: SOURCE: Authors’ analysis of Patient Perceptions of Integrated Care (PPIC) data. NOTES: Percentages for each domain are calculated as the numerical average of the Likert scale responses for each survey item in the domain, rounded to the nearest whole number: Likert Scale: 1 is never; 2 is sometimes; 3 is usually; 4 is always.

1.3.2 Relationships with organizational characteristics of medical groups

Table 1.2 presents results from ordered logistic regressions examining relationships between the six psychometrically derived domains of integrated care and the structural characteristics of each patient’s medical group.

Patient characteristics display several strong, consistent relationships with patient perceptions of integrated care, for instance the significant and positive odds ratios for

optimism and the significant and negative odds ratios for college education and higher income.

In contrast, only three structural characteristics of medical groups displayed statistically significant relationships with patient-perceived integration across the six dimensions. Patients in multispecialty groups were associated with significantly higher patient-perceived integration in one domain: they exhibited 1.7 times greater odds of responding in a higher quartile for Staff Knowledge about the Patient's Medical History compared to patients of primary care medical groups ($p < .05$).

There were no strong relationships between patient-perceived integration and either hospital ownership or technological capabilities, with odds ratios close to one for all dimensions. This result was particularly consistent for IT capabilities, which exhibited odds ratios ranging from 0.99 to 1.01 and tight confidence intervals - the widest interval was 0.95 to 1.04.

Results for size did not indicate a consistent pattern in the relationship with patient-perceived integration. As compared to patients of larger medical groups (10 or more), patients of both solo practices and smaller groups had greater odds of responding in a higher quartile for Provider Knowledge, Staff Knowledge, and Support for Medication and Home Health Management, though only the latter was statistically significant ($p < .01$).

The results for care management processes suggest a slightly negative relationship with patient-perceived integration, with odds ratios all less than or equal to one and only one statistically significant finding: a patient in a group with a one-unit increase in the care management index exhibited 7% lower odds of being in a higher

quartile of Test Result Communication ($p < .01$). After statistically accounting for the multiple comparisons across our regressions for all dependent variables, only this negative care management finding remains statistically significant.

Table 1.2: Association between structural integration characteristics of medical groups and domains of patient-perceived integrated care

	Dependent variables: Integration Dimensions (quartiles)					
	Provider Knowledge of the Patient	Staff Knowledge of Patient Medical History	Specialist Knowledge of Patient Medical History	Support for Self-Directed Care	Support for Medication and Home Health Management	Test Result Communication
Group characteristics						
Multispecialty	1.14	1.73**	1.09	1.09	1.18	0.95
Hospital owned	0.94	1.04	1.00	0.94	1.07	0.98
Solo (v. large)	1.04	1.57	0.80	1.19	1.15	0.73
Small (v. large)	1.06	1.11	0.85	0.94	1.34***	1.08
Tech capability	0.99	0.99	1.01	0.99	1.01	1.01
Care management	0.99	0.98	1.00	0.99	0.99	0.93***
Patient characteristics						
Age 75 and older	1.00	1.09	0.92	0.84**	0.81***	0.93
Male	1.09	1.33*	1.09	1.24**	1.25***	0.97
At least some college	0.75***	0.60***	0.77**	0.79***	0.68***	0.81**
Hispanic	0.87	1.23	1.77	0.78	0.75	0.49**
White	1.35**	1.04	1.04	0.75**	0.86	1.39**
Higher income	0.80**	1.07	0.79**	0.79**	0.77***	1.17
Living alone	1.09	1.62***	1.08	1.03	0.92	1.11
Survey help	0.82	0.76	0.81	1.01	1.15	1.00
# Chronic conditions	0.99	1.09***	1.04**	1.01	1.04***	0.95***
Optimism	1.56***	1.65***	1.42***	1.52***	1.25***	1.33***
Respondents	2609	727	1622	2621	2556	2013
Medical groups	136	85	125	136	136	127

Source/notes: SOURCE: Authors' analysis of PPIC data. SIGNIFICANCE: * $p < 0.10$ ** $p < 0.05$ *** $p < 0.01$ **** $p < 0.001$. NOTES: Columns represent odds ratios from ordered logistic regressions relating the six integration dimensions to the structural characteristics of each patient's medical group. Odds ratios are interpreted as the average odds of a patient providing responses in a higher quartile of perceived integration relative to lower quartiles. Small groups have 2-9 physicians; large groups (reference category) have 10+ physicians. Tech capabilities are measured on a 0-19 point scale; care management on a 0-15 point scale; optimism on a 0-24 point scale. Higher income is defined as \$40,000+. Chronic conditions are measured as a count of 27 CMS-defined Medicare chronic conditions. Due to correlations among domains, p-values are not adjusted for multiple comparisons (please see Appendix A for details)

1.4 Discussion

Our results suggest two main findings. First, patients perceive less integrated care in domains that particularly reflect patient-centeredness, compared to other domains. Second, medical groups that are more structurally integrated as defined in this study (those that are large, multispecialty, and owned by a hospital; have technological capabilities; and use care management processes) do not systematically provide care that patients perceive as more integrated.

Specifically, in the two survey domains that we believe particularly reflect patient-centered care—provider support for both the patient’s self-directed care and the patient’s medication and home health management—patients were the least likely to perceive integrated care. Only 33 percent of respondents said that providers always supported them in the first domain, and just 13 percent said that providers always supported them in the second. In neither domain did the more structurally integrated medical groups achieve significantly higher perceptions of care integration, compared to other groups. In fact, compared to patients in small groups, patients in large groups reported significantly lower perceptions of integrated care in the domain of provider support for the patient’s medication and home health management. These findings lend some support to past research indicating that dimensions of care that are important to patients are often neglected by providers in their efforts to integrate care, including by providers in patient-centered medical homes and in physician groups that are integrated with hospitals (Martsolf et al., 2012).

In addition, we did not find strong evidence that patients of more structurally integrated medical groups perceived their care as more integrated. This finding suggests

caution for providers moving toward more structural integration: Even if structural features of integration increase a medical group's technical capacity for coordination, the care it delivers might not be experienced as more integrated than care delivered by medical groups that are not structurally integrated. In fact, as noted above, patients in small practices were more likely to perceive care as integrated, compared to patients in large practices. Furthermore, patients in practices with greater technological capability were no more likely than patients in other practices to perceive care as more integrated. It is possible, for instance, that physicians with more sophisticated IT systems spend more time interacting with electronic health records, which takes time away from direct interaction with patients. A similar phenomenon has been observed in the airline industry, where heavy reliance on IT has been found to weaken relationships that are critical to coordination in uncertain, interdependent, and time-constrained environments (Gittel, 2000).

More fundamentally, organizational efforts to increase structural integration may at times be misaligned with what patients perceive as integrated care. For example, the lack of higher perceptions of integrated care in hospital-owned groups, compared to other groups, is consistent with previous research suggesting that hospital and medical group ownership changes are often driven by market power and financial consolidation instead of changes in care practices (Budetti et al., 2002).

From a practical perspective, our findings indicate that health care practitioners and policy makers should not assume that structural integration of provider practices will yield care improvements for people with multiple chronic illnesses. Rather, providers and policy makers should focus on the conditions and strategies that enable structurally

integrated organizations to capitalize on their ability to deliver care that is more integrated. Similarly, future research and policy should focus on the conditions and strategies that enable less structurally integrated systems to deliver more integrated care even without the benefit of scale and scope.

The perspective our study offers is particularly important when considering recent policy efforts to increase integration through Accountable Care Organizations (ACOs) and Patient-centered Medical Homes (PCMHs). For ACOs, it is important to look beyond structural changes such as contractual arrangements in order to identify mechanisms that enable truly integrated care that improves patient health. For Patient-centered Medical Homes, implementing new processes alone may be insufficient without consideration of the underlying mechanisms enabling integration across the medical home's components. For both, structural change may be necessary but insufficient for integrating care. A deeper understanding of—and greater investment in—innovation implementation capabilities may also be required (Singer & Shortell, 2011). For example, to overcome cross-specialty coordination challenges, multispecialty medical groups may need to invest in promoting information exchange and aligning workflows.

Additionally, medical groups may need to identify potential *divestments* as well as *investments* to avoid continuing to perform engrained activities that distract providers from integrating care. For example, medical groups that implement care management practices might place less importance on autonomous decision making in favor of collective goal setting and performance management.

1.5 Conclusion

Motivation to deliver truly integrated care may grow as providers bear increasing financial risk and as the chronic disease burden rises because of the aging population. Medical groups may continue their efforts to achieve structural integration. It will be critical to monitor these structural integration efforts to determine whether they translate into care that patients actually perceive as integrated, and further research on the mechanisms that underlie integrated care is needed. The patient-centered measures presented in this study can assist medical groups and policymakers in their monitoring efforts.

CHAPTER 2. CONDITIONS ENABLING CLINIC- COMMUNITY COLLABORATION

Abstract

Collaborations across clinical and community organizations are on the rise in health care, particularly for chronic disease management and prevention. While past studies have focused on the importance of incentives and resources for effectiveness in such collaborations, we draw on team learning and cross-boundary work theory to develop measures and hypotheses about the role of learning across organizations. We test these hypotheses using a novel survey with a sample of 247 nonprofit organizations that collaborate with healthcare clinics on chronic disease programs, with a final sample of 180 responses (73%). Analyzing the groups that form across clinic and community organizations as they collaborate, we find that learning within the group (“intragroup learning”) is significantly associated with performance ($p < .01$). Perceived respect across organizations is positively associated with intragroup learning in this inter-organizational context, and this relationship is moderated by communication behaviors that span the organizational divide, namely *inquiring* and *offering* behaviors that group members exhibit as they pursue their work with members of the other organization. Our findings suggest that – beyond resources and incentives – intragroup learning in clinic-community collaborations promotes effectiveness and that perceived respect across organizations is an important factor enabling learning. They also point to actionable communication behaviors – inquiring and offering – that may strengthen the effect of respect on learning.

2.1 Introduction

Linkages between community-based organizations and clinical care providers are gaining attention in American healthcare, particularly for chronic disease prevention and management (Porterfield et al., 2012; Sequist & Taveras, 2014). These linkages may offer a pathway to improve health outcomes and control costs because they enable patients to receive ongoing disease prevention and management services in accessible and lower-cost community settings. However, efforts to collaborate across organizations in healthcare can be challenging (Singer et al., 2011). Challenges may be particularly strong when efforts require clinical organizations to work with social service and community-based organizations whose missions, structures and cultures often differ markedly from their own (Axelsson & Axelsson, 2006). Understanding how members of clinical and community organizations can effectively collaborate is a critical and understudied element of improving and better integrating chronic disease care.

Organizational theory suggests that a central challenge in inter-organizational relations is the lack of a common managerial hierarchy, depriving the collaboration of mechanisms to ensure commitment and alignment of interests across organizations (Alidina, Rosenthal, Schneider, & Singer, 2016; Gulati, Wohlgezogen, & Zhelyazkov, 2012). Accordingly, research in health care has often focused on the importance of aligned incentives, accountability mechanisms and committed resources across organizations (Lukas et al., 2007). Recent research goes further, suggesting that organizational structures and incentives alone may be particularly insufficient for collaborative efforts that cross organizations, including in care integration (see paper 2), quality improvement (Kerrissey, Satterstrom, Leydon, Schiff, & Singer, 2017), or

accountable care organizations (Hilligoss, Song, & McAlearney, 2017). These findings have led to calls for new research exploring the social elements of how individuals and groups behave as they work together across organizational boundaries in healthcare (Singer, Kerrissey, Friedberg, & Phillips, 2018).

In this paper, we explore the role of learning in groups that form to collaborate across clinics and community-based nonprofit organizations. Joint initiatives across organizations are on the rise in healthcare in response to new financial incentives and measurement programs, requiring unfamiliar parties to explore new operational approaches together (Bohmer, 2016). Learning is particularly important in groups when work is novel, without preset courses of action to follow (Edmondson, 2012). Combining theory on team learning with literature on cross-boundary work, we develop hypotheses about factors that may enable or inhibit learning in groups that implement inter-organizational collaboration. We first draw on qualitative data to develop measures of these factors and then quantitatively test our hypotheses using a survey. Our sample consists of 247 chapters of a community-based nonprofit organization that collaborate with local clinical organizations in order to deliver a community-based diabetes prevention program to at-risk patients. Our findings have theoretical implications for research on healthcare integration and inter-organizational collaboration and practical implications for building effective clinic-community linkages for chronic disease care.

2.2 Intragroup learning in inter-organizational work

Team research has established the importance of learning within groups. Teams are groups that share responsibility for interdependent work (Hackman, 1987), and they

learn when they collectively use knowledge and insight to improve their outcomes (Edmondson, 2002). Team learning behaviors are those that enable members to interact with one another to acquire, share and refine task-relevant knowledge (Argote, Gruenfeld, & Naquin, 2001) and may include group activities such as gathering data, seeking feedback, reflecting on past progress, and asking for external help when needed (Garvin, Edmondson, & Gino, 2008; Singer, Moore, Meterko, & Williams, 2012). The interactive process that unfolds as groups enact these behaviors is important because it enables them to convert various organizational inputs into performance outcomes (Hackman & Morris, 1975).

Because teams often form a key unit of organizational work, their learning is fundamental to broader processes of organizational learning, innovation, and responsiveness to change that enable sustained organizational performance (Edmondson, Dillon, & Roloff, 2007; Senge, 1990). We take the perspective that intragroup learning is similarly relevant when dynamic challenges require organizations to respond to change by forming a collaboration; the new groups that emerge to work across organizations must learn together as they pursue novel initiatives. By “intragroup” we mean within the group that forms with representatives from each organization. Although these entities may be seen as teams in that they share responsibility for an interdependent task, we use the term intragroup in this paper because these emergent groups do not conform to the definition offered in the team effectiveness literature of teams as stable, clearly bounded performance units, and they may or may not act like such traditional teams.

Intragroup learning is likely to be particularly challenging in inter-organizational contexts because the individuals involved come from different organizational settings

with different expertise domains, cultures, and ways of working. Research on knowledge boundaries in organizations has shown that people with differing expertise inhabit “different thought worlds” (Dougherty, 1992), with divergent values, perspectives and understandings. Bridging these differences has been shown to be challenging (Carlile, 2004). Individuals from different settings may interpret the same information differently (Bechky, 2003; Bechky & O’Mahony, 2008) and have difficulty locating and adapting expertise across boundaries (Sole & Edmondson, 2002). Though much of the research on group learning has been conducted across expertise, sites or units within a single organization, many of the challenges it highlights are relevant – and perhaps even more potent - for inter-organizational group work in which professional expertise differences are compounded by distinct organizational settings. In these contexts, the ‘thought worlds’ that must be bridged are not only the technical mindsets of expertise, but also the practical languages of when, how and why organizational work occurs.

Combining this past research on team learning and knowledge boundaries, we suggest that intragroup learning can enable work groups that form across organizations to overcome the challenges posed by organizational boundaries and thereby better deliver on their shared goals.

Hypothesis 1 (H1): Intragroup learning behaviors are positively associated with inter-organizational collaboration outcomes.

2.3 Perceptions of respect and intragroup learning

Respect is a perception of status that reflects the extent to which one is included and valued as a member of an organization or group, and it is a critical component of organizational identification (Bartel, Wrzesniewski, & Wiesenfeld, 2012). Differences in

respect across entities are often present in healthcare contexts where medical professions are central (Friedson, 1970; Shortell, 1974). Such differences on teams can inhibit team learning processes such as risk taking, knowledge sharing and anchoring on shared goals (Bunderson & Reagans, 2011). For instance, research on cross-disciplinary healthcare teams found that differences in perceived status can constrain speaking up among lower status occupations, affecting engagement in quality improvement initiatives (Nembhard & Edmondson, 2006). Research on inter-organizational collaboration suggests that similar differentials across organizations can constrain contributions from one party and thereby limit the collaborators' ability to jointly innovate (Hardy & Phillips, 1998).

Building on this past work, we hypothesize that intragroup learning will be enabled when feelings of respect are perceived across organizations. Because of the prominence of professional status in health care, we focus in particular on the importance of perceived respect on behalf of the clinical organization members who are attempting to engage clinical organization members such as doctors and nurses in joint work.

Hypothesis 2 (H2): Intragroup learning behaviors are positively associated with the degree of respect perceived by community organization staff.

2.4 Communication behaviors in inter-organizational groups

Research on team effectiveness and on boundary spanning provide insight into the elements that may shape learning in inter-organizational groups. Team research documents inputs to learning behavior in groups, such as psychological safety, inclusion of team members in decision making, and clear team goals (Edmondson, 1999; Nembhard & Edmondson, 2006; Sarin & McDermott, 2003). However, these inputs have been studied in intact teams, and learning in groups that cross organizational boundaries

has received much less research attention. Similarly, research on boundary spanning in intact teams shows that members reaching out to connect with others outside the team promotes team effectiveness (Marrone, Tesluk, & Carson, 2007; Tushman, 1977; Ancona & Caldwell, 1992; Choi, 2002; Edmondson, 1999). What happens when people cross organizational boundaries within a team is less well understood.

Another literature investigates cross-boundary work in innovation projects, collecting qualitative observational data to elucidate communication challenges. This work describes how individuals can translate information and align interests across professional and organizational boundaries (Bechky & O'Mahony, 2008; Carlile, 2002, 2004). For example, one study showed how members of different occupations in a production context minimized miscommunication and established common ground through dialogue (Bechky, 2003).

We study boundary spanning communication behaviors as an input to learning within groups that form across organizations to carry out joint work. Consistent with prior research on team learning (e.g., Edmondson, 1999), we conceptualize these communication behaviors as a group-level construct. Because new groups quickly develop specific interpersonal climates that influence member behavior, measures of communication and learning behaviors tend to cohere within and differ significantly across groups (Edmondson, 1999; Edmondson & Lei, 2013). We hypothesize that boundary-spanning communication behaviors will strengthen the relationship between respect and learning. This is based on the notion that amid respect, boundary spanning communication fosters both offering up information and taking it in, and without respect,

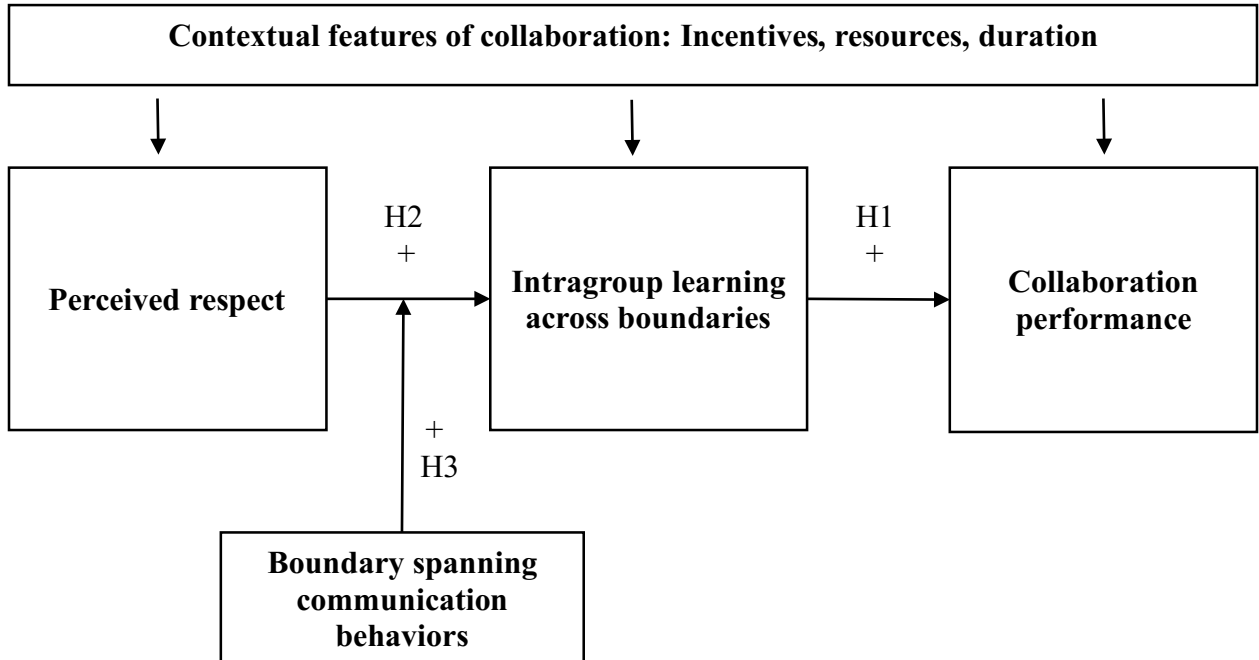
efforts to offer up and take in information may be more limited and thereby inhibit learning.

Hypothesis 3 (H3): Boundary-spanning communication behaviors moderate the relationship between respect and learning: The positive effect of respect is strengthened when groups exhibit boundary spanning communication behaviors.

2.5 Conceptual model

We drew on team learning and cross-boundary work theories to develop a series of hypotheses about factors that enable performance in inter-organizational collaborations between clinics and community organizations (represented in Figure 2.1). We hypothesize that intragroup learning behaviors are positively associated with collaborative performance and that learning behaviors are enabled by perceptions of respect. We also suggest that boundary spanning communication behaviors strengthen the relationship between boundary spanning communication behaviors and intragroup learning.

Figure 2.1 Conceptual model of learning in clinic-community collaboration



2.6 Methods

To test these hypotheses, we studied collaborations between nonprofit organizations and clinics that aimed to jointly develop new patient referral and reporting systems for community-based diabetes prevention programming. We used qualitative data to develop and refine measures of the constructs underlying our hypotheses and tested their relationships using quantitative survey data.

2.6.1 Research site and sample

We studied local chapters of a national nonprofit organization, "HealthSource," and numerous clinical organizations ("clinics") with which they sought to implement novel referral and reporting systems, including with physician offices, federally qualified

health centers and hospitals. The local chapter structure made HealthSource a good site for exploring variation in clinic-community collaboration because it provided similar organizational contexts with variation at the collaboration level. For instance, each chapter implemented its own collaborations with local clinics, but all chapters had the same mission, implemented the same diabetes prevention program, used the same technological platform for tracking patient referral data, and all were approved by a national office through a capability-based readiness assessment.

2.6.2 Construct development

Following an empathic method of survey design, we used qualitative data to verify that the constructs underlying our hypotheses could be operationalized at HealthSource and to develop or adapt survey items to appropriately measure them in this context (Alderfer & Brown, 1972; Edmondson, 1996). In visits to seven HealthSource chapters across four states in 2016 and 2017, the first author conducted 76 interviews with HealthSource staff and their clinical partners, lasting between 30 and 120 minutes each. The seven sites were theoretically sampled in an effort to maximize variation in collaboration features while ensuring that chapter and intervention features were similar (e.g., in mission and internal management of program delivery). Interviews followed a semi-structured interview protocol and were recorded and transcribed verbatim by a research assistant. We generated a codebook pertaining to learning, communication behaviors and respect, with which we conducted focused coding. The following sections describe the development of each construct in detail.

Intragroup learning

We adapted a team learning measure from management research examining the relationship between perceptions of outcome interdependence, team learning, and perceived team effectiveness (De Dreu, 2007). The initial measure used by De Dreu included three items: “Team members learn a lot from each other”; “My team learns from mistakes and errors”; and “Team members ask and give each other feedback.” Based on our qualitative interviews, we identified two adaptations that would make this measure more appropriate for clinic-community collaborations. First, to better reflect the inter-organizational split within the group, we used the terms “we” and “other party” rather than the generic term “team”. Second, we generated two feedback items in order to represent feedback flowing in both directions across organizations (i.e., both giving and receiving feedback), rather than combining into one item. The final construct included four items measured on five-point Likert scales: “I feel we learn together from mistakes and errors,” “I give feedback to the other party”, “I receive feedback from the other party”, and “I feel like we learn a lot from each other”.

Given that these adaptations included substantive wording changes and addition of a new item, we checked the revised intragroup learning construct with cognitive tests and ran a confirmatory factor analysis using the full sample of collaborations. The construct achieved good model fit (RMSEA = 0.03; CFI = 0.99) and exhibited both internal and discriminant validity; for example, the Cronbach’s alpha was 0.88 and higher than its correlation with other similar constructs such as psychological safety (0.73). The items composing the construct exhibited means ranging from 3.56 to 3.86 (on a five-point scale) and standard deviations ranging from 0.92 and 1.04.

Perceived respect

We drew on qualitative data to understand the role of respect in this context. We identified numerous examples of HealthSource staff feeling that clinical organization staff did not respect their ability to contribute in healthcare services. For example, a HealthSource staff member explained: “[The hospital administrators] say we are well-intentioned novices... there is a limit to the types of things they’ll allow us to convene... Everyone thinks we do wonderful things but that we don’t specialize.” Another HealthSource staff member described feeling like he is seen by clinicians as “the guy with a barbell and a whistle,” and another expressed: “You can’t go out [to the clinic] in your [HealthSource] gear with your sneakers on and be like woohoo because that’s how they see you.” In interviews with clinical organization members, we found that these perceptions among HealthSource staff at times appeared consistent with the expressed views of clinical providers and staff. For example, in several interviews, clinical members questioned the “credibility” of HealthSource operating within healthcare and questioned “whether they are ready to play in this sandbox.” These comments increased our confidence that perceived respect might be a salient factor in clinic-community collaboration.

We adapted a respect measure from prior work assessing team member social status, which used three items reflecting perceptions of respect, contribution value and influence (Flynn, 2003). We adapted these items to reflect the inter-organizational split within the groups we studied (using the term “other party”), with the following three

items: “I am confident that the other party respects me”; “I have high status in the other party's eyes”; “I have influence over the other party's behavior”. Using these items, this measure of perceived respect is from the perspective of HealthSource staff reflecting on their beliefs about how clinic staff perceive them. This is consistent with past research on respect, which measures people’s perceptions of where they stand within a group based on how they believe others value and react to them (Bartel et al., 2012). All items were measured on a five-point likert scale. The combined measure of respect exhibited a Cronbach’s Alpha of 0.80.

Boundary spanning communication behaviors

To generate meaningful measures of communication in this context, we first sought to understand the nature of the communication barriers that emerged in clinic-community collaboration. We found two types of communication challenges: one technical (i.e., related to expertise) and another contextual (i.e., related to organizational structures and processes). An example of a technical challenge occurred in understanding technical language from the other domain. As a clinician reflected: “It was difficult in the beginning just learning each other’s language, especially around HIPAA and patient information and the clinical jargon, like calling hypertension HTN.” An example of a contextual challenge occurred in understanding the requirements of successfully navigating the other organization’s bureaucracy. As one HealthSource staff described of a clinical organization: “There are so many departments in the health system. It’s not just getting in...it is understanding how they work together, and who are the patients they are serving.”

While these technical and contextual challenges were present across all groups we studied, we also observed differences in collaborators' ability to overcome them. We qualitatively identified two types of communication behaviors that appeared to enable groups to communicate more effectively across technical and organizational boundaries: *inquiring* and *offering* (summarized in Table 2.1)

Inquiring refers to asking questions to understand the other's context and perspective on the task. Often taking the form of straightforward requests for further explanation, these questions provided opportunities to communicate critical information about technical and organizational issues that seemed obvious to one side but were obscured to the other. For example, when a conflict emerged over low referral rates in one collaboration, the nurses began to blame the electronic system. The HealthSource director described feeling surprised, as she had believed that the problem was getting clinicians to make a referral at all. At this point, she asked the nurses, "What do you mean it is hard to refer?" In response, a nurse said with exasperation: "It's 82 clicks," and they proceeded to discuss the technical referral process and how it might be improved. In this way, a simple question about what was meant began a dialogue in which the nurses could make their experience of the technical system clear to the community organization staff, thereby enabling the group to provide feedback and iterate on solutions.

Offering refers to providing preliminary ideas and resources for task-related problem solving. This behavior differed from *inquiring* in that it took the form of assertive statements about one's own perspective and resources, rather than eliciting those from the others in the group. For example, consider one collaboration that was losing track of referrals because the community organization failed several times to

respond to idiosyncratic phone calls with verbal referrals from the clinic. In a heated meeting, the clinic staff voiced frustration about these missed calls, feeling that their efforts to generate the referrals were undermined. The HealthSource representatives countered that their staffing was limited, saying they could not dedicate a person full-time to the phones. However, the clinical staff then offered a suggestion to establish a voice message system as an alternative. This simple suggestion turned the group conversation from allotment of blame toward jointly devising an alternative plan for fielding idiosyncratic referrals.

Table 2.1: Communication behaviors

Behavior	Example quotes
<p><i>Inquiring</i> Asking questions to understand the other’s context and perspective on the task</p>	<p>Their office manager reached out to us or I reached out to her, I don’t remember. We emailed a little, she had some questions, we talked on the phone, and then I dropped in ...It’s about asking them questions as much as they ask us questions about the program. What are they already doing on referrals? Is it something that is working? Who would be the right person?</p> <p>She wanted a clear-cut plan with details, but I said I wanted help on the problem solving. We did mapping, set priorities. Without the expertise here at [our organization], we needed them to guide me.</p>
<p><i>Offering</i> Offering preliminary ideas or resources for task-related problem solving</p>	<p>We did a lot of problem solving on the fly. I said, we can give a membership for this, she said, we can give a fitbit for that. We got that contract signed in five months. Why make it transactional? I want to get her engaged.</p> <p>When we did the visit, we didn’t go through all the background, we just got into the nitty gritty. And we only had ten minutes. They needed to understand how to refer, like here is the EMR drop down, here is where we’ll hold the class, it’s down the street.</p>

We developed and cognitively tested two survey items to measure these two communication behaviors. One measured inquiring: “We always ask one another questions to understand how best to proceed.” The other measured offering: “Each party always offers important points to help our work together proceed.” The inquiring

measure had a mean of 3.85 and standard deviation of 1.09, while the offering measure had a mean of 3.82 and a standard deviation of 1.02. The correlation between the two measures was 0.71.

2.6.3 Survey administration

We developed a survey that included the above measures of communication behaviors, perceived respect and learning, combined with measures of contextual market and organizational factors and respondent psychological and demographic characteristics for use as controls. We completed six cognitive tests of the survey instrument, including three with HealthSource chapter staff, two with HealthSource national office staff, and one with a healthcare provider with experience in survey design, which resulted in minor wording changes to enhance item clarity.

From May to August 2017, we electronically surveyed one manager in each HealthSource chapter that had delivered at least one diabetes class in 2015 or 2016 (n=247). The list of managers was provided by the national HealthSource organization, which then e-mailed to each manager a link to an independently-hosted site where they could voluntarily and confidentially complete the survey in about 20 minutes. We received responses from 180 managers, for a response rate of 73%. The survey asked each manager to answer the same set of questions sequentially about two recent collaborations. Of the 180 respondents, 143 reported on two collaborations, 21 reported having only one collaboration, 11 reported having no collaborations and five left all collaboration fields blank. We used for our analytic sample the 307 collaborations which were reported upon (143 reporting two = 286; 21 reporting 1 = 21). Table 2.2 presents the quantitative sample characteristics.

Table 2.2: Quantitative Sample

	<u>N (%)</u>
Sample features	
Initial sample of chapters	247 (100)
Responses	180 (73)
Reporting on two collaborations	143 (58)
Reporting on one collaboration	21 (9)
No collaboration yet to report	11 (4)
Submitted blank survey	5 (2)
No response	67 (27)
Analytic sample of unique collaborations*	307
Collaboration features	<u>% (of 307)</u>
Presence of external payment for service	63
Use of contract	34
Chapter size	
Small (1 location)	31
Medium (2-10 locations)	40
Large (over 10 locations)	28
Clinical partner organization type	
Hospital	53
Physician office	21
Federally qualified health center	18
Other/missing	8
Time collaborating	8
One month or less	25
More than one month, less than one year	52
One year to less than three years	15
Three years or more	8
Mean number of referrals generated in prior year	25

Performance measure

We used number of patient referrals from the clinic to the HealthSource chapter in the prior year as a measure of collaboration performance. This is an appropriate performance measure because the shared goal of each group was to generate referrals from the clinic to HealthSource. Additionally, referrals between health and social service agencies have been used as measures of inter-organizational collaboration performance in past research (e.g., Levine and White, 1961). We measured referrals as a count reported

by HealthSource chapters. In our data, the minimum number of referrals was 0, the maximum was 500 and the mean was 25.

2.6.4 Control measures

We included a set of control measures pertaining to environmental incentives, resources to collaborate and collaboration duration. We used two measures to reflect environmental incentives for team members to work together, one pertaining to the presence of payment for program participation and one pertaining to the presence of a contract between organizations. *Contract* refers to whether a written contract was in place (=1 if yes). *Payment*, reflects whether at least some participants in the program were paid for by commercial insurers, employers or grant funding (=1 if yes). To reflect the availability of resources for collaborating we used three measures. *Support* refers to top leader support for the program's implementation, which we measured by HealthSource staff perception using a five-point likert scale on the survey. We used HealthSource chapter size as a proxy for degree of organizational resources, which we measured using *number of branches* (physical locations delivering services) and included as a count variable. We also included clinic organization type as a measure of clinical organization resources, measured as a set of binary dummy variables for whether it was a physician office (*office=1*), hospital (*hospital=1*), or federally qualified health center (*health center=1*). *Duration of collaboration* is a binary measure (=1 if collaborating more than one year); note that a more fine-grained time measure with dummy variables for time intervals did not change our findings, so we used the binary measure for parsimony.

2.6.5 Analyses

We conducted regression analyses using the survey measures. For analyses using the survey-derived learning scale as an outcome measure, we used ordered logit models, which are appropriate for ordinal survey measures. The results of these models are presented as odds ratios. For analyses using the count of referrals as an outcome measure, we used negative binomial models, which are applicable for over-dispersed count outcome variables, and we confirmed the appropriateness of this approach with Alpha tests. The results of these negative binomial models are reported as incident rate ratios. All analyses were performed in Stata version 14.2.

We conducted several sensitivity analyses (see Appendix B). First, we excluded collaborations with less than one year of duration in order to account for potential time interactions in early stage collaborations and also ran models with more discrete time units. Second, we winsorized the referral number variable at the 95th percentile to limit the potential influence of outliers. Third, we ran the analysis using a random sampling of one collaboration per respondent to explore whether our findings might be affected by the reporting patterns of managers in selecting two collaborations to report upon. None of these sensitivity analyses altered our main results.

2.7 Findings

In support of Hypothesis 1, intragroup learning exhibited a strong positive relationship with collaboration outcomes, i.e., numbers of referrals from the clinical to the community organization (see table 2.3). Using findings from Model 2 in Table 2.3, if a team were to have a one-point increase in intragroup learning, its rate of referrals would be expected to increase by a factor of 1.67, holding all other variables in the model

constant ($p < .01$). This corresponds to a predicted 6 referrals in the prior year at a learning score of 1, in comparison to 46 predicted referrals at a score of 5.

Table 2.3: Association between intragroup learning and number of referrals

	DV: Referral number	
	Model 1	Model 2
Learning	1.74**	1.67**
Controls		
Payment		1.01
Contract		1.42
Support		1.56**
Number of branches		1.07**
Office (v. hospital)		0.73
Health center (v. hospital)		0.79
Duration of collaboration		4.47**
N	269	269
Pseudo R2	.01	.05

* $p < .05$; ** $p < .01$; results are incident rate ratios

In support of Hypothesis 2, community organization members' perception of respect exhibited a positive relationship with intragroup learning. As shown in Model 6 in Table 2.4, collaborations with one additional point of higher respect perception were eleven times more likely to have a higher intragroup learning score, holding other variables constant ($p < .01$).

We found support for Hypothesis 3 that the relationship between respect perceptions and intragroup learning is moderated by communication behaviors of inquiring and offering. The interaction terms in models 8 and 10 were positive and significant.

Table 2.4: Respect, learning and the moderating role of communication behaviors

	DV: Intragroup learning				
	Model 6	Model 7	Model 8	Model 9	Model 10
Respect	11.38**	2.61*	2.45'	1.43	1.35
Inquiring		0.99	0.75		
Respect x inquiring		1.32*	1.40**		
Offering				0.92	0.70
Respect x offering				1.50**	1.58**
Controls					
Payment	1.30		0.93		0.89
Contract	2.81**		2.42**		2.35**
Support	1.16		1.07		0.99
Number of branches	0.99		0.99		0.99
Office (v. hospital)	0.36**		0.37**		0.44*
Health center (v. hospital)	0.87		0.92		1.08
Duration of collaboration	1.01		1.21		1.16
N	269	269	269	267	267
Pseudo R2	0.19	0.19	0.22	0.22	0.23

'p<.10 *p<.05; **p<.01

Results are odds ratios

2.8 Discussion

Our exploratory study of clinic-community collaborations suggests that efforts to combine knowledge and resources across organizational boundaries may benefit from intragroup learning when new tasks are pursued. We find intragroup learning to be strongly associated with collaboration performance, even when controlling for contextual measures that have been a focus of prior research on collaborative work across boundaries in healthcare – such as the presence of payment incentives or the use of explicit contracting. We also find that perceptions of respect may promote intragroup learning in these inter-organizational contexts. Lastly, our findings suggest that communication behaviors may accentuate the positive effect of respect on learning in intragroup collaboration.

Our application of a team learning perspective to the inter-organizational work occurring in clinic-community collaborations highlights the importance of studying *how* inter-organizational collaborators approach and manage their joint work at a group level. Past work has made important contributions in demonstrating how learning at the group level relates to organizational learning and responsiveness to change (Edmondson, 2002); we extend that work by suggesting how group learning operates within groups working together across organizations to bridge knowledge gaps in new initiatives. This perspective is valuable because it enables examination of group dynamics that emerge when people come together to pursue shared goals, and it reveals behaviors that may be important to performance. We hope that our efforts to adapt team learning measures for use in inter-organizational settings where representatives from different parties must work together will be helpful to future efforts to study and evaluate inter-organizational collaboration at the group level.

Our results highlight the importance of communication in inter-organizational collaboration, and pinpoint inquiry and offering as salient, concrete elements of communication that can be measured on surveys. Organizational scholars have long noted that inquiry is a critical aspect of communication (Schein, 2013), and recent developments in leadership theory have called for research on concrete and narrow communicative behaviors that exhibit inquiry (Quaquebeke & Felps, 2018). We extend this past work by applying the concept of inquiry to collaborative groups where there are no formal managerial hierarchies.

Lastly, we contribute new theory in our identification and development of the concept of offering. To our knowledge, although the concept of inquiry has received

theoretical attention in the management literature, the concept of offering has not. In collaborative groups that are governed by voluntary association, the ability to offer may be particularly relevant beyond inquiry alone because it communicates one's value to the group and signals one's benefits as a collaborative partner. This is conceptually distinct from the more commonly referenced notion of advocacy in groups because it is focused on contributing to the group rather than defending and promoting one's own domain.

The balance of inquiring and offering ties into early sociological work by Blau (1960) suggesting that social integration of individuals into cohesive groups depends on exchange processes based in both attraction and approachability. In this view, offering can be considered a mechanism of attraction by demonstrating one's ability to add value to the group, while inquiring can be considered a mechanism of approachability in which humility and need are displayed. Future theoretical and empirical work can further develop the concepts of inquiring and offering, explore their interrelationship, identify factors that affect their poignancy, and examine the conditions under which they are important.

The relatively strong relationship between respect and learning is notable for this context because the steep status hierarchy in healthcare may at times lead to low feelings of respect among community organizations when working with clinical organizations. It also points to a limit in our reliance on communication behaviors – while these behaviors may accentuate positive relationships between respect and learning, they may not alone be sufficient to overcome negative effects of low respect.

2.9 Practical implications

Our findings suggest that health policies aiming to promote clinic-community collaboration may be bolstered by addressing group-level challenges in conducting inter-organizational work. This aligns with past work finding that group performance is driven both by incentives for change and the capabilities to respond to those changes (Casalino et al., 2014; Casalino et al., 2013; Rittenhouse et al., 2011). Clinic-community linkages may require training and technical assistance for providers and community organizations to develop joint capabilities to design and implement new initiatives. For example, training and support to develop and normalize communication behaviors for individuals involved in this work may be particularly important. Additionally, top leadership may help mitigate the hindrances of respect issues by vocally affirming the role that community organizations can play in health care services.

2.10 Limitations

This study involves several limitations. First, our survey measured group behaviors from the perspective of community organization managers. While we used qualitative interviews with clinical organization members to verify the plausibility of consistency across partners, we did not quantitatively measure variables across clinical group members. Future research can measure these concepts across all group members and explore variation in perceptions.

Second, our findings are cross-sectional and exploratory. While theory provides a basis for inferring a directional relationship between the variables we studied, the relationship is likely recursive, with repeated interactions leading to mutually reinforcing factors. For example, more effective collaboration may lead to stronger respect and more

learning as collaborators update their prior expectations about one another. Exploration of these nuanced relationships both theoretically and empirically is needed, particularly with longitudinal data.

Third, to enable empirical comparability, we limited our exploration to a narrow set of inter-organizational collaborations between clinics and nonprofit groups that centered on referrals for a community-based diabetes prevention program. While referral number provided a clear outcome tied to the group's shared goal, it does not reflect other potentially important outcomes, such as the desire to expand collaboration to other community health goals. Differences in the contexts of other collaborations may call for renewed empirical exploration and verification.

Fourth, measures of respect and learning were derived from the same source. We attempted to address this issue by including a measure of optimism as a control in sensitivity analysis, and found it did not alter interpretation of the main results.

2.11 Conclusion

As the chronic disease burden grows and cost pressures intensify for provider organizations, efforts to extend health care services to community settings may continue to rise. While aligning incentives and providing resources to establish these linkages is an important step toward collaboration, our findings suggest that success may depend on how organization members enact collaboration together. Careful attention is needed - in research, policy and practice - to the factors that enable clinicians and staff to forge new patterns of working successfully across professional, organizational and sectoral boundaries.

CHAPTER 3. JOINT PROBLEM-SOLVING IN CROSS-BOUNDARY TEAMS

Abstract

Organizations increasingly rely on teams that include members from diverse organizational groups to conduct joint work. These teams must draw on knowledge across the organizational groups that their members represent to generate new joint work processes. Knowledge exchange can be undermined in these collaborative contexts because team members shift frequently and familiarity remains limited. In two studies, we explore how teams can work together effectively when membership fluidity compounds the challenge of working across knowledge boundaries. First, we conduct an inductive comparative case study of fourteen teams composed of clinical care providers and staff from community organizations who collaborate to create referral systems for chronic disease management services. We identify a team factor that appears to promote performance under these conditions: a *joint problem-solving orientation* in which a team emphasizes problems as shared and solutions as requiring coproduction. Second, we collect survey data on a sample of 307 similar clinic-community teams to develop a valid measure of joint problem-solving orientation and to test its relationship to performance. The results show that a joint problem-solving orientation is associated with team performance and that team learning behavior mediates the relationship between a joint problem-solving orientation and performance. We suggest that a joint problem-solving orientation may enable learning and performance in cross-boundary teams.

3.1 Introduction

In interconnected environments, new initiatives often require diverse resources, broad information, and distributed action to succeed. Teams that are formed across units or organizations offer a mechanism for garnering diverse resources and spurring distributed action (Hogg, Van Knippenberg, & Rast, 2012). Ideally, they do so by blending expertise, pooling information, and sharing accountability (Cummings, 2004; Dahlin, Weingart, & Hinds, 2005; Edmondson & Harvey, 2017). However, these teams may confront two related challenges. First, their memberships cross organizational boundaries (e.g., with participation from a supplier and a manufacturer). Second, as they interact episodically over time, they exhibit dynamic participation with shifting membership and multiple allegiances. Much has been written about how differing knowledge and perspectives across organizational boundaries can inhibit joint work (Bechky, 2003; Carlile, 2002, 2004; Kellogg, Orlikowski, & Yates, 2006) and scholars have begun to consider the implications of team membership fluidity, multiple team membership and geographic dispersion for effectiveness (Edmondson, 2012; Mortensen & Haas, 2018; Wageman et al., 2012). These streams of research take different perspectives and have developed in relative isolation. Combining these two literatures can help uncover how membership challenges and organizational boundaries might compound to undermine process innovation.

This multi-method paper explores how teams can work together effectively when team member fluidity compounds the challenge of working across knowledge boundaries. We study teams that form between clinical and community organizations to create referral systems for chronic disease management programs. This phenomenon has

arisen nationally as clinicians that face increased accountability for cost and quality search for community-based collaborators to deliver ongoing services in lower-cost settings (Sequist & Taveras, 2014). These collaborations present a strategic context for studying dynamic participation on cross-boundary teams in designing and implementing referral systems, clinicians and community organization staff meet in shifting configurations over time.

We begin by constructing a framework delineating how conditions of process innovation may create distinct, related challenges for teams. New initiatives often require process innovation because it is unclear in advance how to most efficiently and effectively conduct the novel work at hand. Because process innovation entails both novelty and interdependence across domains (Ettlie & Reza, 1992), it often leads to fluid cross-boundary teamwork: interdependence leads work to cross boundaries, and novelty leads to fluidity because it may be unclear which individuals will be needed to carry out the work and at what point in the work they may be needed. We briefly review the literatures on team effectiveness and cross-boundary work to suggest how differences in language, understandings and interests across organizational boundaries can be exacerbated if member fluidity undermines efforts to establish familiarity and shared memory on a team.

To explore how fluid cross-boundary teams can be effective amid these challenges, we use a multi-method research design and study real teams. In Study 1, we conduct an inductive qualitative study of fourteen clinic-community teams. Our aim was to investigate whether approaches to working together in such teams vary and how these factors may inhibit or promote team effectiveness. We identify a team factor that appears

to promote performance in these challenging settings: a *joint problem-solving orientation* in which a team emphasizes problems as collective and solutions as requiring coproduction. In Study 2, we build on our qualitative findings to develop a valid survey measure of joint problem-solving orientation and to test its relationship to team performance in a sample of 307 clinic-community teams. We find that joint problem-solving orientation is associated with objective measures of team performance and that this relationship is mediated by team learning.

This research contributes to the emerging literature on teams with dynamic participation (Mortensen & Haas, 2018). First, combining literatures on teams and cross-boundary work, we describe how cross-boundary elements within teams might interact with fluid membership to create distinct challenges in teamwork. Second, we identify a new construct grounded in practice that may enhance team effectiveness and provide a rich description to delineate this construct in the context of one type of cross-boundary team. Third, we test and validate the construct in a larger sample of teams and provide exploratory findings that suggest a link between joint problem-solving orientation and performance that is mediated by team learning. Our findings move us closer to a more coherent theory of joint problem-solving and expand our understanding of teamwork in fluid, cross-boundary contexts. With cross-boundary teams on the rise in a variety of settings, including health care, education and the press (Pittinsky, 2009), these insights are important for the growing ranks of managers who must grapple with the real constraints of teamwork in interconnected environments.

In the remainder of this paper, we first draw from the literatures on cross-boundary work and team effectiveness to frame the potential challenges faced in fluid

cross-boundary teams, then describe our empirical approach, present findings from Study 1 and Study 2, and conclude with a general discussion of our results.

3.2 Challenges in cross-boundary work

Research on cross-boundary work – that is, work that involves people from different groups working together to accomplish a shared goal – has documented the challenges that arise when interdependent tasks cross domains of expertise (Bechky, 2003; Bechky & O’Mahony, 2008; Carlile, 2002, 2004). Research has described the different ‘thought-worlds’ that exist across expertise (Dougherty, 1992), with differences in language, understandings and interests (Carlile, 2004) and across practices that are situated locally (Sole & Edmondson, 2002). Much of this work has been inductive, developing rich understandings of these differences and how they manifest; for example, Bechky (2003) conducted an ethnography detailing how engineers, technicians and assemblers on a production floor faced knowledge-sharing difficulties due to differences in language and perspective.

A principal concern in this literature is how communication challenges across these differences prevent knowledge from being integrated to generate a novel solution. Knowledge integration is particularly challenging in the context of new tasks because it is not sufficient to exchange knowledge; rather, it must be shared in a way that complements and transforms domain-specific knowledge into new knowledge that is relevant to the novel task (Carlile & Rebentisch, 2003; Carlile, 2004). This perspective emphasizes methods of communication that enable team members to explore differences, such as through deep dialogue (Tsoukas, 2009) and creating common ground through

communication (Bechky, 2003). A challenge with these processes is that they can be resource and time-intensive (Majchrzak, More, & Faraj, 2012).

3.3 Team effectiveness and fluidity

In theory on teams, team stability has been a central feature of team effectiveness. Teams have been defined as stable, bounded sets of individuals working interdependently toward a shared outcome (Alderfer, 1977). Clarity about who is on the team and consistency in who is on the team over time – referred to as team boundedness and stability - are important for effectiveness in teams because these conditions enable teams to know and effectively use individual members' relevant skills, knowledge and experiences (Hackman, 2002; Valentine & Edmondson, 2015; Wageman, Hackman, & Lehman, 2005). Particularly, team stability enables the creation of transactive memory systems in which members who have trained or worked together are able to rely on one another to identify and draw on one another's distinct knowledge domains (Lewis, 2004; Liang, Moreland, & Argote, 1995).

Team stability may also be important in generating familiarity and relational ties. Research has documented a positive relationship between team familiarity and team performance, particularly amid geographic dispersion and large team size (Espinosa, Slaughter, Kraut, & Herbsleb, 2007), and relational ties formed through frequent interaction are important to establishing collective identity and enabling collective action (Gittell, 2002, 2006). Similar to cross-boundary work literature, much of this literature suggests that familiarity is helpful to teams because it enables more effective communication; for example, research on distributed work has found that site visits

enhance communication by providing visibility into how others think and behave (Hinds & Cramton, 2014).

However, team stability and boundedness may be unrealistic when organizations face uncertain or complex customer needs, worker shifts, or environmental constraints (Hackman & Katz, 2010; Sinha & Van de Ven, 2005; Wageman et al., 2012). In these settings, teamwork can occur among shifting groups of people working collaboratively toward shared goals, rather than exclusively among stable, clearly bounded members (Edmondson, 2012). For example, in some workplaces, individuals are attached to multiple teams at once (O'Leary, Mortensen, & Woolley, 2011), or work in a series of unique configurations due to staggered shifts in round-the-clock operations (e.g., Valentine & Edmondson, 2015). In light of this new reality, team scholars have called for empirical research on how teamwork happens when membership is fluid – that is, when individuals working on a team change over time in response to evolving needs (Mortensen & Haas, 2018).

Fluidity may be problematic for team effectiveness because it undermines the use of structures that promote member familiarity and practice working together (Hackman, 1987), and limits the establishment of work climates that affect factors like worker willingness to detect and report errors (Edmondson, 1996; Edmondson, et al, 2003). Team fluidity may undermine these factors because familiarity does not build with team experience, relational assets do not accrue from prior interactions, and transactive memory systems become fragmented as individuals shift.

3.4 Integrating research on cross-boundary work and fluid teams

Our review of the literatures on cross-boundary work and fluid teams points to several important and distinct challenges (summarized in Table 3.1). Cross-boundary work implies a lack of shared language, understanding and incentives, while membership fluidity implies difficulties in establishing transactive memory systems, familiarity and sustained relationships. Moreover, together these factors point to a central tension: developing familiarity and communication can be important when teams pursue novel work across knowledge boundaries, and yet fluidity in team membership may undermine the value of these approaches because intensive communication to transform knowledge may be lost as members shift.

Table 3.1 Challenges in fluid cross-boundary teamwork

Features	Teamwork challenges	Compounding issues
1. <i>Cross boundary:</i> Work that involves people from different groups working together	<ul style="list-style-type: none"> • Lack of shared language and understanding of others' norms and processes • Different interests • Novelty requires intensive communication to integrate knowledge 	<ul style="list-style-type: none"> • Boundaries obscure where relevant expertise and experience lie, making fluidity more challenging in the moment
2. <i>Fluidity:</i> Individuals working on a team change over time in response to evolving needs	<ul style="list-style-type: none"> • Transactive memory systems are weak and fragmented • Team familiarity does not build steadily with team experience • Relational assets built in prior interaction are not sustained 	<ul style="list-style-type: none"> • Efforts to establish common language, understandings may be lost when individuals shift

Past studies of fluid, cross-boundary teams have found that using pre-set structures such as protocols and defined de-individualized role sets can ameliorate teamwork challenges. For example, in studying ad hoc medical trauma teams, Faraj and

Xiao (2006) found that established protocols could manage distributed expertise and Valentine and Edmondson (2015) found that group structures characterized by a bounded set of roles – not specific individuals – could enable productive team-like interactions such as prioritizing, updating and helping. However, the potential of pre-set structures to ameliorate fluidity in novel contexts is limited because team tasks remain uncertain, making pre-set structures difficult to construct in advance. How fluid cross-boundary teams can interact effectively as they pursue novel initiatives remains an open question.

3.5 Empirical approach

Setting

We studied clinic-community collaborations implemented between local chapters of a national nonprofit organization, “HealthSource”, and numerous clinical organizations (“clinics”), including physicians, medical groups, federally qualified health centers and hospitals. These initiatives sought to design and implement novel patient referral and reporting systems to enable at-risk patients to attend chronic disease management programs delivered at HealthSource chapters. For example, one such program was the Diabetes Prevention Program, a year-long lifestyle intervention including information and motivation around diet and physical activity that was found to reduce diabetes onset risk by 58% among people with prediabetes (Tuomilehto et al., 2001; Ackerman et al., 2008).

Three factors made this an ideal setting for our research. First, the task of establishing referral and reporting systems involved novelty and interdependence, which made teamwork relevant. Each team had to interact in order to tailor the system for the

context in each organization, including to determine how to conduct the referral (e.g., using a paper-based fax system or an interoperable electronic platform) and when and where to hold classes in order to best serve a clinic's patients. Second, the teams were inherently cross-boundary, as they involved members from different organizations and expertise areas (e.g., clinical and nonprofit community service administration). Third, the national chapter structure of HealthSource enabled a unique opportunity to systematically compare variation across teams. All chapters shared a common mission, volunteered to implement the programs, and were approved by the national office through a capability-based readiness assessment, suggesting that pre-existing site capability and motivation differences were constrained. Program delivery was similar as well, following the same curriculum, using similarly trained coaches, and employing similar staffing, with about half to one full time equivalent dedicated to managing the program (a "program coordinator") in collaboration with a mix of HealthSource and clinic staff.

Our primary contacts were at the national office of HealthSource and included the Executive Vice President, the National Director of Chronic Disease Programs and the Project Manager for Program Delivery and Technical Assistance. They enabled our data collection by providing background information, facilitating introductions to chapters and local clinics, and sharing quantitative program data.

Analytic strategy

We pursued a multi-method design for this research because cross-boundary teams concern both new and established constructs (Edmondson & Mcmanus, 2007; Briscoe, 2007; Dutton et al., 2002). We took a sequential approach, employing qualitative methods to understand the context and identify relevant constructs, then using

quantitative methods to test measures of those constructs (Creswell & Clark, 2007). In Study 1, we conducted an inductive field study in which we collected interview and archival data over a 10-month period throughout multi-day field visits to fourteen teams distributed across seven HealthSource locations. In Study 2, we developed, administered and analyzed a survey of all HealthSource chapters delivering the Diabetes Prevention Program in order to measure relevant constructs and test our hypotheses. We describe each study's specific methodology and findings in the relevant sections below.

3.6 Study 1: An Inductive Field Study of Cross-Boundary Teams

To develop theory about fluid cross-boundary teams, we conducted an inductive qualitative study. We theoretically sampled fourteen teams across seven HealthSource chapters from four states (site pseudonyms refer to these seven locations: Davis, Padon, Radley, Hudson, Brown, Hoover, Canyon). To maximize variation in team features while ensuring that chapter and program features were similar, we asked HealthSource staff for one example of a team that they felt had made progress and one that had struggled and probed deeply about each. We then interviewed clinic representatives when possible and verified agreement in their perception of the experience. For example, in the Davis site, one team was described by a clinical member as running “smoothly” and by a HealthSource member as “incredibly successful.” Table 3.2 describes the qualitative sample.

Table 3.2: Qualitative sample

Site	Chapter size*	Location	Starting year	Team A	Team B	Interviews conducted
1 Davis	Medium	Statewide	2011	<i>Physician office:</i> “Incredibly successful”	<i>Health system:</i> “Many barriers”	HealthSource: 7 Partners: 6
2 Padon	Medium	Urban	2013	[none]	<i>Physician office:</i> “Our talking about it was a lot bigger than what’s happened.” <i>Hospital:</i> “It’s not working so well”	HealthSource: 6 Partners: 5
3 Radley	Small	Rural	2016	<i>Hospital:</i> “We’ve made great strides.”	<i>Health center:</i> “We have really struggled.”	HealthSource: 4 Partners: 4
4 Hudson	Small	Rural	2014	<i>Hospital:</i> “We are working together.”	<i>Health center:</i> “There is some connection that doesn’t happen.”	HealthSource: 4 Partners: 4
5 Brown	Large	Urban	2015	<i>Managed care plan:</i> “It’s been successful.”	<i>Physician office:</i> “It’s been tough.”	HealthSource: 5 Partners: 5
6 Hoover	Large	Urban	[missing]	<i>Physician office:</i> “We’ve really grown.”	<i>Health center:</i> “They are slow about referrals. I nag them.”	HealthSource: 4 Partners: 3
7 Canyon	Small	Semi-urban	2014	<i>Physician office:</i> “The system is up and running well”	<i>Physician office:</i> “I got the cold shoulder everywhere.”	HealthSource: 7 Partners: 12

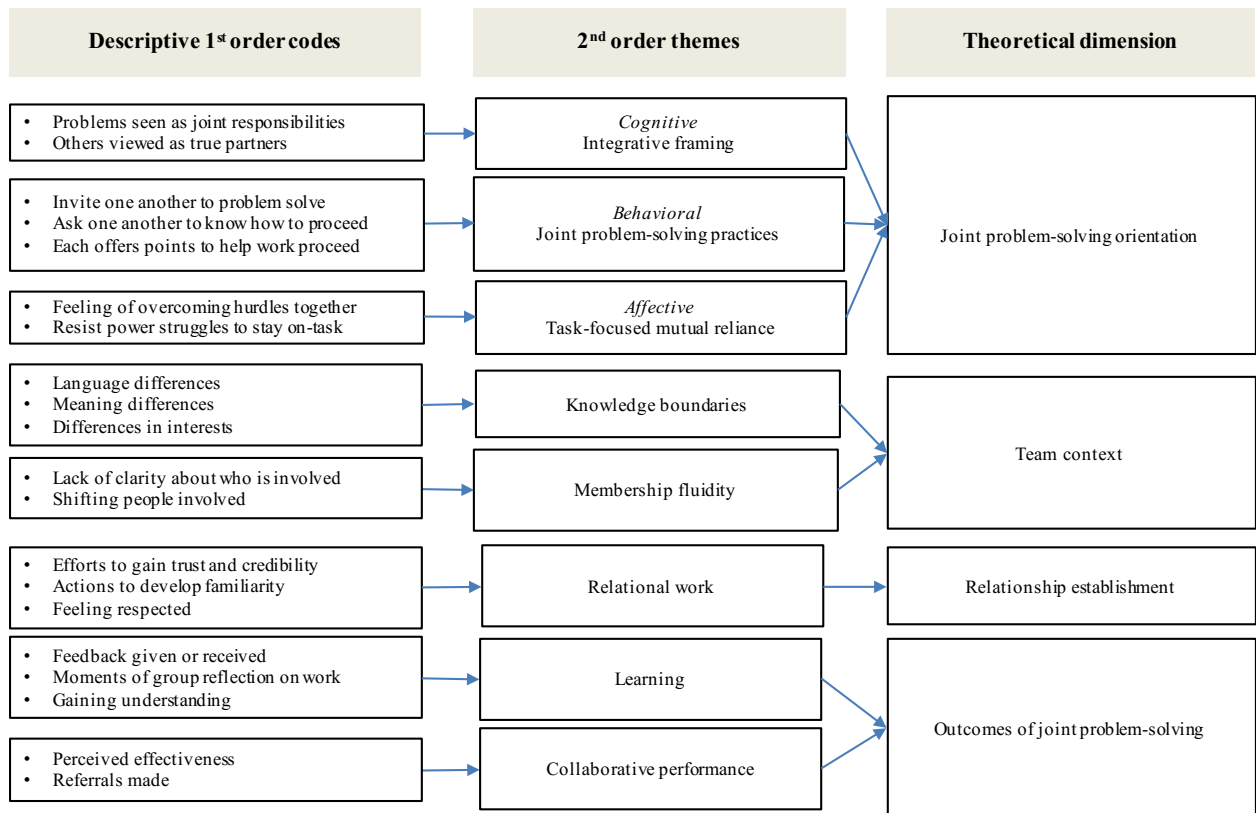
Data collection. We leveraged three sources of data: (1) interviews with individuals at the local HealthSource chapter and the clinics, supplementing with others who observed the team’s work such as community group representatives, (2) extensive field notes, and (3) archival data, including program materials, reports, emails between collaborators, organization websites, organization form 990 tax reports and other

materials provided by informants. Our primary data source is 76 interviews with individual respondents, conducted by the first author between June and November 2016, with follow up interviews in March and April 2017. Interviews used a semi-structured interview protocol and typically lasted about 60 minutes with all informants except for physicians, for whom interviews typically lasted 30 minutes. Interviews with program managers at the community organization often lasted for over two hours and included extensive site tours. Prior to interviews, the first author held a brief phone meeting with chapter leadership to explain the research, learn about the chapter site and identify potential respondents. Interviews were either recorded or transcribed verbatim by a research assistant. We probed for examples of both positive and negative experiences related to the teams, and we used contrast questions (Spradley, 1979) such as “does everyone you collaborate with to establish referrals at that clinic demonstrate such behavior,” to understand whether a given report represented an isolated or more common experience.

Data analysis. Our analysis crossed analytical levels to explore organization, team and individual level factors, though our final analysis focused on the collaborations, because this is where we found the most variation. We iteratively used both within and across-case analysis for the fourteen teams, with a focus on exploring and describing experiences within teams and then systematically comparing them to other teams in order to further generate theory and refine our codes (Miles & Huberman, 1994). We took the following steps: (1) generating a preliminary codebook from our interviews and archival data using open coding, (2) conducting within- and across-case analysis for each site, (3)

updating the codebook with refinement based on these analyses, (3) applying the revised codebook to the full data set. This final revised coding scheme is depicted in Figure 3.1.

Figure 3.1: Coding scheme



3.7 Study 1 findings

Illustrating the challenges of cross-boundary teamwork

By design, all teams we studied were cross-boundary, typically with between two and five members from each organization represented. All exhibited the knowledge-based challenges that theory would predict. We briefly review these features here to provide context, using Carile’s frame of syntactic, semantic and pragmatic boundaries – pertaining to differences in language, meaning and interests, respectively (Carlile, 2004). Syntactic boundaries were present in the use of different languages across clinical and community staff; for example, as one nurse noted: “It was difficult in the beginning just

learning each other's language, especially around [health information privacy regulation] and patient information and the clinical jargon, like calling hypertension HTN." Semantic boundaries were present in different understandings of how work gets done; for example, one HealthSource staff member noted, "The nurses are very driven – they are like, a, b, c. They don't need to process and discuss things over and over like community people do. Clinical is like moving through the process really clearly, and we are like - wait." Pragmatic boundaries were present in differing interests pertaining to the selection of referral mechanisms; for instance, one team experienced a disagreement about whether to use fax (which the clinic felt was easier) versus a phone system (which the community organization preferred).

Fluidity in membership

It quickly became apparent in our site visits that boundary challenges were exacerbated by team member fluidity in this context. In each team, various individuals joined or left the joint work – or remained involved but participated infrequently in team interactions – such that team composition shifted in response to new tasks or situations. For example, one team, bridging a hospital-based clinic and HealthSource, included the HealthSource manager, COO, and three other executives, and from the clinic, several physicians, a nurse, and several physical therapists. The physical therapists joined after several months when it was realized that they could be a key source of referrals. The other HealthSource executives joined when it became clear that referrals to other HealthSource sites would be critical for addressing the clinic's patient population, who might need to participate at a different HealthSource site that was closer to their homes.

Moreover, the initial physicians and administrators only joined meetings when they felt the topic was relevant and/or when their schedules permitted, and often sent representatives instead of attending themselves. These membership changes made it difficult to establish familiarity because interpersonal resources built in one meeting would not then transfer to the next when those attending shifted. This created a persistent feeling of starting again, despite working as a team over many months.

Deliberate efforts to establish familiarity

One pattern of group behavior that emerged from these fluid cross-boundary conditions related to deliberate efforts to develop familiarity. For example, one team postponed designing the referral system in order to first have community organization members attend general clinical planning meetings in order to learn more about their organization. In another example, a HealthSource chapter invited a physician to join their community board for similar reasons. This type of approach was present in five of the teams we studied.

These efforts to build familiarity – though intending to promote collaboration – seemed to stall out. For example, a HealthSource manager described having “so many face-to-face visits and calls”, and yet the team continued to have weak collaboration. She recounted: “So I said [to my staff], let’s just make a visit to go and say thank you. Just say thank you, not ask them for anything. But then they sent just a few [referrals], and we sent them a report and then got no response at all.” A HealthSource manager from another team described a similar frustration after having many meetings:

I got an email from the practice manager and she was like hey are you getting a lot of referrals. And I said no not really, I’d

love to provide you more resources if you have any ideas about where the break down is happening. She didn't ask for anything.

As these cases illustrate, it appeared that spending effort to develop familiarity was not yielding the intended benefits of enhancing communication and enabling collaboration.

We found evidence of two potential issues that may explain this result. One was that the relationships formed to build familiarity were at times disconnected from the group task and, in the presence of member fluidity, may have thus delayed work without generating sustained relational benefits. For example, the woman who joined the clinical planning group never appeared able to leverage her relationships when it came time to design the referral system because the referral work involved different people at the clinic from the planning committee. A second issue was that efforts to build familiarity may have led at times to more independent approaches to work. For example, team members who sought to show one another what they were capable of were more likely to conduct independent work – as one noted: “I’m trying to prove why this is important.” Practices of thanking may have further underscored the perspective that individual contributions are central rather than team action, and may have occurred in place of a feedback process that would enable learning. This independent work led some to see the team’s effort as “more work, more work, more work,” dominated by favors to appease the other team members rather than a joint responsibility, and to perceptions of “nagging.”

Joint problem-solving as an emergent team factor

In contrast to efforts to deliberately develop familiarity, we observed six teams that appeared to start work and make progress rapidly, despite knowing little about team

members from the other organization. These teams exhibited a particular orientation toward their joint work that appeared to enable their collaboration without familiarity. We term this orientation as a joint problem-solving orientation, which focuses on jointly identifying problems and co-producing solutions. There were three elements that distinguished this phenomenological experience on teams: integrative framing, joint problem-solving practices, and task-focused mutual reliance. In the following paragraphs, we first provide a narrative description of joint problem-solving orientation on one team and then describe each of the three elements of joint problem-solving orientation.

A team involving HealthSource and a physician office provides an example of a joint problem-solving orientation and helps illuminate its implications. The HealthSource manager (“Tricia”) was contacted in mid-2016 by a pediatrician (“Dr. Smith”) interested in establishing patient referrals to a children’s healthy weight program offered by HealthSource. Tricia and one staff member drove to the clinic for their first meeting, to which Dr. Smith had brought another physician, a social worker, and an office administrator. In the one-hour meeting, the new team focused on addressing a series of problems, including when and where to hold a class to accommodate Dr. Smith’s low-income patients and the type of referral mechanism to use (e.g., a paper referral with a fax versus using the electronic medical record). In this initial meeting, the team quickly exhibited a joint problem orientation through a series of inquiries about the challenges on either side. For example, Tricia asked Dr. Smith and the social worker about the conditions their patients were facing that might make attending this type of class a challenge, which helped to uncover important information about when and where to hold a class. Dr. Smith similarly asked the group to brainstorm about whether an electronic

referral approach would be possible. When a junior physician in the room suggested an electronic query of patient records, Tricia then offered to look into the option and get back to the group. This led to a series of e-mails in which Tricia, her program coordinator, the social worker and the physician problem-solved to design an electronic query.

This orientation toward joint problem-solving appeared to enable rapid learning in this team. For example, in one email to Dr. Smith's office, Tricia shared what she had learned from another physician's office about how to do electronic review. She wrote: "I wanted to share this learning with you because we are learning together. We are muddling through." She proceeded to describe what she had discovered, thereby following through on her offer to look into the electronic option. Reflecting back on this and similar circumstances, Tricia described implementing different referral efforts as involving "a lot of itty bitty errors" – a series of trial and error, followed by feedback - from which team members were able to learn together.

Integrative framing refers to the cognitive experience of seeing the joint work as truly collaborative. It was composed of two codes: seeing problems as joint responsibilities and viewing others on the team as true partners. Seeing problems as joint responsibilities was evident in statements such as the following comment by a HealthSource staff:

It takes me talking to a leader [at the clinic] as problems emerge. If someone says this conversation will be helpful, I'll do it. You need to sit at the table and meet where they are. You can't just say to them that I have [this program] and want to work with you.

In an example of seeing others as true partners, a hospital administrator at the Hoover site noted: “This [work with HealthSource] has helped me think about how we see engagement. It’s nice to have community partners come to us. We think we are the greatest thing since sliced bread. But we don’t always know how to do community programs.”

Joint problem-solving practices refers to behaviors that team members exhibited to elicit and share information and other resources. It was composed of three codes: inviting one another to problem solve, asking the other to know how to proceed, and offering points to help the work proceed. An example of inviting occurred when a HealthSource team member realized in a conversation with nurses that she did not have expertise relevant for a cancer survivorship program, and she invited the nurse critiquing her to join her in devising a solution. An example of asking occurred in a conversation about low referral rates; the HealthSource staff asked: “What do you mean it is hard to refer?” prompting the nurse to then explain, “It’s 82 clicks,” signaling complexity in the technical system that was impeding referrals. The team members were then able to focus on the number of clicks in the electronic system as a problem, which required simplifications for both organizations. An example of offering occurred when a disagreement about disruptions in referrals by phone occurred, and the clinical staff offered the suggestion of setting up a dedicated voicemail system. Offering also took the form of candid information. For example, one HealthSource manager said about the hospital manager: “Her stand out quality is that she will tell me what I am doing wrong to get these referrals.”

Task-focused mutual reliance refers to an affective feeling of mutual reliance that is based specifically on the problems at hand, as opposed to a general feeling of trust or respect. It was composed of two codes: a feeling of overcoming hurdles together and resisting power struggles by focusing on the task. For example, consider this example of resisting a power struggle by focusing on the task, from a HealthSource manager:

Like there is one school nurse who was so skeptical. I would have bet money she wouldn't send patients. She wanted a clear-cut plan with details. But I said I wanted help on the problem-solving. We did mapping, set priorities. Without the expertise here at [HealthSource], we needed them to guide us.

By not heeding the nurse's request for a concrete plan, this team member was able to further emphasize the importance of solution coproduction on the team and avoid having to directly address the nurse's skepticism.

3.8 Study 1 Discussion

Our qualitative analysis illustrated how teams confronted knowledge boundary and fluidity challenges that together limited the value of efforts to develop familiarity. We found that in these contexts joint problem-solving may have enabled teams to start work together rapidly and learn by trial-and-error as they pursued process innovation. We define a joint problem solving orientation as a shared emphasis on problems as collective and solution co-production. Building on past work that has measured team orientations using items that describe team emphases and climate, we conceptualize joint problem-solving as an *orientation*. Notably, team learning orientation describes an emergent state in teams characterized by collective beliefs about the importance of development over competence (Alexander & Knippenberg, 2014; Bunderson & Sutcliffe, 2003). Our

qualitative data similarly suggested that joint problem-solving orientation is an emergent state characterized by collective beliefs about problems (represented by integrative framing) and solutions being shared across team members, (represented by joint problem-solving practices and task-focused mutual reliance).

3.9 Study 2: Testing a Model of Joint Problem-solving Orientation in Cross-boundary Teams

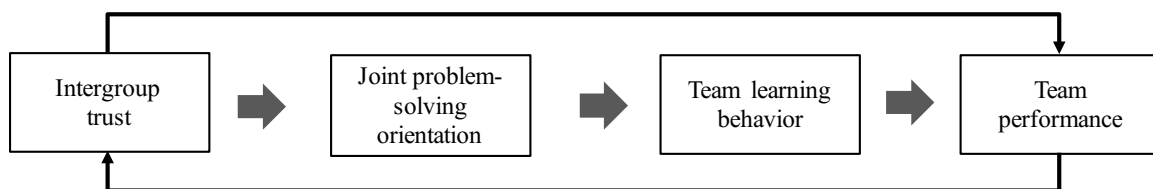
Our qualitative findings from Study 1 suggested that joint problem-solving orientations vary across teams and may be an important factor in team interaction. The purpose of Study 2 was to measure this construct and test its relationship to performance in a larger sample when holding other salient contextual features constant. In this study, we develop a conceptual model of joint problem solving orientation on teams, create a construct to measure it, administer a survey across a national sample of HealthSource-clinic teams, and test hypotheses using an objective measure of team performance (number of referrals).

Drawing on the team literature and Study 1 findings, we constructed a conceptual model of joint problem-solving orientation and team performance (depicted in Figure 3.2). This model implies several testable hypotheses. First, our inductive work suggested that a joint problem-solving orientation would be positively related to team performance, as team members would begin experimenting with novel work and jointly produce solutions to problems: *H1: Joint problem-solving is positively associated with performance in fluid cross-boundary teams.* Second, we hypothesize that joint problem-

solving affects performance by fostering team learning: *H2: The relationship between joint problem-solving and performance is mediated by team learning.*

Our third hypothesis argues that joint problem-solving will mediate the relationship between intergroup trust and team learning. Research on intra-team trust, defined as a belief in the benevolence, honesty and competence of others within the group (Mayer, Davis, & Schoorman, 1995; Simons & Peterson, 2000), has found a positive relationship between trust and performance, particularly under conditions of task interdependence, skill differentiation and authority differences (De Jong et al., 2016). We take the perspective that in fluid intergroup settings, trust will be based on institutional cues that enable trust without firsthand knowledge (Mcknight, Cummings, & Chervany, 1998), and therefore measure intergroup trust (based on perceptions of the other organizational group, rather than the individual personal perception). We propose the following hypothesis: *H3: Joint problem-solving mediates the relationship between intergroup trust and team learning.*

Figure 3. 2. Conceptual model of joint problem-solving on teams



Our survey sample included the lead collaboration manager at each of the 247 local HealthSource chapters that delivered the Diabetes Prevention Program in 2016 (Table 3.3 describes the quantitative sample). We administered the survey electronically

to one manager at each of the 247 chapters in English from May to August 2017, receiving 180 responses pertaining to 307 unique collaborations (of the 180 respondents, 143 reported on two collaborations, 21 reported having only one collaboration, 11 reported having no collaborations and five left all collaboration fields blank) for a response rate of 73%. In addition to demographic and HealthSource chapter items, the survey included 14 items about team features (e.g., meeting frequency, presence of a written contract) and 22 items assessing perceptions of team orientations, beliefs, and behaviors. While the qualitative phase of this study included descriptions of collaborations for various chronic disease programs, we restricted the survey to concern a single program – the Diabetes Prevention Program – to maximize comparability across responses. Prior to administering, we cognitively tested the survey with a sample of five HealthSource employees using hour-long interviews with each, resulting in language modifications for clarity and consistency. Table 3.4 presents variable means, standard deviations, and correlations.

Table 3.3: Quantitative sample

<i>Site Characteristics</i>	<i>N (%)</i>	<i>Collaboration Characteristics</i>	<i>%</i>	<i>Respondent Characteristics</i>	<i>%</i>
Responses (n=180)	180 (73)	Contract in place	32	Gender (female)	89
Size		Duration		Age (< 40)	48
1 branch	56 (31)	Less than 1 month	8	Tenure (>5 yrs)	54
2-5 branches	45 (25)	1 month - < 1 year	25	Position	
6-10 branches	33 (18)	1 year - < 3 years	52	Coordinator	36
11-20 branches	38 (21)	3 years or more	15	Director	39
Over 20 branches	8 (4)	Clinical org type		Other	25
Referral experience	62 (34)	Hospital	53	Education	
Collaborations reported		Provider office	20	Bachelors/less	51
2 collaborations	143 (79)	Health center	18	Advanced health	14
1 collaboration	21 (12)	Other	9	Other advanced	28
None	16 (9)			Other	7

Table 3.4: Means, standard deviations, and correlations

	Mean	S.D.	1.	2.	3.	4.	5.
1. Joint problem-solving	3.717	0.855	1				
2. Trust	4.228	0.876	0.581*	1			
3. Learning	3.675	0.836	0.764*	0.554*	1		
4. Referrals	23.872	51.992	0.114'	-0.089	0.163*	1	
5. Perceived effectiveness	2.893	1.237	0.564*	0.296*	0.495*	0.318*	1

' $p < 0.10$, * $p < .05$

Dependent variables

Number of referrals: Referrals are a count measure of the number of patients sent from the clinic to HealthSource for participation in the diabetes program in the prior year. Conceptually, this is an appropriate measure of team performance in this context because the purpose of the team activity was to generate referrals from the clinic to HealthSource. Additionally, referrals between health and social agencies have been used as measures of inter-organizational collaboration in past research (e.g., Levine and White, 1961). Referrals were collected from the HealthSource chapters. In our data, the minimum number of referrals was 0, the maximum was 500 and the mean was 24.

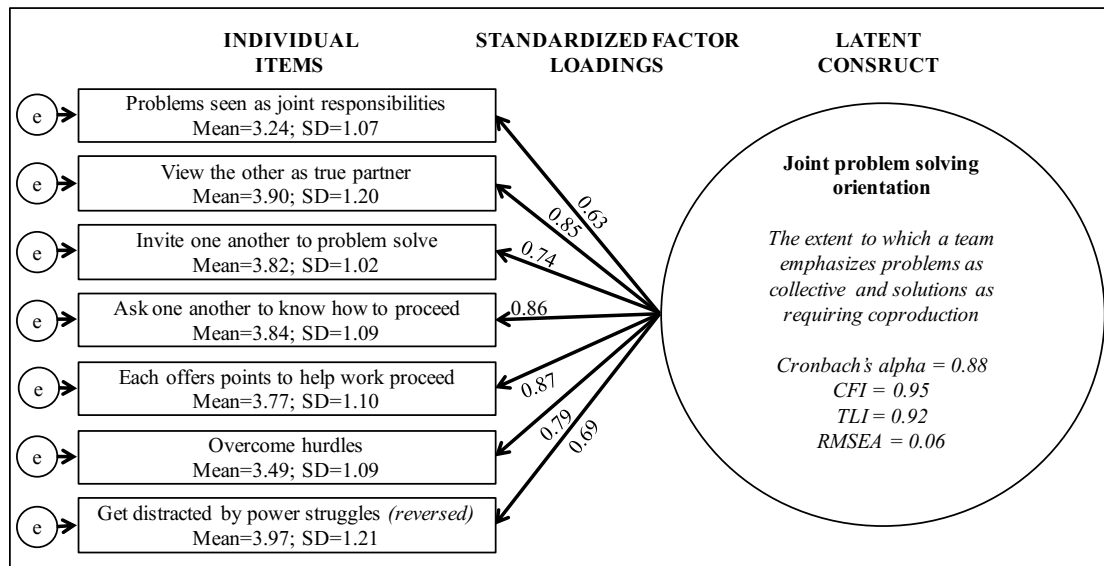
Perceived team performance. We also measured perceptions of team performance from the HealthSource manager perspective. Respondents answered, “how effective has your engagement with [clinic name] been in generating referrals to the program?” using a five-point likert scale ranging from “poor” (1) to “excellent” (5). The mean response was 2.89, which when rounding to the nearest whole number corresponds to a qualitative response of “average”. Number of referrals and perceived team performance were

significantly correlated at $r=.32$ ($p<.01$), and we used both measures as proxies for team performance to assess the robustness of our findings to outcome measure choice.

Independent and mediating variables

Joint problem-solving orientation. We drew from Study 1 findings to develop the joint problem-solving orientation construct and measure. Confirmatory factor analysis supported a seven-item measure, with each item pertaining to how the respondent perceived the team's emphasis on joint problem identification and solution coproduction. Each item response was on a five-point Likert scale, ranging from 1 "strongly disagree" to 5 "strongly agree." For example, one item states: "We absolutely invite one another to be part of the problem-solving process." See the appendix for each of the construct's seven items verbatim. We used a confirmatory factor analysis that accounted for the multi-level clustering in our data using MPlus Version 7.2. The construct achieved good model fit (RMSEA = 0.06; CFI = 0.95) and exhibited discriminant validity (e.g., the joint problem-solving construct's Cronbach's alpha of 0.88 was higher than any of the correlations between the construct and similar psychological constructs, including psychological safety (0.72) and perceived status (0.72)). The items composing the construct also exhibited variation, with never more than 48.89% of responses in the most positive response option for any particular item and means never exceeding 3.97 on a five-point scale. Figure 3.3 presents the confirmatory factor analysis with standardized factor loadings, in addition to means and standard deviations for each item in the construct.

Figure 3.3: Confirmatory factor analysis for joint problem-solving



Team learning. We used team learning as a measure in our mediation analysis, based on an adapted learning measure (De Dreu, 2007) that included items pertaining to learning together from mistakes, giving and receiving feedback, and learning from one another (see appendix for verbatim items).

Antecedent and control variables

We included salient contextual features in the model as controls. *Time* refers to the duration of the teamwork (=1 if at least one year working together). *Contract* refers to whether a written contract was in place (=1 if yes), which we included as a structural feature that may influence behavior in inter-organizational work. *Size* refers to the size of the HealthSource chapter using number of branches (physical locations delivering services), which we included as the key size constraint (analysis in comparison to clinic size and market size revealed only HealthSource size to be predictive of referrals,

suggesting that organizational resources for diabetes program delivery were the most relevant size constraint in this context). *Team composition* was measured as a perception using an item that asked the respondent about the degree to which they felt the people at the organization were the right people to move their work forward, using a 1-5 Likert scale. We included a binary measure, *incentives*, reflecting whether at least some participants in the program were paid for by commercial insurers, employers or grant funding (=1), as opposed to having the patient pay out of pocket (=0), which we included because qualitative data suggested that external payment for program participation was associated with increased enrollment and referral rates. We included a measure of *trust*, which was measured on the survey using an adapted measure of intragroup trust (Simons & Peterson, 2000), with items pertaining to counting on the other party to live up to their word, fully trusting, and expecting honesty (see appendix for verbatim items).

Analysis

Our analyses with referral number as an outcome used negative binomial models, which are applicable for over-dispersed count outcome variables, and we confirmed the appropriateness of this approach using Alpha tests. The results of these analyses are reported as incident rate ratios. Our analyses with perceived effectiveness as an outcome used ordered logit models, which are appropriate for ordered categorical outcome variables. Ordered logit models require that the relative odds associated with each possible pair of categorical outcomes are equivalent, and we confirmed that this assumption held by verifying non-significant Brant tests after each model. The results of these ordered logistic models are reported as odds ratios. Standard errors for all negative binomial and ordered logistic models are clustered by HealthSource chapter and are

robust to heteroscedasticity, thus accounting for non-independence of observations and improving the accuracy of statistical tests. To explore whether learning mediated the effect the relationship between joint problem-solving and referral number, we conducted mediation analyses following the multilevel mediation analysis procedure described by Krull and MacKinnon (2001). For all analyses, we used a consistent sample of 267 teams, which represented the teams for which we had full data on all variables in the final full models (model four and eight). All analyses were performed in Stata version 14.2.

We conducted several sensitivity analyses. First, we conducted all regressions using a subset of the data in which only one collaboration per respondent was randomly selected to ensure that the presence of two collaborations for most HealthSource chapters in our data did not lead to spurious correlations. Second, we only included collaborations with between one and three years of duration in order to account for potential time interactions in early or very late stage teams. Third, we winsorized the referral number variable at the 95th percentile to limit the potential influence of outliers (i.e., we set all observations above the 95th percentile in referrals to have the same number of referrals as the 95th percentile). Fourth, we accounted for the potential for same-source bias using a perceptual measure of respondent optimism in the full regression models. Results from these sensitivity analyses are presented in Appendix C. All findings remained directionally consistent and patterns of statistical significance remained.

3.10 Study 2 findings

Joint problem-solving orientation was positively and significantly related to both number of referrals and perceived team performance, as shown in Tables 3.5 and 3.6, indicating support for H1. Using findings from the full Model in Table 3.5, if a team were

to have a one-point increase in its joint problem-solving orientation, its rate of referrals would be expected to increase by a factor of 1.61, holding all other variables in the model constant ($p < .01$). This corresponds to a predicted 6.12 referrals in the prior year at a joint problem-solving score of 1, in comparison to 9.96 predicted referrals at a score of 2, 16.06 at a score of 3, 25.90 at a score of 4, and 41.78 at a score of 5. These findings were consistent and even stronger when using perceived team performance as an outcome measure. Using findings from the full model in Table 3.6, for every one-point increase in joint problem-solving, teams exhibited 3.95 times greater odds of being in a higher category of perceived team performance ($p < .01$).

Table 3.5: Negative binomial models with number of referrals in prior year as outcome

	Controls	Joint PS Model	Full Model
Joint PS orientation		1.40** (0.18)	1.61** (0.25)
Controls			
Trust	0.95 (0.13)		0.74 (0.12)
Composition	1.38** (0.14)		1.25* (0.12)
Incentives	1.07 (0.28)		0.92 (0.24)
Time >1 year	3.21** (0.81)		3.23** (0.83)
Contract	2.27** (0.51)		1.97** (0.42)
Larger size	1.06** (0.02)		1.06** (0.02)
Constant	1.35 (0.85)		1.10 (0.74)
N	267	267	267
Clusters	143	143	143
Pseudo R2	0.04	0.01	0.05

* $p < 0.05$, ** $p < .01$; standard errors in parentheses
results are in incident rate ratios

Table 3.6: Ordered logit models with perceived effectiveness as outcome

	Controls	Joint PS Model	Full Model
Joint PS orientation		4.28** (0.71)	3.95** (0.86)
Controls			
Trust	1.82 (0.33)**		0.94 (0.17)
Composition	1.75** (0.23)		1.51** (0.16)
Incentives	1.44 (0.42)		1.07 (0.34)
Time >1 year	1.70 (0.47)		2.00* (0.58)
Contract	1.98** (0.51)		1.38 (0.37)
Larger size	1.90* (0.48)		1.02 (0.02)
N	267	267	267
Clusters	143	143	143
Pseudo R2	0.09	0.12	0.15

* $p < 0.05$, ** $p < .01$; standard errors in parentheses results are odds ratios

In support of H2, learning mediates the relationship between joint problem-solving and number of referrals, as indicated in Table 3.7. The mediation effect can be observed in the weakening of the joint problem-solving coefficient and its loss of significance when adding team learning to the final model. We find that 77% of the total effect of joint problem-solving on referral number is mediated through team learning.

Table 3.7: Learning as a mediator between joint problem-solving orientation and team performance

	DV: Referral number in prior year	DV: Learning	DV: Referral number in prior year
Joint problem-solving	13.22** (5.00)	0.62** (0.05)	3.04 (6.14)
Learning			16.79** (5.86)
Constant	-8.30 (18.80)	0.80** (0.20)	-27.54 (18.60)

* $p < 0.05$, ** $p < .01$; standard errors in parentheses; control variables hidden from view; models are OLS with adjustment for multi-level data

We found some support for H3 that joint problem-solving orientation mediates the relationship between intergroup trust and learning (Table 3.8). The intergroup trust coefficient weakens in magnitude when adding joint problem-solving to the table, though it remains significant at the .01 level. These findings correspond to 70% of the total effect of intergroup trust on learning being mediated by joint problem-solving. By comparison, a similar model substituting a measure of psychological safety for intergroup trust finds weaker evidence of mediation – only 47% of the effect is mediated in this case.

Table 3.8: Joint problem-solving as a mediator between intergroup trust and learning

	DV: Learning	DV: Joint problem-solving	DV: Learning
Intergroup trust	0.47** (0.05)	0.53** (0.05)	0.14** (0.05)
Joint problem-solving			0.62** (0.05)
Constant	1.19 (0.24)	0.60** (0.23)	0.80 (0.20)

* $p < 0.05$, ** $p < .01$; standard errors in parentheses; control variables hidden from view; models are OLS with adjustment for multi-level data

3.11 Discussion

This research sought to understand how teams work together effectively across organizational boundaries to pursue goals that demand innovation. We soon recognized that team fluidity further complicated knowledge transfer across boundaries by limiting the development of team member familiarity. Past research on team member familiarity and common sense alike may lead people in fluid, cross-boundary settings to start by seeking to build familiarity as a strategy to facilitate the collaborative work ahead. Our

qualitative findings suggest, in contrast, that a joint problem-solving orientation, in which teams emphasize problems as shared and solutions as requiring coproduction, is a powerful explanatory factor in explaining performance in fluid cross-boundary teams.

Findings from both of our studies indicate that a joint problem-solving orientation may be an important component for performance on fluid cross-boundary teams.

Problem-solving has been studied from an individual cognitive-behavioral perspective in the psychology literature for many years (D'zurilla & Goldfried, 1971). The concept is also used in negotiation literature, which has suggested joint problem-solving as a way to move from distributive toward integrative solutions (Follett, 1941). Our qualitative findings align with this central idea, suggesting that a joint problem-solving orientation can enable diverse teams to create new value through coproducing solutions to problems, rather than simply redistributing existing value that lies between team members. In addition, prior ethnographic research has noted the presence of joint problem-solving in inter-organizational work (Ring & Van de Ven, 1994; Uzzi, 1997), without precisely defining joint problem-solving, or exploring why it emerged or failed to emerge in certain contexts, or how it related to performance. Our quantitative findings further suggest that joint problem-solving orientation is a measurable, valid construct that may offer value in future studies exploring team performance.

The construct of a joint problem-solving orientation connects well to research on team climate and especially on the role of climate variables, such as psychological safety, in team learning behavior (Edmondson, 1999). When team members explicitly or implicitly embrace the idea that the work presents a series of problems to be collaboratively solved, they are likely to help create psychological safety for voice and

experimentation (Edmondson, 2003). We thus add to prior work showing a relationship between team learning orientation and team psychological safety in stable teams (Wilkins & London, 2006) by suggesting that a joint-problem solving orientation can be measured and may be particularly useful in explaining performance amid fluidity.

Our observation that familiarity-based efforts may be insufficient for ensuring positive relational dynamics and performance in fluid teams introduces a potential boundary condition for studies of teams in dynamic contexts. Past research on intergroup teams has theorized that intergroup performance rests on the ability of intergroup leaders to foster an intergroup relational identity (Hogg et al., 2012), and research on coordination has suggested that relationships are critical facets of coordinated action (Gittell, 2006). Our findings suggest that member fluidity may render such relational foci less relevant, and that joint problem-solving may offer an alternative. The implications of joint problem-solving may further extend to ideas about role communication. Whereas research on temporary project work in the film industry has shown how practices of thanking, polite admonishing, and joking can communicate role expectations that are critical to maintaining continuity across projects (Bechky, 2006), we found that thanking practices might even be counterproductive in fluid contexts if they promote independent work and thereby distract people from joint problem-solving.

The teams we studied are an example of the type of teams with dynamic participation - characterized by multiple team membership, member fluidity and geographic dispersion - that have been the center of recent calls for expanded empirical research (e.g., Mortensen and Haas, 2018). From our qualitative data, the extent to which individuals working on the team changed over time appeared to be a central feature of

dynamic participation affecting team processes because of its constraints on team familiarity, though multiple team membership and geographic dispersion were also present. Our context exhibits how elements of dynamic participation may co-occur, and points to ways in which their intersectionality may pose additional complexity.

We were struck in particular by how poorly the term fluidity seemed to describe the phenomenon we observed. While fluidity implies smooth movement over time, the teamwork we observed was markedly punctuated, with membership shifts becoming apparent in brief, episodic encounters between team members. This punctuated element of the teamwork may be common among cross-boundary work teams pursuing process innovation and particularly relevant for joint problem-solving. When shifting members of fluid teams interact infrequently or episodically, each interaction is a scarce resource, with substantial opportunity costs related to what is not said or done. Moreover, opportunities to become mired in differences abound. Consider that recent research found that cross-functional teams can transcend knowledge boundaries by iteratively and rapidly creating new representations that provide a common co-creation experience rather than deeply diving into resolving differences (Majchrzak et al., 2012). A joint problem-solving orientation may help foster this kind of fast, iterative learning among diverse experts. In addition, research on emergent groups responding to disasters has suggested that such teams may need to rely on opportunistic and minimally acceptable timely action (Majchrzak, Jarvenpaa, & Hollingshead, 2007). A joint problem-solving orientation may similarly promote teamwork in this type of uncertain, high-stakes and rapidly shifting context.

From a practical perspective, our research has implications for managers who must manage intergroup teamwork. Joint problem-solving suggests that managers can promote the pursuit of rapid teamwork in certain contexts, even without the benefits of familiarity. This implies that managers might be better off diving into joint tasks instead of spending time to develop familiarity when teams are fluid and cross boundary and tasks are novel. In addition, the capabilities that enable managers to pursue joint problem-solving may differ markedly from those that enable teamwork in other more stable team environments.

3.12 Limitations and future research

Further exploring the antecedents of joint problem-solving orientations would generate important insights for managers about how to promote joint problem-solving orientation in practice. Ethnographically studying fluid cross-boundary teams through longitudinal, direct observation may be particularly fruitful. Our research relied on respondent reports about occurrences rather than observing them directly. We probed about contextual, behavioral and demographic factors in teams that both exhibited and failed to exhibit joint problem-solving orientations, and we triangulated across interviews with team members in order to address potential bias (in two cases we probed and resolved inconsistent reports through thirty-minute follow-up interviews), but we were unable to observe these factors in direct observation. Ethnographic study could help to elucidate the antecedent factors that enable joint problem-solving orientations to evolve.

Future research can quantitatively explore joint problem-solving orientation as a group-level construct, as our quantitative study took the perspective of one manager reporting on the team. Understanding the extent of variation in perceptions of joint

problem-solving orientation in a team can shed light on how joint problem-solving operates collectively, and it may uncover important asymmetries in perceptions across team members. For example, research on trust has shown that it can be asymmetric across organizations, with trust being lower for parties that face greater risks from the exchange or that have less power (Mcevily, Zaheer, & Kamal, 2017). In addition, future research measuring outcomes from various perspectives can help to further limit same-source bias. We addressed this limitation in two ways in this study. First, we used number of referrals alongside the perceptual measure of performance and observed findings with similar directionality. Second, we ran sensitivity analysis for the regressions using a perceptual measure for the outcome by adding a control variable measuring respondent optimism using a validated measure of life orientation toward optimism (Scheier et al., 1994). This measure was non-significant and did not alter interpretation of the findings ($p= 0.95$ in the full negative binomial model and $p=0.56$ in the full ordered logit model).

Finally, concerns about generalizability must be noted given the specific context of this research. We studied teams that formed across organizations to design and implement a novel initiative. Member fluidity is likely particularly common in teams that form across organizations to pursue novel work because the task-related needs of the work and who is required to do it are initially unclear. However, the model of joint problem-solving might be relevant for other settings where joint tasks are novel, knowledge boundaries are present, and work interactions are episodic with shifting members, such as cross-unit committee work within a firm.

3.13 Conclusion

Teamwork across boundaries is increasingly common for organizations operating in dynamic environments. The teams that take shape in these environments often exhibit membership fluidity that makes it difficult for members to establish familiarity across boundaries. New theory is required to describe and understand team performance under these challenging conditions. By examining fluid cross-boundary teams, we have induced and tested a model of performance in these contexts that highlights the role of a joint problem-solving orientation to kick-start collaborative action. This perspective extends current perspectives on teamwork by showing how team joint problem-solving orientations may enable learning and performance, even when membership is fluid and team familiarity remains low.

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APPENDICES

APPENDIX A: SUPPLEMENTARY MATERIALS FOR CHAPTER 1

Appendix A.1 Survey refinements, scale development and psychometrics

Opportunities to improve the original PPIC survey

Evaluation of the PPIC pilot survey concluded that, “additional opportunities for improving the instrument and its administration” existed (Singer et al.), including: (1) rewording or replacing items and applying a more articulated response scale to achieve more variance, reduce cross-loading, and bolster weaker constructs’ reliability, (2) larger sample size, (3) more empirical assessment confirming scale reliability and comparing patient perceptions with additional measures of care integration.

Adaptations in the revised survey version

We refined the survey with input from a panel of 27 expert advisors and conducted cognitive testing, including 10 cognitive interviews (eight in English and two in Spanish). The primary issues raised during cognitive review included respondents not feeling that certain questions pertained to their experiences, or that they were referring to irrelevant issues. For example, multiple respondents mentioned that a question about whether anybody at a provider’s office helped them get services at home to manage their health conditions was confusing because they felt they didn’t need those services. Consequently, we added a screener question so that this type of respondent would be routed past the question. We also clarified instructions throughout the survey where the cognitive interviewer noticed participants becoming confused, such as by emphasizing words, adding preamble to selected items, and simplifying language, particularly in the Spanish translation. We modified frequency scales that posed problems for respondents.

Psychometrics & survey properties

Survey properties supported its reliability and validity in this sample. Item nonresponse was 4.8% on average, excluding those who mailed back blank surveys or left at least 80% of questions blank. Of the items included in our analysis, none had more than 79% of responses in the most favorable option.

The survey's psychometric properties were evaluated after administration. Of the 59 integrated care items, 26 were included in psychometric testing. Those excluded were items that confirmed doctor and clinic (Q1, Q2, Q3), served only as gates to other questions (Q7, Q20, Q24, Q28, Q32, Q38, Q43, Q45, Q48, Q53, Q55), exhibited low covariance coverage (Q8, Q16, Q44, Q51), were dominated by another item (Q35 by Q36), or were judged prone to misinterpretation (Q40). We also excluded items drawn from the CAHPS survey, which we used for testing discriminant validity (Q12, Q13, Q14, 15), and those pertaining to integration with the hospital (Q54, Q56, Q57Q58, Q59), because they applied only to a small subset of respondents. We treated these as an index instead (see note on additional index below). Four items were orphaned as a result of psychometric testing (Q4Q5, Q6, Q11, Q37), leaving 22 items that comprised six dimensions of patient-perceived integrated care.

We conducted factor analysis by randomly splitting the full sample (n= 3067) into two, with one to be used for exploratory factor analyses (n=2000) and one to be used for confirmatory factor analyses (1,067). We conducted a series of exploratory factor analyses on the first sample using the weighted least squared multi-variate (WLSMV) estimator and a Geomin rotation in Mplus 7.2. We also repeated these analyses using survey responses that had been adjusted for patient optimism. In all these exploratory

factor analyses, we assessed factor structures based on eigenvalue magnitude (greater than 1), shape of the scree plot, pattern of factor loadings, face validity (conceptually meaningful groupings), and goodness of fit for each exploratory solution. After determining the optimal number of factors, we dropped items with redundant content, loadings <0.4 across all identified factors, or high cross-loadings (i.e., loadings exceeding 0.3 on two or more factors). Using the best exploratory factor model according to our criteria, we conducted a confirmatory factor analysis, first with the exploratory sample and then with the confirmatory sample to evaluate goodness of fit.

The six-factor structure achieved good model fit (Root Mean Square Error of Approximation of 0.024 with CI 0.021 to 0.028, Standardized Root Mean Square Residual of 0.025, Comparative Fit Index of 0.976, Tucker Lewis Index of 0.957, and Chi-Square value of 9013 with 325 degrees of freedom, $p < 0.000$) as well as internal validity (as measured by Cronbach's alphas ranging from 0.68 to 0.84 and a correlation of 0.60 for a two-item scale). Discriminant validity, an indication that dimensions are conceptually distinct from one another and potentially related measures, was strong, as indicated by Cronbach's alphas within dimensions greater than correlations between any two dimensions and greater than correlations of any dimension with the CAHPS communication score. Construct validity, an indication that dimensions measure what they purport to measure, was indicated by significant positive relationships between the integration domains and five additional survey items measuring general aspects of perceived care quality and communication ($p < .0001$; correlations from 0.19 to 0.55).

For analysis, factor scores were created as the mean of the numeric scores for the relevant items within the factor, with the restriction that at least one item was answered.

Please note that for this reason, the sample size for a factor can be larger than the sample size of a single item contained within the factor.

Note on additional index measuring Transition Following a Hospitalization

In addition to the six psychometrically-derived domains of patient-perceived integrated care, we also measured an index, *Transition Following a Hospitalization*, as past work has established the theoretical importance of post-hospital care integration for patients with chronic illnesses. We report response distributions for this index in this Technical Appendix, section A3.

Appendix A.2 Bivariate relationships

Table A.1: Bivariate relationships between organizational characteristics and integrated care domains

	Provider Knowledge of the Patient	Staff Knowledge of Patient Medical History	Specialist Knowledge of Patient Medical History	Support for Self-Directed Care	Support for Medication and Home Health Management	Test Result Communication
Multispecialty	0.0177	0.1161*	0.047	0.0106	0.0001	-0.0325
Hospital ownership	-0.02	-0.0274	0.0038	-0.0209	0.0012	0.0066
Solo	-0.0033	0.0095	-0.0214	0.0431*	-0.0104	-0.0457*
Small	0.0113	-0.0473	-0.0348	-0.0233	0.0499*	0.0379
Tech capabilities	-0.0387*	-0.0203	0.0294	-0.023	-0.0058	0.0482*
Care management	-0.0249	-0.0055	0.0007	-0.0028	-0.0135	-0.1086*

* $p < .05$

Appendix A.3 Responses by item

Table A.2: Provider Knowledge of the Patient Response Distribution

	N	Patient responses (%)			
		Never/ poor	Sometimes/ fair	Usually/ good	Always/ excellent
Q 9: In the last 6 months, how often did you have to repeat information that you had already provided during the same visit?	2815	76%	19%	2%	3%
Q 10: In the last 6 months, how often did this provider seem to know the important information about your medical history?	2819	2%	4%	19%	75%
Q 46: In general, how often does the provider named in question one seem informed and up-to-date about the care you get from specialists?	1847	5%	10%	26%	59%
Q 47: In general, how often do you have to remind the provider named in question one about care you receive from specialists?	1832	58%	27%	8%	7%
Q 17: How would you rate this provider's knowledge of your values and beliefs that are important to your health care?	2785	2%	5%	30%	64%

Table A.3: Staff Knowledge about the Patient's Medical History Response Distribution

	N	Patient responses (%)			
		Never	Sometimes	Usually	Always
Q 21: In the last 6 months, how often did these other staff seem up-to-date about the care you were receiving from this provider?	987	3%	9%	32%	57%
Q 22: In the last 6 months, how often did these other staff talk to you about the care you received from this provider?	953	18%	21%	29%	33%
Q 23: In the last 6 months, how often did these other staff seem to know the important information about your medical history?	979	5%	12%	32%	50%

Table A.4: Support for Self-Directed Care Response Distributions

	N	Patient responses (%)			
		Never/ Not at all	Some- times/ Yes, no help	Usu- ally/ Yes, some	Al- ways/ Yes, def.
Q 31: In the last 6 months, how often did this provider or someone in his or her office help you identify the most important things for you to do for your health?	2732	10%	13%	28%	49%
Q 33: In the last 6 months, how often did this provider or someone in his or her office help you get these services at home to take care of your health?	319	27%	12%	13%	49%
Q 34/36: In the last 6 months, did this provider or someone in his or her office give you instructions about how to take care of your health, and how often did the instructions you received help you take care of your health?	1700	38%	6%	23%	33%
Q 18/19: In the last 6 months, did this provider talk with you about setting goals for your health, and did the care you received from this provider help you meet your goals?	2702	24%	2%	26%	48%
Q 29/30: In the last 6 months, did this provider or someone in his or her office ask you about these things that make it hard for you to take care of your health, and did you and this provider or someone in his or her office come up with a plan to help you deal with things that make it hard for you to take care of your health?	700	36%	5%	29%	30%

Table A.5: Specialist Knowledge About the Patient’s Medical History Response Distributions

	N	Patient responses (%)			
		Never/ No	Sometimes	Usually/ Yes some	Always/ Yes def
Q 50: When you see this specialist, does he or she seem to know enough information about your medical history?	1841	4%	n/a	23%	74%
Q 52: When you see this specialist, how often does this specialist seem to know all your test results from other providers?	1783	12%	17%	27%	45%

Table A.6: Support for Medication and Home Health Management Response Distributions

	N	Patient responses (%)			
		Never	Sometimes	Usually	Always
Q 39: In the last 6 months, how often did this provider or someone in his or her office talk with you about how you were supposed to take your medicine?	2684	14%	11%	20%	55%
Q 41: In the last 6 months, how often did this provider or someone in his or her office talk with you about what to do if you have a bad reaction to your medicine?	2625	35%	13%	17%	35%
Q 42: In the last 6 months, how often did this provider or someone in his or her office contact you between visits to see how you were doing?	2749	61%	24%	8%	7%
Q 49: In general, how often does the provider talk with you about the medicines prescribed by these specialists?	1273	18%	25%	23%	34%

Table A.7: Test result communication Response Distributions

	N	Patient responses (%)			
		Never	Sometimes	Usually	Always
Q 25: In the last 6 months, when this provider or someone in his or her office ordered a blood test, x-ray, or other test for you, how often did this provider or someone from his or her office follow up to give you those results?	2253	4%	7%	13%	76%
Q 26: In the last 6 months, how often did you have to request your test results before you got them?	2242	79%	14%	3%	4%
Q 27: In the last 6 months, how often were your test results presented in a way that was easy to understand?	2263	2%	4%	21%	73%

Table A.8: Index of Transition Following a Hospitalization Response Distributions

	N	Patient responses (%)			
		No	Yes, not easy	Yes, some	Yes, def.
Q 56: After your most recent hospital stay, did the provider named in question one or someone in his or her office contact you to check if you were able to follow instructions about any medicines you were prescribed?	400	59%	n/a	n/a	41%
Q 57/58: After your most recent hospital stay, were you given instructions about caring for yourself at home, and were the instructions you were given easy to understand?	511	13%	1%	12%	74%
Q 59: After your most recent hospital stay, did the provider named in question one seem to know important information about this hospital stay?	499	14%	n/a	17%	69%

Appendix A.4 Robustness checks

Table A.9: OLS Results

	Dependent variables: Integration Dimensions (raw scores)					
	Provider Knowledge of the Patient	Staff Knowledge of Patient Medical History	Specialist Knowledge of Patient Medical History	Support for Self-Directed Care	Support for Medication and Home Health Management	Test Result Communication
Multispecialty	0.056	0.217*	0.027	0.047	0.065	-0.033
Hospital owned	-0.011	-0.035	-0.012	-0.016	0.017	-0.006
Solo (v. large)	0.014	0.141	-0.107	0.11	0.046	-0.088
Small (v. large)	0.022	0.027	-0.074	-0.016	0.126**	-0.005
Tech capabilities	-0.004	0.001	0.004	-0.003	0.002	0.006
Care management	-0.003	-0.007	-0.002	-0.001	-0.007	-0.021**
Age 75 and older	0.007	0.068	-0.024	-0.100*	-0.107**	-0.003
Male	0.04	0.11	0.072	0.119**	0.110**	0.016
At least some college	-0.068**	-0.176**	-0.103*	-0.130**	-0.188**	-0.065*
Hispanic	-0.052	0.087	0.148	-0.121	-0.098	-0.288*
White	0.065*	0.023	0.016	-0.167**	-0.106	0.084
Higher income	-0.021	0	-0.131*	-0.113*	-0.144**	0.025
Living alone	0.034	0.138*	0.002	0.004	-0.056	0.005
Survey help	-0.057	-0.093	-0.073	0.057	0.051	0.007
# Chronic conditions	0.001	0.029**	0.017*	0.008	0.022***	-0.015**
Optimism	0.120**	0.202**	0.164**	0.198**	0.114**	0.079**
Respondents	2609	727	1622	2621	2556	2013
Medical groups	136	85	125	136	136	127

NOTES: * p<0.05; ** p<0.01 Standard errors are heteroskedasticity robust; medical groups with fewer than 5 respondents are excluded from analysis; weights included for patient nonresponse; SVY command used to adjust for sampling design; small groups are those with 2-9 physicians; large (reference group) is 10+ physicians; tech capabilities is on a 0-15 point scale; care management is on a 0-20 point scale; higher income is \$40,000+; optimism is on a 0-24 point scale; chronic conditions are from a list supplied by Medicare.

Table A.10: Ordered logistic regressions including groups with fewer than 5 responses

	Dependent variables: Integration Dimensions (raw scores)					
	Provider Knowledge of the Patient	Staff Knowledge of Patient Medical History	Specialist Knowledge of Patient Medical History	Support for Self-Directed Care	Support for Medication and Home Health Management	Test Result Communication
Multispecialty	1.154	1.740**	1.114	1.115	1.199	0.949
Hospital owned	0.941	1.055	1.003	0.943	1.077	0.961
Solo (v. large)	1.032	1.292	0.860	1.184	1.169	0.690
Small (v. large)	1.067	1.109	0.881	0.948	1.374**	1.073
Tech capabilities	0.984	0.982	1.011	0.993	1.008	1.009
Care management	0.987	0.983	0.994	0.995	0.985	0.936**
Age 75 and older	0.993	1.008	0.910	0.845*	0.814**	0.927
Male	1.105	1.332*	1.120	1.251**	1.255**	1.003
At least some college	0.752*	0.700*	0.784*	0.793**	0.681**	0.817*
Hispanic	0.873	0.795	1.660	0.785	0.751	0.492**
White	1.346*	1.068	1.015	0.755*	0.856	1.375**
Higher income	0.795**	0.968	0.783*	0.782**	0.765**	1.171
Living alone	1.102	1.648**	1.068	1.033	0.917	1.126
Survey help	0.801	0.885	0.783	0.994	1.134	0.971
# Chronic conditions	0.993	1.049	1.039*	1.007	1.044**	0.948**
Optimism	1.569**	1.539**	1.404**	1.521**	1.251**	1.315**
Respondents	2639	901	1684	2653	2587	2075
Medical groups	147	139	143	148	148	145

NOTES: * p<0.05; ** p<0.01 Standard errors are heteroskedasticity robust; weights included for patient nonresponse; SVY command used to adjust for sampling design; small groups are those with 2-9 physicians; large (reference group) is 10+ physicians; tech capabilities is on a 0-15 point scale; care management is on a 0-20 point scale; higher income is \$40,000+; optimism is on a 0-24 point scale; chronic conditions are from a list supplied by Medicare.

Appendix A.5 Note on significance

Failure to detect significant results on medical group features may have resulted from characteristics of the data rather than a lack of relationship among the variables, an issue that we attempted to address and explore. Our study was designed to have power to detect minimum differences of 0.12 standard deviations (accounting for group clustering), which aligned with effect sizes in similar previous research (Reid et al., 2009). While the individual response rate was somewhat lower than expected, we addressed potential measurement error by excluding groups with fewer than five responses from analyses. In addition, since the total number of groups is the key factor driving the power of our group-level variable estimates, it is especially encouraging that the number of groups represented in the final sample was higher than expected (Snijders, 2005). The variation in the dependent variables was also sufficient to warrant associational analysis, as no domain score had more than 73.5% of responses in the top category, and the number of group clusters exceeded 80 in all regressions.

Appendix A.6 Adjustment for multiple comparisons

The main analysis presented in this paper does not adjust for multiple comparisons because the presence of correlated integration domains across regressions would have violated a key assumption in multiple comparison adjustments that there is independence across tests (Benjamini & Hochberg, 1995). The table below displays the significant positive correlations across domains.

Table A.11: Correlations across integration domains

	1. Provider Knowledge of the Patient	2. Staff Know- ledge of Patient Medical History	3. Specialist Knowledge of Patient Medical History	4. Support for Self- directed Care	5. Support for Medication and Home Health Management	6. Test Result Communi- cation
1.	1.0000					
2.	0.4543*	1.0000				
3.	0.3825*	0.2998*	1.0000			
4.	0.4229*	0.4841*	0.2646*	1.0000		
5.	0.3675*	0.4473*	0.3326*	0.5531*	1.0000	
6.	0.5065*	0.3597*	0.2189*	0.3513*	0.2961*	1.0000

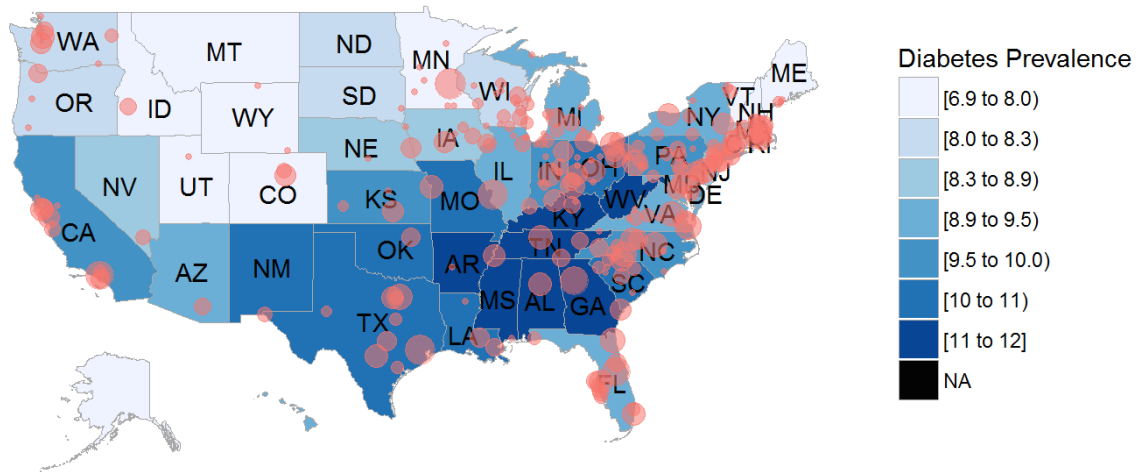
*p<.05

We conducted a supplemental analysis to explore the impact of including a correction for multiple comparisons. We calculated the critical P values that would limit the false discovery rate (the expected rate of type I error) to no more than 5% of all statistically significant results (Friedberg et al., 2009). We found that the significant findings on the main independent variables for the care management process variable ($b = 0.93$; $p < .001$) and the small size variable ($b = 1.34$; $p = .002$) remained significant, while the significant finding on the multispecialty variable ($b = 1.73$; $p = 0.018$) did not. These results align with our interpretation of the main finding that there is little observed relationship between the integrated care domains and the structural features of medical groups measured in this study.

APPENDIX B: SUPPLEMENTARY MATERIALS FOR CHAPTER 2

Appendix B.1 Sample geographic distribution

Figure B1: Survey sites by size and state diabetes prevalence



Notes: Each red dot represents a HealthSource chapter delivering the intervention; size of the dot is scaled to chapter size using number of operating branches; state shading reflects state diabetes prevalence.

Appendix B.2 Survey items

Perceived respect

- 1 I am confident that the other party respects me
- 2 I have high status in the other party's eyes
- 3 I have influence over the other party's behavior

Learning

- 4 I feel we learn together from mistakes and errors
- 5 I give feedback to the other party
- 6 I receive feedback from the other party
- 7 I feel like we learn a lot from each other

Boundary spanning communication behaviors

- 8 *Inquiring*: We always ask one another questions to understand how best to proceed
- 9 *Offering*: Each party always offers important points to help our work together proceed

Appendix B.3 Response distribution

Table B.1: Item response distributions for respect, learning and boundary spanning communication behaviors

Item	N	Response (%)				
		1 Strongly disagree	2 Somewhat disagree	3 Neither agree nor disagree	4 Somewhat agree	5 Strongly agree
Perceived respect						
1. I am confident that the other party respects me	269	1	5	18	30	46
2. I have high status in the other party's eyes	269	2	11	36	28	23
3. I have influence over the other party's behavior	269	12	20	49	14	5
Learning						
4. I feel we learn together from mistakes and errors	269	3	4	37	37	19
5. I give feedback to the other party	269	1	6	25	41	27
6. I receive feedback from the other party	269	4	10	29	40	17
7. I feel like we learn a lot from each other	268	4	7	32	35	22
Boundary spanning communication behaviors						
8. We always ask one another questions to understand how best to proceed	270	5	5	21	38	31
9. Each party always offers important points to help our work together proceed	268	3	7	26	35	29

Appendix B.4 Correlations among items and measures

Table B.2: Perceived respect item correlations

Items	1.	2.	3.
1. I am confident that the other party respects me	1.00		
2. I have high status in the other party's eyes	0.69	1.00	
3. I have influence over the other party's behavior	0.50	0.54	1.00

Table B.3: Learning item correlations

Items	4.	5.	6.	7.
4. I feel we learn together from mistakes and errors	1.00			
5. I give feedback to the other party	0.58	1.00		
6. I receive feedback from the other party	0.67	0.60	1.00	
7. I feel like we learn a lot from each other	0.68	0.56	0.73	1.00

Table B.4: Boundary spanning communication item correlations

Items	8.	9.
8. We always ask one another questions to understand how best to proceed	1.00	
9. Each party always offers important points to help our work together proceed	0.71	1.00

Table B.5: Measure correlations

Constructs	A.	B.	C.	D.	E.
A. Respect	1.00				
B. Learning	0.74	1.00			
C. Asking	0.56	0.64	1.00		
D. Offering	0.59	0.70	0.71	1.00	
E. Number of referrals	0.06	0.16	0.07	0.17	1.00

Appendix B.5 Control measure correlations

Table B.6: Control measure correlations

Measure	1.	2.	3.	4.	5.	6.	7.	8.
1. Payment (1=external payment present)	1.00							
2. Contract (1=contract present)	0.13*	1.00						
3. Leader support (0-5 likert)	0.08	0.10	1.00					
4. Number of HealthSource branches (count)	0.24*	0.09	-0.11	1.00				
5. Clinic type: Doctor's office	0.00	-0.18*	0.02	-0.12*	1.00			
6. Clinic type: Health center	0.07	0.11	0.03	0.11	-0.21*	1.00		
7. Collaboration duration (1= greater than 1 year)	-0.02	0.05	-0.04	-0.01	-0.02	0.07	1.00	
8. Number of referrals	0.04	0.26*	0.15	0.20*	-0.14*	-0.01	0.21*	1.00

*p<.05

Appendix B.6 Regressions excluding early-stage collaborations (less than 1 month)

Table B.7: Relationship between referral number and learning excluding early-stage collaborations (less than 1 month)

	DV: Referral number	
	Model 1	Model 2
Learning	1.77**	1.65**
Controls		
Payment		1.01
Contract		1.39'
Support		1.50**
Number of branches		1.07**
Office (v. hospital)		0.71
Health center (v. hospital)		0.81
Duration of collaboration		3.69**
N	249	249
Pseudo R2	.01	.05

'p<.10; *p<.05; **p<.01; results are incident rate ratios

Table B.8: Respect, learning and the moderating role of boundary spanning communication behaviors excluding early-stage collaborations (less than 1 month)

	DV: Intragroup learning				
	Model 6	Model 7	Model 8	Model 9	Model 10
Respect	11.35**	2.56*	2.33'	1.33	1.21
Inquiring		0.89	0.69		
Respect x inquiring		1.35*	1.43**		
Offering				0.78	0.60
Respect x offering				1.56**	1.65**
Controls					
Payment	1.37		0.96		0.92
Contract	2.38**		2.08**		2.01**
Support	1.13		1.04		0.96
Number of branches	1.00		1.00		1.00
Office (v. hospital)	0.36**		0.36**		0.42**
Health center (v. hospital)	0.90		0.97		1.16
Duration of collaboration	1.01		1.22		1.10
N	249	249	249	247	267
Pseudo R2	0.19	0.19	0.22	0.22	0.23

'p<.10 *p<.05; **p<.01

Results are odds ratios

Appendix B.7 Regressions with winsorized referral number

Distribution of referral number variable

Observations: 289

Mean: 23.87

Standard deviation: 51.99

Skewness: 5.22

Kurtosis: 37.45

Table B.9: Distribution of referral number variable

Percentile	Referral number
25 th	1
50 th	8
75 th	23
95 th	100

Table B.10: Relationship between referral number (winsorized at 95th percentile) and learning

	DV: Referral number	
	Model 1	Model 2
Learning	1.56**	1.63**
Controls		
Payment		1.29
Contract		1.26
Support		1.42**
Number of branches		1.05**
Office (v. hospital)		0.79
Health center (v. hospital)		0.97
Duration of collaboration		3.81**
N	269	269
Pseudo R2	.01	.04

*p<.05; **p<.01; results are incident rate ratios

Appendix B.8 Regressions with one collaboration per respondent

Table B.11: Relationship between referral number and learning *with one collaboration per respondent*

	DV: Referral number	
	Model 1	Model 2
Learning	1.75**	1.87**
Controls		
Payment		1.16
Contract		1.37
Support		1.65**
Number of branches		1.06**
Office (v. hospital)		0.95
Health center (v. hospital)		0.57
Duration of collaboration		5.35**
N	142	142
Pseudo R2	.01	.05

*p<.05; **p<.01; results are incident rate ratios

Table B.12: Respect, learning and the moderating role of boundary spanning communication behaviors *with one collaboration per respondent*

	DV: Intragroup learning				
	Model 6	Model 7	Model 8	Model 9	Model 10
Respect	11.52**	2.47	2.30	1.32	1.24
Inquiring		0.89	0.62		
Respect x inquiring		1.34'	1.46*		
Offering				0.86	0.59
Respect x offering				1.58*	1.71*
Controls					
Payment	1.45		1.18		1.04
Contract	3.05**		2.68**		2.66**
Support	1.10		1.03		0.93
Number of branches	1.00		1.00		1.01
Office (v. hospital)	0.42**		0.44*		0.66
Health center (v. hospital)	0.64		0.51		0.68
Duration of collaboration	1.21		1.52		1.51
N	142	142	142	141	141
Pseudo R2	0.19	0.19	0.21	0.22	0.24

'p<.10 *p<.05; **p<.01

Results are odds ratios

APPENDIX C: SUPPLEMENTARY MATERIALS FOR CHAPTER 3

Appendix C.1 Construct items

Joint problem-solving orientation

- 1 Problems arising in this engagement are seen as joint rather than individual responsibilities
- 2 We always ask one another questions to understand how best to proceed
- 3 Each party always offers important points to help our work together proceed
- 4 We absolutely invite one another to be part of the problem-solving process
- 5 I view the other party as a true partner
- 6 I feel we get distracted by power struggles (*reverse coded*)
- 7 I feel we overcome hurdles effectively

Trust

- 8 I count on the other party to fully live up to their word
- 9 I am certain I can fully trust the other party
- 10 I expect the complete truth from the other party

Team learning

- 11 I feel we learn together from mistakes and errors
- 12 I give feedback to the other party
- 13 I receive feedback from the other party
- 14 I feel like we learn a lot from each other

Appendix C.2 Response distributions

Table C.1: Item response distributions for joint problem-solving, trust and learning

Item	N	Response (%)				
		1 Strongly disagree	2 Somewhat disagree	3 Neither agree nor disagree	4 Somewhat agree	5 Strongly agree
Joint problem-solving orientation						
1 Problems arising in this engagement are seen as joint rather than individual responsibilities	268	8	10	47	21	14
2 We always ask one another questions to understand how best to proceed	270	5	5	21	38	31
3 Each party always offers important points to help our work together proceed	269	5	5	27	32	31
4 We absolutely invite one another to be part of the problem-solving process	268	3	7	26	35	29
5 I view the other party as a true partner	270	5	8	20	24	43
6 I feel we get distracted by power struggles (<i>reverse coded</i>)	270	5	7	22	17	49
7 I feel we overcome hurdles effectively	269	6	9	35	30	20
Trust						
8 I count on the other party to fully live up to their word	269	1	3	13	19	64
9 I am certain I can fully trust the other party	267	1	6	19	25	49
10 I expect the complete truth from the other party	269	1	6	17	29	46
Learning						
11 I feel we learn together from mistakes and errors	269	3	4	37	37	19
12 I give feedback to the other party	269	1	6	25	41	27
13 I receive feedback from the other party	269	4	10	29	40	17
14 I feel like we learn a lot from each other	268	4	7	32	35	22

Appendix C.3 Item correlations

Table C.2: Joint problem solving orientation item correlations

Items	1.	2.	3.	4.	5.	6.	7.
1 Problems arising in this engagement are seen as joint rather than individual responsibilities	1.00						
2 We always ask one another questions to understand how best to proceed	0.57	1.00					
3 Each party always offers important points to help our work together proceed	0.58	0.77	1.00				
4 We absolutely invite one another to be part of the problem-solving process	0.50	0.71	0.73	1.00			
5 I view the other party as a true partner	0.43	0.58	0.61	0.67	1.00		
6 I feel we get distracted by power struggles (<i>reverse coded</i>)	0.29	0.23	0.29	0.20	0.37	1.00	
7 I feel we overcome hurdles effectively	0.50	0.53	0.56	0.60	0.60	0.44	1.00

Table C.3: Trust item correlations

Items	8.	9.	10.
8 I count on the other party to fully live up to their word	1.00		
9 I am certain I can fully trust the other party	0.68	1.00	
10 I expect the complete truth from the other party	0.69	0.79	1.00

Table C.4: Learning item correlations

Items	11.	12.	13.	14.
11 I feel we learn together from mistakes and errors	1.00			
12 I give feedback to the other party	0.58	1.00		
13 I receive feedback from the other party	0.67	0.60	1.00	
14 I feel like we learn a lot from each other	0.68	0.56	0.73	1.00

Appendix C.4 Sensitivity analyses

Table C.5: Negative binomial models with number of referrals in prior year as outcome using one collaboration per respondent

	Controls	Joint PS Model	Full Model
Joint PS orientation		1.39*	1.56*
Controls			
Trust	0.97		0.75
Composition	1.42**		1.24
Incentives	0.87		0.82
Time >1 year	3.74**		3.73**
Contract	1.78*		1.61*
Larger size	1.07**		1.07**
Constant	1.09		1.03
N	143	143	143
Pseudo R2	0.05	0.01	0.05

* $p < 0.05$, ** $p < 0.01$; standard errors in parentheses; results are in incident rate ratios

Table C.6: Ordered logit models with perceived effectiveness as outcome using one collaboration per respondent

	Controls	Joint PS Model	Full Model
Joint PS orientation		4.78**	4.54**
Controls			
Trust	1.73**		0.93
Composition	1.71**		1.37*
Incentives	1.10		0.90
Time >1 year	1.54		1.95
Contract	1.73		1.26
Larger size	1.02		1.03
N	143	143	143
Pseudo R2	0.08	0.14	0.17

* $p < 0.05$, ** $p < 0.01$; standard errors in parentheses; results are odds ratios

Table C.7: Negative binomial models with number of referrals in prior year as outcome using collaborations with at least 1 and no more than 3 years of duration working together

	Controls	Joint PS Model	Full Model
Joint PS orientation		1.36'	1.49**
Controls			
Trust	0.99		0.75'
Composition	1.24*		1.22'
Incentives	1.37		1.24
Contract	3.25**		2.89**
Larger size	1.08**		1.07**
Constant	2.73*		2.38'
N	139	141	139
Clusters	94	94	94
Pseudo R2	0.05	0.01	0.06

' $p < .10$; * $p < 0.05$, ** $p < .01$; standard errors in parentheses; results are in incident rate ratios

Table C.8: Ordered logit models with perceived effectiveness as outcome using collaborations with at least 1 and no more than 3 years of duration working together

	Controls	Joint PS Model	Full Model
Joint PS orientation		5.45**	5.06**
Controls			
Trust	2.61**		1.11
Composition	1.64**		1.57**
Incentives	2.33'		1.65
Contract	2.43*		1.62
Larger size	1.02		1.02
N	139	141	139
Clusters	94	94	94
Pseudo R2	0.12	0.15	0.20

' $p < .10$; * $p < 0.05$, ** $p < .01$; standard errors in parentheses; results are odds ratios

Table C.9: Negative binomial models with number of referrals in prior year as outcome with number of referrals winsorized at the 95th percentile

	Controls	Joint PS Model	Full Model
Joint PS orientation		1.32*	1.46**
Controls			
Trust	0.98		0.80
Composition	1.34**		1.23*
Incentives	1.22		1.10
Time >1 year	2.86**		2.89**
Contract	1.71**		1.56*
Larger size	1.04**		1.04**
Constant	1.42		1.18
N	267	270	267
Clusters	143	143	143
Pseudo R2	0.03	0.01	0.04

* $p < 0.05$, ** $p < .01$; standard errors in parentheses; results are in incident rate ratios

Regressions with control measure for respondent optimism

Optimism items

In uncertain times, I usually expect the best
 If something can go wrong for me, it usually will
 I am always optimistic about my future
 I hardly ever expect things to go my way
 Overall, I expect more good things to happen to me than bad
 I rarely count on good things happening to me

Table C.10: Models including measure of respondent optimism

	Negative binomial model DV: Referral Number	Ordered logit model DV: Perceived effectiveness
Joint PS orientation	1.61**	4.15**
Controls		
Optimism	1.00	0.95
Trust	0.74	0.96
Composition	1.25*	1.51**
Incentives	0.92	1.07
Time >1 year	3.23**	1.98*
Contract	1.97**	1.39
Larger size	1.06**	1.02
Constant	1.10	-
N	267	267
Clusters	143	143
Pseudo R2	0.05	0.15

* $p < 0.05$, ** $p < 0.01$; standard errors in parentheses; results are in incident rate ratios