The Role of Micro and Macro Level Organizational Coordination in Accountable Care Organizations

By

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Abstract

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The aim of this dissertation is to explore both micro and macro level healthcare coordination constructs and to explore associated concepts to better understand what enables or impedes coordination in the delivery system. Given the significance and importance of coordinating mechanisms, my studies examine types of coordination at the micro (Relational Coordination), and macro (Care Transition Management) levels, to contribute to the literature in healthcare coordination and to support healthcare transformation toward a safer, higher quality, and more cost-effective delivery system.

The growing literature on team level coordination has not explored how facilitative leadership supports or hinders coordination, nor have studies examined how team member participation and solidarity culture are associated with team level coordination. At the organizational level, studies have explored healthcare care coordination, accountability, and electronic health records as individual constructs, but no studies have looked at all three together and explored the association between them.

Study 1 and 2 examine micro-organizational coordination in two accountable care organizations with quantitative and qualitative investigations of Relational Coordination and teamwork factors including; Leadership Facilitation, Team Participation, Solidarity Culture. Study 3 explores macro-organizational coordination to see if physician group Accountable Care Organization (ACO) affiliation and greater EHR functionality are positively associated with more robust Care Transition Management (CTM) capabilities.
Dedication

For my family and friends,
for my teachers and mentors,
for my colleagues and students.

For all those suffering from
physical, spiritual, and mental health issues,
may we continuously improve health, healthcare,
and well-being for ourselves and others.
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Introduction

The National Academy of Medicine (NAM) identified coordination as one of twenty national priorities to improve health by making healthcare delivery safer, more effective, patient-centered, timely, efficient, and equitable (Kohn, Corrigan, & Donaldson, 2000). Given the advent and rise of value and outcomes based healthcare delivery, structures and processes like coordination that enable measurable improved performance are increasingly relevant to 21st century care delivery systems. Coordination of care is an essential component and strongly associated with integrated care delivery (Hartgerink et al., 2014c). Coordination of patients across the care continuum has become increasingly important as bundled payment and value based risk sharing become the norm for healthcare delivery systems (Shortell, Casalino, & Fisher, 2010a). Healthcare is slowly and steadily shifting away from paying on a fee-for-service basis and moving towards bundled payments that consist in part on reimbursement for performance outcomes related to coordination of care. Therefore, it is more important than ever to evaluate the ability of organizational forms like ACO’s to support coordination efforts in critical areas like patient transfers between units and care transition management.

Coordination occurs at different levels of the healthcare delivery system ranging from very large macro societal levels to small micro local provider levels, for example; across healthcare delivery organizations, across payment systems, between care provider systems, between hospitals and primary care practices, between care team members, and between providers and patients. To achieve consistent sustainable high levels of performance, coordination at all levels of the system must be improved and understood as a system of interacting parts, with the aim of improving care for patient populations (Hackman, 1990; Hackman, 2002; Parkhe, Wasserman, & Ralston, 2006; Tang, Chan, Zhou, & Liaw, 2013). The need to better coordinate in healthcare delivery is not limited to the United States as many other countries struggle with creating high performing healthcare systems through better coordination between provider-provider and provider-patient interactions (Coulter & Cleary, 2001).

Coordination has been widely studied across healthcare domains, e.g., telehealth (Barnett et al., 2006; Darkins et al., 2008), hospital systems (Bodenheimer, 2008; Gittell, Beswick, Goldmann, & Wallack, 2015; Hofmarcher, Oxley, & Rusticelli, 2007), ambulatory care (Haas, Swan, & Haynes, 2013; O’malley, Grossman, Cohen, Kemper, & Pham, 2010), and nursing home care (Coleman, 2003). Organizational factors that support enhanced coordination include a variety of structural, process and organizational elements, and more research is needed to understand what kind of leadership is needed, how the team members participate, and what kind of team culture promotes team coordination.

At the macro level coordination between the governing bodies (federal, state, local), health and social care institutions, and professionals are complex as technology, structure, and financing mechanisms have rapidly changed. Coordination of patients across the care continuum has become increasingly important as bundled payment and value based risk sharing is increasing, i.e., accountable care organizational forms become the norm for healthcare delivery systems (Shortell, Wu, Lewis, Colla, & Fisher, 2014c). Healthcare is slowly and steadily shifting away from paying on a fee-for-service basis, and moving towards bundled payments that consist in part on reimbursement for performance outcomes related to coordination. As such it has become critical to evaluate the ability of organizational forms like
ACO’s to support coordination efforts in critical areas like care transition management. While much attention of the macro organization level literature on care transitions focuses on structural and technical issues, the human factors area is starting to gain more momentum (Werner, Gurses, Leff, & Arbaje, 2016).

Healthcare coordination at the organizational level is an important element for many facets of delivery including; Care Transition Management (CTM), Accountable Care Organizations (ACO’s), and electronic health record (EHR) functionality. Each of these have been demonstrated to improve value and outcomes under certain circumstances (Fisher et al., 2009; McClellan, McKethan, Lewis, Roski, & Fisher, 2010; Shortell, Casalino, & Fisher, 2010b; Shortell et al., 2014c; Song et al., 2012a), but no studies to date have examined all three constructs.

Multi-disciplinary teamwork constructs like patient centered medical homes, microsystems, and integrated delivery teams all describe the importance of coordination among diverse healthcare professionals as a critical factor linked to performance outcomes and team effectiveness (Fleissig, Jenkins, Catt, & Fallowfield, 2006; Nelson, Batalden, & Godfrey, 2011; Rittenhouse et al., 2011a; Rodriguez et al., 2015a). Coordination is one critical component of integrated team-based care delivery that has been associated with higher levels of quality of care and lower cost (Reiss-Brennan et al., 2016). As more organizations focus on teamwork and coordination of work among front line providers, it will be important to better understand what factors, values, and behaviors of “teamwork” promote coordination and ultimately improve patient outcomes. Examining how doctors, nurses, and medical assistant’s express aspects of these organizational constructs, using their own words can help us gain a richer understanding of the relationship among team level coordination, participation, leadership, and solidarity. Understanding differences and similarities of front-line clinicians can help us understand coordination of care delivery and can provide additional insight into variation among professional roles (Gilmartin & D’Aunno, 2007).

References


Hackman, J. R. 1990. *Groups that work (and those that don't): creating conditions for effective teamwork*.


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Curriculum Vitae

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Education

May 2017        Ph.D., Health Policy and Management
University of California at Berkeley, School of Public Health

June 1996       M.S. Evaluative Clinical Sciences, Health Policy and Administration
Dartmouth Medical School, Dartmouth Institute for Health Policy and Clinical Practice

June 1994       B.A., Philosophy and Psychology
Dartmouth College

Publications

Books


Articles


Eugene C. Nelson, D.Sc., M.P.H.; Paul B. Batalden, M.D.; Karen Homa, MS; Marjorie Godfrey, MS RN; Christine Campbell; Linda Headrick, MD, MS, **Thomas P. Huber**, MS; Julie Mohr MSPH, PhD; John Wasson, MD: “Microsystems in Health Care: Creating a Rich Information Environment.” The Joint Commission Journal on Quality Improvement, January 2003, Volume 29.


**Training and Teaching Experience**

2003 - 2008

**University of California at San Francisco, California Healthcare Foundation, and California Children’s Hospital Association**

Program Faculty. Presented in various workshops and training programs for clinicians and administrators on process mapping, redesign and performance improvement techniques. Participant groups ranged from 125-250 clinicians in multiple sessions throughout the year.

- Process Mapping Seminars
- Deployment Flowcharting Seminars
- Value Stream Mapping Seminars
- Microsystem (Team) Approaches to Improvement
1995 - 2011 Institute for Health Care Improvement

Faculty. Facilitated workshops at the IHI Annual National Forum, which attracts over 5,000 health care professionals.

• 23rd Annual International Summit on Improving Patient Care in the Office Practice and the Community: Presented, “Collaborating for Outcomes, RN MD Communication”. March 2011, Dallas, TX
• 22nd Annual National Forum: Presented, “Translating Transitional Care Models”. December 2010; Orlando, FL.
• 12th Annual National Forum: Participated in panel discussion entitled “From Theory to Practice: Microsystems in Health care” with co-authors E.C. Nelson, M. Godfrey, and J.J. Mohr. Session attended by more than 60 executives, medical directors, professors, chief nursing officers, and quality improvement professionals. December 2000; San Francisco, CA.

2001 American Hospital Association

Guest Speaker. Presented at the Annual Leadership Summit 2001 Conference to a group of Creating Healthier Communities Fellows. The summit is an annual gathering of hospital and health system CEOs, administrators and senior management teams along with recognized health care consultants and management leaders from allied health care provider organizations, and community-based groups.

• Presented findings and led discussion based on white paper “Microsystems Thinking and Research as Practical Units for Improvement,” (T.P. Huber, 2001).

2001-1996 Dartmouth Medical School Annual Symposium

Guest Speaker. Presented research and findings at Dartmouth Medical School Annual Symposium. Attended by 50 policy-level educators, medical directors, and nursing managers representing 30 organizations from 26 states and 6 countries.

• Huber T.P., 8th Annual Summer Symposium: Presented lecture on “Building Knowledge for the Leadership of Improvement of Health Care.” July 2001; Hanover, NH.

• **Huber, T.P.**, Mohr, J.J., “Microsystems in Health care: Discovering Factors for Success.” Center for the Evaluative Clinical Sciences at Dartmouth (CECS), Dartmouth College, July 9 – July 13, 2001, Hanover, NH.

• Splaine, M., Baker R., **Huber, T.P.**; “Creating an Effective Organizational Context for Microsystems,” Center for the Evaluative Clinical Sciences at Dartmouth (CECS), Dartmouth College, July 9 – July 13, 2001, Hanover, NH.

**Professional Experience**

2014 - Present  
**University of California at Berkeley, School of Public Health**  
**Berkeley, CA**  
Researcher: Graduate student research and instruction using innovative health services research methods and tools at UC Berkeley’s Center for Healthcare Organization and Innovation Research (CHOIR).
- Micro-level research on team facilitative leadership, solidarity culture, and relational coordination in accountable care teams.
- Macro-level research on accountable care organizations, care transition management, electronic health records, and accountable communities for health.
- Policy-level comparative research on accountability and coordination ideas shaping health policy in the United States and Switzerland.

2012 - 2014  
**Quantros, Inc**  
**Milpitas, CA**  
Senior Director. Built a consulting organization at Quantros to assist clients in safety risk management and surveillance, pay-for-value reporting, and performance improvement.
- Developed vision, mission, and action plans for the practice, led a team of consultants and created operations platform including: marketing collateral, online presence, training webinars, salesforce dashboards, and growth strategy.
- Sold and led engagement in risk reduction across 18 emergency departments using data analytics, process redesign, and human factors.

2008 - 2012  
**Kaiser Permanente Program Offices**  
**Oakland, CA**  
Managing Director. Responsible for corporate strategy and culture change in the national patient care services division. Managed a 1.5 million-dollar budget and staff of six people.
- Led the development and implementation of a three-year inter-disciplinary nurse-physician training program. Trained more than 4500 leaders and front
line workers nationally resulting in 7% improvement in communication scores.
• Led a two-year implementation and assessment of a leadership practice training program for 250 leaders in Southern California.
• Completed a multi-center transitional care study focused on reducing readmissions rates across Northern California.
• Led the development and implementation of consistent leadership competencies across 36 hospitals for chief nurse officers.
• Led a culture transformation program to include “compassion” as part of the yearly review process for all 45,000 nurses adopted in January 2012.

2003 - **UCSF, CCHA, and CHCF**  
2008  
Management Advisor. Worked with (UCSF) University of California at San Francisco, (CCHA) California Children’s Hospital Association, and (CHCF) California Healthcare Foundation clients in teaching and advising on quality and safety performance improvement.
• University of California at San Francisco: Led training seminars on high performing teams, systems thinking, and process mapping. Worked with eight hospitals on team based quality improvement strategies leading to a 21% reduction in sepsis rates across eight hospitals.
• California Children’s Hospital Association: Led team based change management initiatives across 13 neonatal intensive care units in hospitals in California. Achieved a 25% reduction in outcome measures and $2.5 million in cost savings.
• California Healthcare Foundation: Worked with 10 community clinics on teaching workflow redesign process and helped reduce patient wait times by 50%.

2000 – **Dartmouth Institute for Health Policy and Clinical Practice**  
2003  
Research Associate. Contributed to a book, nine articles, and action guide on high performing (microsystems) teams in healthcare. Managed $600,000 budget and eight staff members.
• Contributed to a book on microsystems (teams), nine articles, and a 120-page action guide on: team performance, leadership, change management.
• Completed project 20% under budget while achieving all objectives including; research design, site visits, qualitative and quantitative analysis, and reports.
• Taught training seminars and courses in organizational development and performance improvement at Dartmouth’s Institute for Health Policy and Clinical Practice, Dartmouth’s Tuck School of Business, and the Institute for Healthcare Improvement.

1998- **The Lewin Group**  
1998- San Francisco, CA
2000  Management Consultant. Worked for the Lewin Group, a healthcare think tank and strategy consulting firm. Completed more than 15 projects as a consultant for clients in organizational strategy, operations redesign, and change management.

- Participated in strategy and operations projects: Operations redesign, mergers and acquisition, strategy development, technology evaluation, system re-engineering, leadership development, and strategic planning.


**Leadership and Strategic Management**


Altman D, Saltmarsh E, **Huber TP**, “Market Analysis and Strategic Planning for Children’s Hospital,” Client Report and Presentation. Utilized California’s Office of Statewide Health Planning and Development database to create market analysis.

Lewin L, Saltmarsh E, **Huber TP**, “Merger and Acquisition Strategies for a Hospital System,” Report on merger and joint operation possibilities.

Altman D, Bui-Tong, Larrieu, M, **Huber TP**, “Regional Academic Health Center Development,” Report and presentation on economic modeling for a proposed regional health center residency program.

Watt M, Jakmauh E, **Huber TP**, “Strategic Planning for the Millenium, Achieving Value through Networks,” Report and presentations on creating hospital network.

**Change Management and Operations Redesign**


Bailey, S, **Huber TP**, “Call Center Conference Planning and Assessment,” Report, presentation, organized conference, and analysis of national call centers.

**Huber TP**, “An Introduction into Total Quality Management: Systems Thinking,” Internal Lewin Group Seminar


Technology Assessment and Evaluation

Huber TP, Bekkers I, “Conversations about Health Care Technology and Internet Innovations,” Presentation to the Lewin Group Management Committee.


Coye M, Huber TP, “Key Health Care Trends at the Dawn of the New Millenium,” Center for Health Affairs presentation.
1. **Title: The Role of Leadership Facilitation on Primary Care Team Coordination in Accountable Care Organizations**

**Research Objective:** Team coordination is a central aspect of integrated care delivery and increasingly critical to primary care practices of Accountable Care Organizations (ACOs). Relational Coordination is work coordination and task interdependence reinforced by relationships and communication. While studies demonstrate the positive relationship between relational coordination and a variety of patient and provider outcomes, less is known about ways to foster relational coordination. We examine the association of leadership facilitation and primary care relational coordination, and examine the role of team participation and solidarity culture in explaining the association.

**Study Design:** Cross-sectional survey design using a two-level hierarchical structure with team members nested in 16 randomly selected primary care practices of two Accountable Care Organizations. Reliable and valid measures of relational coordination ($\alpha = 0.87, M = 3.92, SD = 0.81$), leadership facilitation ($\alpha = 0.96, M = 3.68, SD = 1.15$), solidarity culture ($\alpha = 0.82, M = 3.44, SD = 0.68$), and team participation ($\alpha = 0.92, M = 3.83, SD = 0.99$), were assessed with a team survey conducted January – March 2015. Multilevel linear regression estimated the association of relational coordination, leadership facilitation, solidarity culture, and team participation; controlling for age, occupation, gender, years on team, and team size. Mediation of the relationship between leadership and relational coordination by solidarity and participation was assessed using structural equation modeling and path analysis.

**Population Studied:** 411 primary care practice team members (doctors, nurses, medical assistants, dieticians, diabetic educators, social workers, and receptionists) from 16 primary care practices of ACOs completed the survey (86% response rate; n=411).

**Principal Findings:** In multilevel regression analyses, leadership facilitation ($\beta =0.21, p<0.001$) and team participation ($0.16, \beta = p<0.001$) were positively associated with relational coordination, but solidarity culture was not associated. The association of leadership facilitation and relational coordination was partially mediated by team participation.

**Conclusions:** Both leadership facilitation and team participation were positively associated with relational coordination in primary care practices of ACOs. Solidarity culture, however was not associated with relational coordination, indicating that solidarity may reflect in-group behavior or homophily rather than a desire for better relationships or communication in the practices we studied. The small mediation effect suggests that both leadership participation and team participation exert independent effects on encouraging relational coordination.

**Implications for Policy or Practice:** Relational coordination of primary care team members of ACOs can be supported by enhancing leadership facilitation and/or by improving team participation, but not by promoting a culture of solidarity. Under pressure to meet cost and quality targets, ACOs might be well served to focus directly on promoting team task coordination by using interventions directly aimed at improving leadership facilitation and/or team participation. Efforts to achieve a greater culture of solidarity appear not to be needed although they may be important for other purposes.

**Keywords:** Relational Coordination, Teamwork, Culture, Solidarity Culture, Team Participation, Leadership Facilitation, Accountable Care Organization, Primary Care Practice
**Background and Context**

Teams and inter-disciplinary teamwork as an organizing structure for improved front line care delivery performance has been well described (Hackman, 1990; Hackman, 2002; Michan & Rodger, 2000; Reiss-Brennan et al., 2016; Rodriguez et al., 2014; Wageman, 1995), but less is known about the supporting structures and enablers of front line coordination among team members like leadership facilitation, a culture emphasizing solidarity, and team participation. There is a growing evidence base regarding a kind of task coordination called “relational coordination”, in achieving improved performance under conditions of complexity, uncertainty, and task interdependence (Gittell & Logan, 2015; Hartgerink et al., 2014b; Manser, 2009). Relational coordination can be thought of as mutually reinforcing elements of communication and relationships for the purpose of task integration (Gittell, 2009; Gittell et al., 2000).

While many studies have looked at outcomes associated with relational coordination, fewer studies have examined team level factors associated with relational coordination. Specifically, what might organizations do to develop more relational coordination? For example, what roles might leadership facilitation, team participation, and solidarity culture play in developing greater relational coordination? Understanding the association and potential linkages between leadership facilitation and coordination may help us better understand where and what kind of support is needed at the front line of care delivery. Gaining more knowledge about participation and solidarity, and how these constructs relate to coordination among team members, can help us understand how feeling part of the team and actively participating on the team can improve coordination among team members.

Relational Coordination (RC) has been shown to be particularly important in settings that are characterized by task uncertainty, ambiguity, and time constraint like with healthcare delivery (Hoffer Gittell, 2002). While there is an extensive literature in relational coordination in healthcare, relatively little research has been conducted in primary care practices or (ACO) Accountable Care Organizations (Gittell & Logan, 2015). While some structural factors like team member selection, training, protocols, and information systems have been studied; human factor elements like leadership, participation, and solidary have not been studied empirically (Gittell, Seidner, & Wimbush, 2010). The aim of this study is to address both the gaps in ambulatory and ACO research as well as focusing on teamwork factors.

Gaining more knowledge about participation and solidarity, and how these constructs relate to coordination among team members can help us understand how feeling part of the team and actively participating can improve coordination among team members. This study explores the association between RC and team participation, solidarity culture, and leadership facilitation; as well as the potential mediating effect of solidarity and participation on the relationship between leadership and relational coordination.

**Theoretical and Conceptual Models**

Primary care practices are ideally characterized by overlapping care processes between complementary, multi-disciplinary team members delivering coordinated care to a panel of diverse patients with acute and chronic care needs (Wagner et al., 2001). Given the diverse nature of the patient population and the different professional groups, i.e., medicine, nursing, and medical assistants – the environment can be characterized as one of uncertainty of tasks,
interdependence of team members, and time constraints – ideally suited for a measure like (RC) Relational Coordination. Relational Coordination was first defined while studying flight departure task coordination among team members, and has been subsequently examined in many contexts including; healthcare, criminal justice, consulting, education, pharmaceuticals and healthcare (Gittell & Logan, 2015). RC involves seven dimensions including frequent, timely, accurate, and problem solving communication; as well as shared goals, shared knowledge, and mutual respect (Gittell et al., 2000). RC theory is based on mutually reinforcing relational and communication dynamics among team members in complex and rapidly changing environments like primary care practices (Gittell, Godfrey, & Thistlethwaite, 2012). Both the quality of the relationships as well as the quality of the communication determines the effectiveness of coordination among team members (Gittell, 2009).

In healthcare, relational coordination studies have included hospital care and elective surgery (Gittell, 2001; Hoffer Gittell, 2002) emergency care, trauma care, nursing home care, primary care, disease management (Cramm & Nieboer, 2012b; Havens, Vasey, Gittell, & Lin, 2010), integrated care delivery (Hartgerink et al., 2014a), academic medical center (Hinami et al., 2010), outpatient clinics (Lee, 2008), and chronic care programs (Noël, Lanham, Palmer, Leykum, & Parchman, 2012), quality of care, postoperative pain and functioning, and length of stay for elective surgery (Gittell et al., 2000), standardization of care, and care management (Rundall, Wu, Lewis, Schoenherr, & Shortell, 2016).

Prior relational coordination studies have involved a wide variety of methods including cross-sectional study designs (Cramm & Nieboer, 2012b), longitudinal study designs (Cramm & Nieboer, 2014), and cluster randomized controlled trials (Deneckere et al., 2013). Various sub-components of relational coordination and related teamwork constructs have been studied including; boundary spanning, manager characteristics, and scope of responsibility (Meyer et al., 2014), job design and coordination of work (Gittell, Weinberg, Pfefferle, & Bishop, 2008a), provider characteristics and co-management(Hinami et al., 2010), reciprocal learning (Noël et al., 2012), and workforce engagement (Warshawsky, Havens, & Knafl, 2012).

While several studies in hospital settings have shown a positive association between RC and patient outcomes, less work has been conducted in the ambulatory realm (Gittell & Logan, 2015). One study of relational coordination and chronic care delivery in a primary care setting has shown a positive association between RC and quality of care (Cramm & Nieboer, 2012a, c). However, a recent study has found a lack of association between RC and patient reported outcomes (Shortell et al., 2017). While primary care studies with relational coordination have been, few compared to the hospital setting, fewer still have examined what factors promote and support relational coordination. Our study seeks to fill this gap in the literature and examines how solidarity culture, team participation, and leadership facilitation are associated with relational coordination; and examines the potential mediation of the relationship between leadership and RC by both solidarity and participation.

Solidarity Culture

Culture and closely related climate research in organizational theory shows a progression from humanistic leadership and group dynamics, to empirical research and instrument driven climate research, to culture studies using qualitative and quantitative methods (Schein, 1990a). Organizational culture can be defined as shared values, beliefs,
behavioral norms (Ouchi & Wilkins, 1985; Swartz & Jordan, 1980; Van Maanen, 1979), as a property of the social system (James, 1890), as a social process where individuals share values and beliefs (Rousseau, 1990), or shared assumptions which are taught to new comers, including a limited socialization based on perceptions, thinking, and feelings, but excluding behaviors (Schein, 1992). Organizational culture can be both the product and process that shapes human interaction as well as the interaction outcome (Jelinek, Smircich, & Hirsch, 1983). Understanding culture is important in that it helps explain human relationships, and power structures that ultimately impact performance outcome characteristics (Bloom, Alexander, & Nichols, 1992; Glisson & James, 2002).

Organizational culture and climate studies are particularly important in healthcare organizations which as service organization and complex professional organizations have human interaction as a key ingredient; and thus, culture helps explain part of the link between organizational characteristics and outcomes (Glisson, 2000; Hammons, Piland, Small, Hatlie, & Burstin, 2000; Meyer, Stanley, Herscovitch, & Topolnytsky, 2002). For example, culture studies for high performing ACO’s have been correlated with effective collaboration between providers, as well as relationship building across organizational boundaries to improve coordination (Raths, 2013a; Raths, 2013b; Shulkin, 2012).

Measuring organizational culture has evolved greatly 25 years. For example, the Competing Values Framework (CVF) developed by Quinn and Rohrbaugh has been used in more than 10,000 organizations and has four culture types including; clan, adhocracy, market, and hierarchy, as measured by competing which values people hold in an organization’s performance outcomes (Hartnell, Ou, & Kinicki, 2011; Quinn & Rohrbaugh, 1983). Shortell et al., utilize the CVF to build towards comprehensive organizational assessment by including; leadership, communication, coordination, problem solving conflict management, and team cohesiveness to study intensive care units (Shortell, Rousseau, Gillies, Devers, & Simons, 1991).

In this study, we use a specific measure of culture for front line health care teams specifically developed for primary group practices that assess a sense of belonging and cohesiveness. The team “solidarity culture” measure was adapted and developed for healthcare by Kralewski from Reynold’s original 12-dimension culture framework model (Kralewski, Wingert, & Barbouche, 1996; Reynolds, 1986). Kralewski defines a solidarity culture as a culture where team members have “a sense of belonging to the group practice, attachment to the group or cohesiveness, and open sharing of views among group members” (Kralewski et al., 1996). Solidarity is based on physician practice styles and has been shown to accurately reflect the ability of a practice to come together in the care delivery process (Kralewski et al., 1996).

The solidarity culture measure was conceptualized according to Schein’s original concept of culture that deciphers cultural patterns as emerging inductively and in the language of the field (Schein, 1990b) Kralewski’s concept of solidarity is focused on explaining relationships among employees in primary care practice medical groups and has been found to be reliable and valid (Kralewski, Dowd, Kaisi, Curoe, & Rockwood, 2005).

Team Participation in Decision Making (Team Participation)

Participation as a social construct can be attributed to Homans who established behavioral sociology and contributed social exchange theory which seeks to explain social behaviors with various propositions (Homans, 1974). Team Participation as a group process was
defined by social psychologists studying organizations that defined team participation as “consisting of members who engage jointly with others in making decisions” (Katz & Kahn, 1978; Katz & Gartner, 1988). A more recent definition of team participation comes from organizational behavior research that describes team participation as “the extent to which an individual communicates orally during formal meetings of the team” (Robbins, 2001). Understanding team participation processes helps us understand how interdisciplinary team members work together, cooperate, and communicate to achieve performance outcomes (Kirkman & Rosen, 1999).

Multi-disciplinary teams consist of diverse interdependent professionals that are increasingly being used to deliver healthcare services across the care continuum (Fried, Topping, & Rundall, 2000; Rodriguez et al., 2014). To achieve the benefits of improved coordination and enhanced performance outcomes, reduced hierarchies and active team member participation is needed (Nutting et al., 2009; Shaw, 1990). A study of 40 cross-functional teams in 16 hospitals showed a positive relationship between team participation and patient outcomes (Alexander et al., 2005). Participation along with the presence of a team champion, achievement orientation, and involvement of physicians are positively associated with team effectiveness (Shortell et al., 2004). The study defined effectiveness in part by the “way the team worked together” which relates to team participation.

Leadership Facilitation of Change (Leadership Facilitation)

A recent healthcare leadership review of 60 empirical papers articulates the importance of research that examines leadership at the team level (Gilmartin & D’Aunno, 2007). The importance of leadership at the team level comes from studies that find teams struggling and challenged without clear direction, guidance, or feedback from leaders when implementing a new change (Rodriguez et al., 2014). Avolio et al., provide an overview of modern leadership theories and describe the field as heading toward a more holistic view of leadership, the follower as an integral part of the leadership dynamic, and leadership as complex, distributed, and shared in organizations (Avolio, Walumbwa, & Weber, 2009). Prior studies have demonstrated that leadership sets the vision, and supports the team during organizational change and redesign (Frankel, Leonard, & Denham, 2006). While many leadership theories exist, a set of theories like relational leadership theory and leadership facilitation, focus on the social influence process through which emergent coordination and change can happen (Hagedorn & Heideman, 2010; Uhl-Bien, 2006). While leadership impact on the performance of the larger organization has been questioned, leadership has been shown to make a difference at the team level (Hackman, 2002; Podolny, Khurana, & Hill-Popper, 2004).

We focus on a kind of leadership called “leadership facilitation” of change. Leadership facilitation “captures external support of the practice and management characteristics that impact the front-line practice” (Hagedorn & Heideman, 2010; Helfrich, Li, Mohr, Meterko, & Sales, 2007). Leadership facilitation captures how front line providers and staff perceive management’s support in healthcare delivery and so “reflects how management supports the practice in improving patient care, creates a positive environment, solicits feedback, and supports changes in the practice” (Helfrich, Li, Sharp, & Sales, 2009). Leadership facilitation captures the dynamic, processes oriented, and shared view of how followers view leadership (Helfrich et al., 2011).
Leadership facilitation of change reflects behavior of leaders and was originally conceptualized as a subscale of the Organizational Readiness for Change Assessment (ORCA) instrument, which is based on the Promoting Action on Research in Health Services (PARIHS) framework (Helfrich et al., 2011). Leadership facilitation as defined by ORCA is healthcare specific and works optimally when used on a targeted population, i.e., chronic care management like diabetes and cardiovascular disease (Hagedorn & Heideman, 2010; Shortell et al., 2015).

Grace et al. studied leadership facilitation during an implementing of interdisciplinary teams and finds that effective leadership facilitation is critical during change (Grace, Rich, Chin, & Rodriguez, 2016; West, 2006). Given the increasing speed of innovation and care delivery changes in front line care delivery, it becomes even more critical to understand how effective leadership facilitation functions and how it may promote or enhance relational coordination.

**Research Questions and Hypothesis**

**A Culture of Solidarity (Solidarity Culture)**

Practice *solidarity* culture measures cohesiveness in primary care practices under conditions of uncertain decision making, and examines such topics as how freely members share their views during meetings, and if they have a sense of belonging to the team (Kralewski et al., 1996). Solidarity culture as conceptualized by Kralewski focuses both on the predictive power that links culture to outcomes like coordination among team members, and organizational technical or task requirements (Kralewski et al., 2005).

In a study of primary care practices, multi-disciplinary team meetings have been shown to be positively associated with relational coordination (Hartgerink et al., 2014c), and care coordination (Hinami et al., 2010). Previous research also found that highly collegial cultures rely on informal peer review mechanisms to assure quality rather than any structural programs (Kaissi, Kralewski, Curoe, Dowd, & Silversmith, 2004).

Positive team climate, a concept closely related to culture, and multi-disciplinary team meetings both support social interactions where members are more likely to share openly and feel respected by other professions (Boon, Verhoef, O'Hara, & Findlay, 2004; Henneman, Lee, & Cohen, 1995). Team members that work in positive cultures defined by a supportive and enjoyable environment with frequent inter-disciplinary team meetings, have also been found to increase coordination and communication, and are more willing to share their expertise (West & Anderson, 1996). Given these previous studies that have shown positive associations between multidisciplinary team meetings and care coordination, team cohesion and improved social interactions, positive cultures and increased communication, and coordination linked to sharing of expertise, we posit that: *(H1) a solidarity culture is positively associated with relational coordination.*

**Team Participation in Decision Making (Team Participation)**

Practice participation elucidates how practice members engage with others, promote healthy communication, and a sense of shared understandings of teamwork for coordination (Alexander et al., 2005). Team participation probes how practice members feel about contributing information, feel supported in decision making, team sharing of decision making
processes, and the ability to voice alternatives (Alexander & D’Aunno, 2003). Shared decision making and communication patterns are the mechanisms for how the team members build a shared understanding of the work (Frankel et al., 2006; Mills, Neily, & Dunn, 2008; Robbins, 2001). In addition to communication, team participation has a relational aspect including the building a shared understanding, and the development of group norms with more frequent interactions (Homans, 1974). Team participation thus has both communication and relational mechanism that also make up relational coordination.

Multi-disciplinary teams have been found to make with better decisions than regular teams, enhanced performance outcomes, shared learning, creative solutions, professional growth for members, and empowerment (Edmondson, Bohmer, & Pisano, 2001; Kozlowski & Bell, 2003; Paulus, 2000). To achieve these benefits multi-disciplinary teams must have a “high degree of cooperation, communication, and participation among team members” (Donnellon, 1993). Communication is the underlying mechanism that ties together the participative elements and provides the emotional support (Lichtenstein, Alexander, McCarthy, & Wells, 2004). Like relational coordination, high levels of practice participation are associated with improved patient outcomes (Alexander et al., 2005). Given the similarities with the communication mechanisms and the relational aspects for both team participation and relational coordination (Gittell & Logan, 2015; Hertel, Geister, & Konradt, 2005; Lichtenstein et al., 2004), we posit: (H2) team participation is positively associated with relational coordination.

Leadership Facilitation of Change (Leadership Facilitation)

Empirical studies of leadership have demonstrated that leadership is positively and significantly associated with a supportive organizational culture and climate (Gilmartin & D’Aunno, 2007; Corrigan et al, 2002;). Studies of leadership and communication have found a significant and positive relationship with certain leadership discourse styles and relational stances, i.e., tighter span of control (Fairhurst, 2008; Jablin & Putnam, 2000; Uhl-Bien, 2006, 2011; Hackman, 2013; Gittell, 2001) Thus, the relational aspect of leadership has the potential to be positively associated with relational coordination.

The leadership also reflects how staff view patient education and patient involvement in their own care, which has been theorized to be important for relational coordination (Gittell, 2015). Leadership is instrumental in setting the vision for the organization, facilitating an atmosphere for change, and has been found to set the tone for engagement and culture, and can foster a team environment in which team participation and a sense of belonging are more likely to enhance task coordination (Gilmartin & D’Aunno, 2007; Dunham & Taylor, 2000; Gittell, 2015). Thus, leadership may also be linked or associated with the communication aspect of RC. Given the evidence of leadership facilitation associated with supportive organizational climate, and positive association with both team member communication and relational components in prior studies, we hypothesize that; (H3) leadership facilitation is strongly and positively associated with relational coordination.

Leadership can act both directly or indirectly on team members sense of belonging and how individuals choose to participate on the team. The indirect or context providing aspects of leadership both gives shape and is shaped by the environment of how the team does their work, such as in rewarding innovation, soliciting input from staff, promoting an enjoyable environment in our study, and is usually associated with leadership as a facilitator role, rather
than the leaders as manager role. This, thus, argues for leadership as being mediated by solidarity (Denti & Hemlin, 2012). A study looking at status differences in multi-disciplinary teams found a correlation between leadership and satisfaction among coworkers and posit that team participation can create an open and supportive communication environment for leaders to enact their vision (Lichtenstein et al., 2004). Adaptive leadership styles like leadership facilitation are positively impacted by effective sharing among team members, participative decision making (Manser, 2009; Boyle, 1999). Thus, supporting a view that participation may mediate the relationship between team leadership and relational coordination.

In a review of 30 empirical studies on leadership and innovation Denti and Hemlin argue that how leaders influence, “the various processes and mechanisms of influence” used suggests that leadership facilitation may be mediated by culture and team participation (Denti & Hemlin, 2012). At least seven of the eight leadership facilitation factors in our model can be interpreted as how leaders influence and are influenced by the team, including the environment for accomplishing goals, enjoyable and positive culture, supportive practice change efforts, and making sure there is time and space for care improvement. Thus, we hypothesize a mediating influence of solidarity culture and team participation on leadership facilitation and relational coordination; (H4) solidarity culture mediates the relationship of leadership facilitation and relational coordination, and (H5) team participation mediates the relationship of leadership facilitation and relational coordination.

Figure 1 in the Appendix displays the logic model of relationships among relational coordination and the team constructs leadership facilitation, team participation, solidarity culture, the hypothesis H1-H5, as well as the sub-components that make up relational coordination, solidarity culture, team participation, and leadership facilitation.

**Data, Methods, Analysis**

Our study uses data from a Patient-Centered Outcomes Research Institute (PCORI) grant examining patient activation and engagement, patient outcomes, and teamwork characteristics in primary care practices of two (ACO’s) Accountable Care Organizations. 411 practice members from 16 practices completed a 41-question survey called the “teamwork assessment instrument”. The survey consists of 5-point Likert scale (1 = low, 5 = high) items and measures relational coordination, team participation, solidarity culture, and leadership facilitation. Demographic questions include how long individuals have worked in the practice and the team, how many hours per week the person spends in the practice, age, sex, and race/ethnicity (PCORI Grant: IHS-1310-06821).

The dependent variable *Relational Coordination* measure consists of a seven-item validated survey ($\alpha = 0.87, M = 3.92, SD = 0.81$) that measures the coordination of work with four communication dimensions including; frequency, accuracy, timeliness, and problem solving; as well as three relational dimensions including; shared goals, shared knowledge, and mutual respect (Gittell et al., 2000). The *Solidarity Culture* measure is comprised of a validated and reliable 4-item subscale using a 5-point Likert scale drawn from the validated Kralewski “Group Practice Organizational Culture Instrument” (Kralewski et al., 1996), and has an internal consistency of ($\alpha = 0.82, M = 3.44, SD = 0.68$). The *Team Participation* measure is a validated 7-item subscale measure using a 5-point Likert scale ($\alpha = 0.92, M = 3.83, SD = 0.99$) developed by Alexander (Alexander et al., 2005; Davis-Sacks, 1991), and measures how
practice members engage with others, promote healthy communication, and shared understandings of teamwork. The Leadership Facilitation composite consists of a validated 7-item subscale using a 5-point Likert scale ($\alpha = 0.96, M = 3.68, SD = 1.15$). The scale is derived from the Organizational Readiness for Change (ORCA) survey and captures leadership facilitation and management characteristics that impact practice members (Hagedorn & Heideman, 2010; Helfrich et al., 2007; Helfrich et al., 2009). The leadership sub-scale characteristics measured include; rewarding creativity, soliciting input from staff for improvement, and promoting a supportive change oriented atmosphere.

The cross-sectional survey design results in a two-level hierarchical structure with practice members nested in practices. The level 1 variables are individual practice members’ Relational Coordination, Team participation, and Leadership Facilitation, and Solidarity Culture nested within the practice. The 1st level of individual practice member specific coefficients are modeled with HLM regression equation below;

$$\text{Relational Coordination}_{ij} = \beta_0 j + \beta_1 \text{Solidarity}_{ij} + \beta_2 \text{Participation}_{ij} + \beta_3 \text{Leadership}_{ij} + \beta_4 \text{Age}_{ij} + \beta_5 \text{Occupation}_{ij} + \beta_6 \text{Gender}_{ij} + \epsilon_{ij}, \epsilon_{ij} \sim N(0, \theta)$$

Level 1 specifies practice member coefficients where Relational Coordination of a particular practice member(i) of practice (j) is modeled as a function of an individual practice members specific intercept $\beta_0 j$, solidarity culture with coefficient $\beta_1$, team participation with coefficient $\beta_2$, facilitative leadership with coefficient $\beta_3$, $\epsilon_{ij}$ represents the practice member and cluster (team) specific error term with mean 0 and variance of $\theta$. Additional practice member variables were included as control variables for the Model including; age with coefficient $\beta_4$, occupation with coefficient $\beta_5$, gender with coefficient $\beta_6$. $\epsilon_{ij}$ represents the team member and cluster (team) specific error term with mean 0 and variance of $\theta$.

For the 2nd level with practice cluster specific coefficients the practice level intercept is modeled as:

$$\beta_0 j = \gamma_0 0 + \gamma_0 1 \text{years} + \gamma_0 2 \text{size} + u_0 j , u_0 j \sim N(0, \psi)$$

The practice specific intercept is a function of the population average intercept ($\gamma_0 0$), having number of years together as a TeamYears($\gamma_0 1$), and TeamSize($\gamma_0 2$). $u_0 j$ is the practice specific error term with mean 0 and variance $\psi$. Several models were considered including: model 1 that is without covariates to estimate the percentage of variance with relational coordination that is between and within teams; model 2 that includes the covariates of solidarity culture, team participation, and leadership facilitation, model 3 adds the individual level covariates of age, occupation, gender; model 4 adds practice level variables including; the number of years the team has worked together teamyears, and the size of the team teamsize to the regression. The coefficients of teamyears and teamsize will represent the mean difference in relational coordination between different practices, controlling for solidarity, team participation, and leadership variables. The regression coefficients for covariates represent the mean increase in relational coordination of an individual practice member holding the other covariates constant.

For sensitivity analysis, different combinations of professional roles and including or leaving out ancillary staff (diabetes educator, dietician, and social worker) were conducted. Structured Equation Modeling (SEM) Path Analysis was used to better understand the direction of the relationships among the key variables of relational coordination, solidarity, team participation, and leadership. For the path analysis, we ran unstandardized and standardized
models and tested direct and indirect effects, goodness of fit tests, and model fit tests (Acock, 2013). We ran subscale tests for the relational coordination construct, breaking RC into the relational and the communication aspects of relational coordination, as well as using individual RC elements as the dependent variable.

Limitations of the study include standard cross-sectional data collection and survey related issues. Our conclusions test associations rather than causal patterns between variables. Our data collection included all practice members so it’s possible that respondents provided information about the larger practice rather than the specific team members with whom they worked. The survey respondents included a high percentage of females (84%) and prior studies have found differences between males and females with relational coordination but with inconclusive positive and negative relationships of gender to RC (Hartgerink et al., 2014c; Manski-Nankervis, Furler, Young, Patterson, & Blackberry, 2015). The relational coordination measure asked clinical respondents questions regarding diabetes and cardiovascular care, so our findings might not hold for other chronic diseases, or different care delivery services like hospital or home health care. Both the independent and dependent variables come from the same survey and so there is a common method variance limitation, and the correlations among variables might be inflated or biased because the same individuals are responding to the questions (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003).

Results

Descriptive statistics shows a total of 411 respondents from 16 healthcare teams completed the overall survey. The mean number of respondents for each team was nine, the lowest number of respondents was six, and the highest number of respondents per team was 58. See figure 2a for team member distribution and 2b for team member histogram. The average team size was 9 people with a standard deviation of 5. While all variables had 411 complete responses, the relational coordination variable has 375 responses for the HLM multivariate regression due to respondents answering some of the questions with (not applicable) that was treated as missing data, in line with prior relational coordination research methodology.

Figure 3 in the appendix shows the frequency of each of the professional’s self-identified profession across all the teams. Medical assistants were the largest respondents with 125, and then primary care providers (93), nursing (85), receptionist (79). The smallest groups are diabetes educators and dieticians. The histogram for relational coordination is symmetrically distributed but is skewed slightly to the right toward the higher end of responses (Figure 4). The relationship between relational coordination and team participation, leadership, solidarity and innovation are linear and fairly weak (Figure 5-8). The average number of years that teams have worked together (teamyears) is 5.83, with a standard deviation of 1.56, and range of (2.73 – 9.07) years. Table 1 shows the overall mean, overall standard deviation, between team standard deviation, and within team standard deviation scores, for relational coordination, leadership facilitation, solidarity, and team participation. All the variables have greater within team variation than between team variation. Pairwise deletion correlation of the main variables shows that solidarity and leadership facilitation are correlated at 0.69, whereas other variables were not highly correlated (Table 2). We ran a Variance Inflation Factor analysis

10
and found solidarity with VIF = 1.93, leadership VIF = 1.92, and an overall VIF of 1.63 so quite low levels of collinearity and thus kept both variables in the model (O’brien, 2007).

Table 3 in the appendix presents the multi-level regression estimates of the 4 models for relational coordination. Model 1 is the null model showing little variation between teams ($\Psi$=0.13, p<.001), and greater variation between individuals ($\theta$=0.80, p<.001). The estimated intra-correlation was very slight at 0.03, which can be interpreted in two ways. The intra-class correlation in model one shows that 3% of the total variability in relational coordination is explained by team-level characteristics, or the correlation between two randomly drawn team members is 0.03.

Model 2 added several team factors including team participation, leadership, solidarity, innovation which tells us that the model can explain 5% of the total variance. Solidarity measured by $\beta_1$ was not statistically significant in this model. The coefficient $\beta_2$ for leadership is estimated as 0.19 and significant at the 1% level, which means that relational coordination is estimated to increase by 0.19 per unit increase in leadership, controlling for other variables. The coefficient $\beta_3$ for team participation is estimated as 0.17 and significant at the 1% level, which means that relational coordination is estimated to increase by 0.17 per unit increase in team participation, controlling for other variables. Like the earlier model, there was little variation between teams ($\Psi$=0.16), but greater variation between individuals ($\theta$=0.74). Model 3 added the covariates of Age, Occupation and Gender, none of these variables were significant. Model 4 added Team Years and Team Size, neither was found to be significant. The Chibar2 value is below 0.05 for all models and thus we can reject the null hypothesis.

Standardized Path Coefficients or standardized beta weights in our Structural Equation Model (SEM) showed that leadership is the strongest predictor for relational coordination and has a standardized path coefficient of .30, z=3.81, p<.001 using a standardized solution. The full path model is shown in Figure 9, and detailed results for the SEM is shown in table 4 indicating that 91% of effect of leadership on RC is direct, or that 9% of effect of leadership is an indirect effect due to the partial mediation of team participation. The SEM model also showed that the solidarity culture path coefficient is very small and not significant. For SEM path analysis we used standardized coefficients and utilized information from the entire 411 responses using the STATA option of method(mlmv) that does not use listwise deletion to ensure all the information available was used (Acock, 2013).Coefficients for the path analysis are slightly different then the results from the HLM regression since we used method(mlmv) maximum likelihood estimate using all observed values where there is at least some data for the observation, specifically designed for situations where there are missing values (Acock, 2013).

In the path analysis, we treat leadership as the exogenous variable – so not causally dependent on any variables in the model. This can be justified if we think of leadership as a facilitating or supporting role for the team. The partial mediation of participation provides some plausibility to a more causal mechanism linking leadership to relational coordination. As prior research methods indicate we assume our model to be recursive (single direction only with no feedback) as most researchers assume a recursive model even if there is some feedback (Acock, 2013; Hox & Bechger, 1998).
Discussion

In our multilevel regression analyses, leadership facilitation ($\beta = 0.21$, $p<0.001$) and team participation ($0.16$, $\beta = p<0.001$) were positively associated with relational coordination supporting hypotheses two and three, but solidarity culture was not associated with RC regarding our first hypotheses. The association of leadership facilitation and relational coordination was only slightly mediated by team participation offering partial support for hypothesis five but not by solidarity culture, hypothesis four. 9% of the effect of leadership on relational coordination was due to the indirect effect or mediated effect of team participation. The small mediation effect suggests that both leadership facilitation and team participation exert mostly independent effects on relational coordination.

Solidarity culture was not associated with relational coordination, indicating that solidarity may potentially reflect in-group behavior or another mechanism rather than a desire for better communication or relationships in the practices we studied. There are several possible explanations for the statistically insignificant association of solidarity and relational coordination: (1) team size makes a difference, once there are more than 8 members in-group and outgroup, or (group think) behavior becomes a factor (Janis, 1982), (2) how long the team has worked together influences the strength of the formed bonds, and a closer relationship is formed with people that are more similar to each other (homophily) on the immediate team (McPherson, Smith-Lovin, & Cook, 2001), (3) respondents might assume the solidarity questions relate to their identification with professional role (Chreim, Williams, & Hinings, 2007), or their union (Visser, 2006), their employer (Backhaus & Tikoo, 2004), rather than the care team, (4) solidarity might be a coping mechanism to a stressful environment, so solidarity is negative for RC (Cohen & McKay, 1984), (5) solidarity could also be more of a passive trait and thus does not correlate well with RC that is more active and task oriented (Trappenburg, 2015).

Health Policy and Practice Implications

Relational coordination has been shown to be linked to improved perceptions of outcomes (Havens et al., 2010), and improved outcomes of care (Gittell et al., 2008a; Gittell, Weinberg, Bennett, & Miller, 2008b). Thus, it is important to understand what factors contribute to higher relational coordination. The current findings indicate that relational coordination is influenced by both within the team and between team factors but is much larger for within team dynamics. The between team variance was very slight and suggests that relational coordination differs only a small amount between the teams in our study, while the within team variance suggests that, relational coordination differs for everyone on a team.

Team members in this study showed higher levels of relational coordination when they reported feeling like they could also participate (team participation), and there were good leadership facilitation practices. Solidarity was not significant indicating that practice leaders might spend more time on building team participation and leadership facilitation. Solidarity did not mediate the relationship between leadership and relational coordination but team participation had a small but statistically significant partial mediation.

Relational coordination in primary care team members of ACOs may be supported by enhancing leadership facilitation and/or by improving team participation, but not by promoting a culture of solidarity. Under pressure to meet cost and quality targets, ACOs might be well
served to focus directly on promoting team task coordination by using interventions directly aimed at improving leadership facilitation and/or team participation. Efforts to achieve a greater culture of solidarity appear not to be needed although they may be important for other purposes.
Appendix

Figure 1: Model for Testing the Association of Relational Coordination with Leadership Facilitation of Change, Team Participation in Decision Making, and a Culture of Solidarity
Figure 2a. Team Member Count Across 16 Teams

<table>
<thead>
<tr>
<th>site</th>
<th>Freq.</th>
<th>Percent</th>
<th>Cum.</th>
</tr>
</thead>
<tbody>
<tr>
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<td>6.33</td>
<td>6.33</td>
</tr>
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<td>2</td>
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</tr>
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<td>4</td>
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<td>5</td>
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<td>8</td>
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</tr>
<tr>
<td></td>
<td>Total</td>
<td>411</td>
<td>100.00</td>
</tr>
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</table>

Figure 2b. Team Distribution

Figure 3. Professionals Distribution

<table>
<thead>
<tr>
<th>Team Member Distribution across all 16 teams</th>
<th>Freq</th>
</tr>
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<tbody>
<tr>
<td>Diabetes Educator, (RN, Health, Peer)</td>
<td>20</td>
</tr>
<tr>
<td>Dietician</td>
<td>4</td>
</tr>
<tr>
<td>Medical Assistant</td>
<td>125</td>
</tr>
<tr>
<td>Nursing (RN, Care Manager, LVN)</td>
<td>85</td>
</tr>
<tr>
<td>Primary Care Provider</td>
<td>93</td>
</tr>
<tr>
<td>Receptionist</td>
<td>79</td>
</tr>
<tr>
<td>Social Worker</td>
<td>5</td>
</tr>
<tr>
<td>Total N of Professionals</td>
<td>411</td>
</tr>
</tbody>
</table>
Figure 4. Histogram of Relational Coordination

Figure 5: RC and Team participation

Figure 6: RC and Leadership

Figure 7: RC and Solidarity

Figure 8: RC and Innovation
Figure 9: SEM Pathway Analysis for Relational Coordination, Leadership Facilitation, Team Participation, and Culture of Solidarity in Practice Teams

**Figure 9:** SEM pathway analysis for relational coordination, leadership facilitation, team participation, and culture of solidarity in practice teams. The diagram illustrates the relationships between different factors such as leadership facilitation of change, relational coordination, team participation in decision making, and a culture of solidarity, with corresponding coefficients and significance levels indicated.

**Legend:**
- H4 and H5 are the indirect effects of leadership facilitation on relational coordination mediated by a culture of solidarity (H4) and through team participation (H5).
- H4* and H5* are the direct effects of leadership on a culture of solidarity and team participation.
- H1, H2, H3 are the associations of relational coordination with solidarity, participation, and leadership, controlling for age, role, gender, team size, and team years.

**Coefficients and Significance Levels:**
- e1 = .90
- e2 = .51
- e3 = .84
- .035***
- .18***
- .70***
- -.003
- -.0003
- .30***
- .19***
- .035**

**Significance Levels:**
- **p < 0.05**
- **p < 0.01**
- **p < 0.001**
Table 1. Mean and Standard Deviation of Within and Between Levels

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
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<tr>
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<td>.81</td>
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<tr>
<td>Between</td>
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<tr>
<td>Within</td>
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<tr>
<td>Team participation</td>
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<tr>
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<tr>
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<td>Within</td>
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<td>1.00</td>
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<td>.93</td>
</tr>
<tr>
<td>Within</td>
<td>3.66</td>
<td>.93</td>
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</table>

Table 2: Correlations of Leadership Facilitation, Solidarity Culture, Team Participation, Age, Professional Role, Gender, Teamsizes, and Teamyears

<table>
<thead>
<tr>
<th></th>
<th>rccomp</th>
<th>tlf</th>
<th>tsc</th>
<th>tp</th>
<th>age</th>
<th>role</th>
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Table 3: Multilevel Regression of Relational Coordination for Team Members

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<td>2.41(.35)***</td>
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<td>Solidarity Culture</td>
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<td>0.03(.08)</td>
<td>0.01(.08)</td>
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***p<0.001, **p<0.01, *p<0.01

Table 4: SEM Path Analysis between Leadership and Relational Coordination with Solidarity and Participation as Mediators (Standardized Coefficients)

<table>
<thead>
<tr>
<th>Relationship</th>
<th>Direct Effect</th>
<th>Indirect Effect</th>
<th>Total Effect</th>
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<tbody>
<tr>
<td>Leadership on Solidarity</td>
<td>0.698***</td>
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<td>Leadership on Participation</td>
<td>0.177***</td>
<td>-</td>
<td>0.177***</td>
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<tr>
<td>Solidarity on RC</td>
<td>-0.005</td>
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<td>0.031</td>
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<tr>
<td>Participation on RC</td>
<td>0.194***</td>
<td>-</td>
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<tr>
<td>Total Leadership on RC</td>
<td>0.297***</td>
<td>0.031</td>
<td>0.328***</td>
</tr>
</tbody>
</table>

1. The significance levels shown here are for the unstandardized solution.
2. * p<0.05, ** p<0.01, *** p<0.001
3. Controlled for age, gender, role, teamyears (years team has been together, and teamsize (size of team).
4. Teamyears has a small Total Effect on RC 0.11. Professional Role and Gender (Female) have very slight Indirect Effects on RC, -0.036** and -0.032* respectively, but no significant Total Effects.
5. 0.297/0.328 = 91% of the effect of leadership on relational coordination is direct, 9% is indirect but statistically insignificant (testing the standardized solution), there is no mediation of leadership by solidarity, and a small partial mediation of leadership on relational coordination by participation.
Appendix B: Relational Coordination, Solidarity, Team participation, and Leadership Facilitation
Survey Questions (PCORI): Team Assessment Survey Questions

1. Frequent Communication
How frequently do the people in each of these groups communicate with you about providing care to patients with diabetes and/or cardiovascular disease?
When answering this question, be sure to consider all forms of communication, including in-person meetings, phone calls, e-mails, etc.

<table>
<thead>
<tr>
<th></th>
<th>Not nearly enough</th>
<th>Not enough</th>
<th>Just the right amount</th>
<th>Too often</th>
<th>Much too often</th>
<th>N/A</th>
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2. Timely Communication
Do they communicate with you in a timely way about providing care to patients with diabetes and/or cardiovascular disease?

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<th>Sometimes</th>
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3. Accurate Communication
Do they communicate with you accurately about providing care to patients with diabetes and/or cardiovascular disease?

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4. Problem Solving Communication
When there is a problem with providing care to patients with diabetes and/or cardiovascular disease, do people in each of these groups blame others or work with you to solve the problem?

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5. Shared Goals
Do people in each of these groups share your goals for providing care to patients with diabetes and/or cardiovascular disease?

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6. Shared Knowledge
Do people in each of these groups know about the work you do with patients with diabetes and/or cardiovascular disease?

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</table>

7. Mutual Respect
Do people in each of these groups respect the work you do with patients with diabetes and/or cardiovascular disease?

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<tr>
<th>Role</th>
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<td>Agree</td>
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</table>

**Team Participation**

We are interested in the extent of your agreement or disagreement with each of the statements below, as they relate to the team providing care to patients with diabetes and/or cardiovascular disease.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Disagree</th>
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<th>Neutral</th>
<th>Somewhat Agree</th>
<th>Agree</th>
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<tbody>
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<td>a. I frequently contribute information</td>
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<td></td>
</tr>
<tr>
<td>b. I frequently interpret information</td>
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<tr>
<td>c. I can comfortably disagree with others</td>
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<tr>
<td>d. I feel free to participate actively</td>
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<tr>
<td>e. I usually propose alternatives</td>
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<td>f. I usually evaluate alternatives</td>
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<tr>
<td>g. I frequently participate in making decisions</td>
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**Leadership facilitation**

We are interested in the extent of your agreement or disagreement with each of the statements below, as they relate to your practice site leadership and management.

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<tr>
<th>Leadership and management in your practice...</th>
<th>Disagree</th>
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<th>Somewhat Agree</th>
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<tr>
<td>a. Reward clinical innovation and creativity to improve care</td>
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<td>b. Solicit opinions of clinical staff regarding decisions about patient care</td>
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<td>c. Seek ways to improve patient education and increase patient participation in treatment</td>
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<td>d. Make sure that we have the time and space necessary to discuss changes to improve care</td>
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<td>e. Strongly support practice change efforts</td>
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<td>f. Promote an environment that is an enjoyable place to work</td>
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<td>g. Create an environment where things can be accomplished</td>
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**Solidarity culture**

We are interested in the extent of your agreement or disagreement with each of the statements below for culture.

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<td>e. We have a strong sense of belonging to the practice</td>
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<td>f. It would be hard for me to leave Our colleagues at this practice</td>
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<td>g. Team members openly share their patient care challenges and failures with each other</td>
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<td>h. There is a well-defined pecking order among team members</td>
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2. Coordinating Care in Accountable Care Organizations: Views of Front Line Providers

Abstract: In primary care practices of Accountable Care Organizations (ACO’s), interdisciplinary teams work together to provide care to a defined group of patients. Team coordination is a critical aspect for achieving superior healthcare multidisciplinary performance. However, high performance and coordination often prove elusive as status, hierarchy, and professional silos keep providers from coordinating optimally with each other. Our study explores how primary care practice doctors, nurses, and medical assistants perceive and express a kind of task coordination called relational coordination, and investigates factors that impede or promote coordination like leadership facilitation, solidarity culture, and team participation. The qualitative methods used consist of a mixed inductive/deductive approach based on semi-structured interviews with 49 clinicians from sixteen primary care practices of two accountable care organizations. We found that clinical respondents often linked solidarity culture with team participation. However, solidarity culture and relational coordination appear to describe separate phenomena as respondents clearly distinguished between a sense of belonging to the team versus coordination tasks. Leadership facilitation had a wide range of views from positive to negative comments by respondents and was distinct across professional roles. The role of trust among team members and information technology enabled communication emerged as important themes for enhanced team coordination.

Keywords: Relational Coordination, Solidarity Culture, Team Participation, Leadership Facilitation, Teamwork, Team, Primary Care Practice, Accountable Care Organization, Ambulatory Care
Background and Context

Under the Affordable Care Act, Accountable Care Organizations (ACO) are reimbursed for quality and cost of care for a patient population, and are increasingly utilizing team based approaches to achieve improved care delivery results (Fisher & Shortell, 2010). One primary mechanism of the team centered restructuring is the creation of patient centered medical homes (PCMH), that shift responsibility for care away from single physicians and towards team-based care that is responsible for cost and quality for a patient group (Shortell et al., 2014). While many factors promote high functioning teamwork among diverse multi-disciplinary care teams (Grumbach & Bodenheimer, 2004; Sevin, Moore, Shepherd, Jacobs, & Hupke, 2009; Sinsky et al., 2013), one important component of this type of teamwork relates to how good team members coordinate in complex task environments (Xiao, Hunter, Mackenzie, Jeffries, & Horst, 1996). In healthcare delivery, interdisciplinary coordination has been acknowledged as a crucial factor for achieving safe, effective, and high quality care by the National Academy of Sciences, the Joint Commission, and the World Health Organization (Havens et al., 2010).

Multi-disciplinary teamwork constructs like patient centered medical homes, microsystems, and integrated delivery teams all describe the importance of coordination among diverse healthcare professionals as a critical factor linked to performance outcomes and team effectiveness (Fleissig et al., 2006; Nelson et al., 2011; Nelson et al., 2002; Rittenhouse et al., 2011b; Rodriguez et al., 2014). To achieve consistent sustainable high levels of performance, coordination at all levels of the system must be improved and understood as a system of interacting parts, with the aim of improving care for patient populations (Hackman, 1990; Hackman, 2002; House, Rousseau, & THOMASHUNT, 1995; Parkhe et al., 2006; Tang et al., 2013).

A report by Stanford-UCSF for the Agency for Healthcare Research and Quality (AHRQ) challenged researchers by noting that more than 40 definitions, conceptual models, and measures exist for a variety of coordination paradigms. Five common elements across the wide variety of paradigms include; (1) multiple participants including patients and various providers, (2) necessary coordination with dependencies between participants, (3) the need for knowledge about roles and activities as well as resources available, (4) information exchange availability like timeliness, and (5) care integration for appropriate guideline implementation (McDonald et al., 2007). At the provider-provider level, coordination challenges between providers consist of such issues as; (1) conflicting medical treatments, (2) duplication of diagnostic procedures, (3) electronic medical information exchanges, (4) continuity issues, and (5) care transition procedures (Wagner, 2000; Wagner et al., 2001; Wagner, Austin, & Von Korff, 1996). Coordination may include various elements including: clinical and data integration across providers, patient empowerment and patient portals, multidisciplinary care teams, and patient and provider empowerment (Kromm, Ross, Wodchis, & Deber, 2014).

Coordination can be thought of task interdependent professionals that operate within and across organizations has, especially relating to interdependency mechanisms (Lawrence & Lorsch, 1967; Thompson, 1967). Our study explores this kind of task coordination and interdependency construct called Relational Coordination (RC), which is experienced by front line care providers (doctors, nurses, medical assistants) in primary care practices of Accountable Care Organizations.
While much of the RC literature has explored outcomes of relational coordination, less articles have described antecedent factors that support RC (Gittell & Logan, 2015). The qualitative study undertaken here further refines our understanding of the three proposed antecedents of relational coordination from study 1 including: leadership facilitation, team participation, and solidarity culture (Huber et. al., Study 1). We explore how front line staff members describe and perceive each of these constructs along with relational coordination. Figure 1 in the Appendix shows each of these team constructs and sub-components that make up the construct.

A prior qualitative study by Rundall et al., explored the interaction of relational coordination and care management, exploring the views of managerial and clinical leaders (Rundall et al., 2016). The article found that ACO leaders mentioned shared goals, frequency of communication, timeliness of communication, and problem solving communication, but did not mention mutual respect, accuracy of communication, or shared knowledge. Each of the four aspects of RC mentioned were linked to the care management processes like standardization and care planning (Rundall et al., 2016). Our paper expands upon the analysis of Rundall et al., by exploring antecedents of RC and focusing on the view of front line physician, nurses, and medical assistants.

While there is a robust literature on relational coordination, to date no study has focused on primary care practices of ACOs, to explore how relational coordination, facilitative leadership, a solidarity culture, and team participation are described by front line providers, and how those providers offer similar and differing views on each of these constructs. Understanding how leadership facilitation may support a positive change oriented front line delivery system culture can help us understand the context and environment in which relational coordination can thrive. Exploring how activated and action empowered clinicians (team participation) relates to RC can elucidate how participation may be related to RC. By studying a solidarity culture and RC we can better understand the relationship between clinicians that feel like they belong to the team and how they view interdependent task coordination. A deeper investigation of the link between solidarity and coordination may also help us better understand when and how a solidarity culture can promote or impede team level coordination, or if they are truly independent, and address unique team aspects as we found in study 1 (Huber et al., Study 1).

**Theoretical and Conceptual Model**

Relational Coordination (RC) encompasses both relational and communication elements (Gittell et al., 2000). RC has been shown to be particularly important in settings that are “characterized by task interdependence, ambiguity, and time constraints” like healthcare primary care practices (Gittell et al., 2000). Relational Coordination was first defined while studying flight departure task coordination among team members, and has been subsequently examined in many industries like criminal justice, consulting, education, pharmaceuticals and healthcare (Gittell, 2013). Relational Coordination (RC) measures task integration driven by two mutually reinforcing elements of communication and relationships, and has been linked to improved performance outcomes in a variety of settings (Gittell et al., 2000; Hoffer Gittell, 2002).

Types of delivery organizations and healthcare units examined using RC include: hospital
care and elective surgery (Gittell, 2001; Hoffer Gittell, 2002), emergency care, trauma care, nursing home care, primary care, disease management (Cramm & Nieboer, 2012b; Havens et al., 2010) integrated care delivery (Hartgerink et al., 2014b) academic medical center (Hinami et al., 2010) outpatient clinics and chronic care programs (Noël et al., 2012) quality of care, postoperative pain and functioning, and length of stay for elective surgery (Gittell et al., 2000).

Outcomes predicted by relational coordination from a review of 69 studies in 16 industries include many types of performance outcomes: “efficiency, financial outcomes, client engagement, worker well-being, learning and innovation, and mixed evidence for quality and safety” (Gittell & Logan, 2015). Predictors or antecedents of RC previously studied include organizational structures: “hiring for teamwork, training for teamwork, shared conflict resolution, shared accountability, and shared rewards”, while predicting structures that have not been found to be associated although predicted by relational coordination theory include: “boundary spanner roles, shared protocols, clinical guidelines, and shared information systems (Gittell & Logan, 2015). Similar relational coordination and related teamwork constructs have been studied including; boundary spanning, manager characteristics, and scope of responsibility job design and coordination of work (Gittell et al., 2008b); provider characteristics and co-management (Hinami et al., 2010); reciprocal learning (Noël et al., 2012); and workforce engagement (Gittell, 2013).

Our study extends the analysis for the relational coordination to primary care practices of ACO’s as well as exploring proposed antecedent constructs including: team participation measures developed by (Alexander et al., 2005), leadership facilitation (Helfrich et al., 2009), and solidarity culture by (Kralewski et al., 1996). Alexander’s practice participation measures how practice members engage with others, promote healthy communication, and shared understandings of teamwork to coordinate work. Questions probe how practice members feel about contributing information, can offer alternative suggestions, and help make decisions. High practice participation includes good information sharing, sharing of decision making processes, and the ability to voice alternatives (Alexander et al., 2005). Leadership captures external support of the practice and management characteristics that impact the front-line practice (Hagedorn & Heideman, 2010; Helfrich et al., 2011) Questions on leadership facilitation probe how management supports the practice in improving patient care, creates a positive environment, solicits feedback, and supports changes in the practice (Helfrich et al., 2007; Helfrich et al., 2009). The practice solidarity measure by Kralewski consists of practice cohesiveness, as measured by questions that probe if practice members feel free to share their view and have a sense of belonging to the practice (Kralewski et al., 1996).

Higher levels of relational coordination at the front line of care can help providers achieve higher levels of performance, safety, and better patient outcomes (Gittell, 2001; Stein et al., 2015). While there is a growing evidence base regarding the importance of relational coordination in promoting effective interdependent work of health care teams (Deneckere et al., 2013; Gittell & Logan, 2015; Hartgerink et al., 2014a; Manser, 2009) less is known about organizational structural factors that enable or promote relational coordination.

Our study explores how doctors, nurses, and medical assistants describe these constructs, using their own natural language. A qualitative investigation of front line providers offers a first-person narrative of how organizational constructs like relational coordination, leadership facilitation, solidarity culture, and team participation are described (Daveson et al.,
Differences and similarities among providers like doctors, nurses, and medical assistants can help us understand how variously they describe their relationships, communication, sense of belonging, and how they participate on the team.

Statement of Research Questions

We examine how front line clinicians describe the major themes of relational coordination including four kinds of communication, and relational aspects; shared knowledge, mutual respect, and shared goals. The goal of the study is to better understand how different providers describe relational coordination and the teamwork constructs of leadership facilitation, team participation, and solidary culture. By exploring differences and similarities described by the voices of front-line care delivery team members, we aim to provide additional insight and clarification among these team constructs as well as elucidating the variation between professional roles.

There are five areas of inquiry pursued in this article. The first is how do front line clinicians (nurses, doctors, and medical assistants) in accountable care organizations express and describe the relational coordination elements which include: frequent, timely, accurate, and problem solving communication; as well as shared goals, shared knowledge and mutual respect? Which of these RC elements are expressed frequently and which ones are hardly spoken about or not mentioned at all? Are there distinctions between the professional roles in how they perceive relational coordination? Prior work in relational coordination and wider organizational behavior literature suggests differences between how physicians, nurses and medical assistants view relationships and communication (Lichtenstein et al., 2004; Martin et al., 2008). Prior work suggests that physicians report lower levels of relational coordination compared to nurses (Gittell et al., 2008a; Whitehead, 2007). While nurses have been found to struggle in power and status relations with doctors in primary care due in part by the issue of scope conditions for each practice, medical assistants have a clear role and thus are free to work to the fullest of their ability (Cahill, 1996; Edmonson, 2003; Wagner, 2000).

To my knowledge, no prior qualitative studies have included the medical assistants, doctors and nurses to examine the perspective of each of these professions on relational coordination. Building on prior knowledge of similarities and differences of professional roles in healthcare we explore: (Q1) How do the doctors, nurses, and medical assistants in primary care teams of ACO’s view and express aspects of relational coordination among their peer groups and with other professions.

A second set of questions explores similarities and differences between professional roles in expressing relational coordination and team participation. Prior work suggests that there are differences between professions in teamwork behaviors and how actively a team member chooses to participate vary considerably due to power and status differences between strong professional disciplines in healthcare (Lichtenstein et al., 2004; Miller, 2001; Schein, 1990b; Sexton et al., 2006; Thomas, Sexton, & Helmreich, 2003). How do front line clinicians in ambulatory care practices of ACO’s describe connections between relational coordination and team participation? In what context are the connections made, and are there differences between doctors, nurses, and medical assistants in how they link relational coordination elements and team participation? Prior work in status differences between healthcare
professions shows that higher power and influence professionals argue for more team participation, whereas lower status groups argue for more autonomy (Martin et al., 2008). Higher status professionals experience different levels of psychological safety, engagement (team participation), and inclusiveness (Nembhard & Edmondson, 2006). Given the clear power differences, authority structure, and strong professional disciplines in healthcare, we thus explore: *(Q2) Are there differences between professional roles in how doctors, nurses, and medical assistants describe team participation and the relationship between team participation and relational coordination.*

A third question delves into a finding from a companion study that showed while leadership facilitation and team participation were significantly and positively associated with relational coordination, solidarity culture was not (Huber et al., Study 1). Several theoretical reasons were posited as possible explanations including: (1) team size makes a difference, once there are more than 8 members in-group and out-group, or (group think) behavior is a factor, (2) a closer relationship is formed with people that are more similar to each other (homophily), (3) respondents might assume the solidarity questions relate to their identification with role (profession), or their union, their employer, rather than the care team, (4) solidarity might be a coping mechanism to a stressful environment, so solidarity is negative for RC, (5) solidarity could also be more of a passive trait and thus does not correlate well with RC that is more active and task oriented. Since solidarity and participation were found to be linked closely in a preliminary review of the transcripts, we explore how front line both the solidarity and participation constructs relate to the relational coordination construct, while searching for evidence that support or reject the posited reasons for the non-association of team solidarity and coordination. We explore *(Q3) the relationship between solidarity culture, team participation and relational coordination, and how and when these constructs are or are not related.*

A fourth question deals with how leadership supports the building of relational coordination? Leadership literature suggests a mixture of positive and negative impact on front line care delivery. For example, prior work has found that power tends to produce certain leader behaviors that are the opposite of facilitative, and can be deleterious on relational coordination and engagement by lower status groups (Anderson, John, & Keltner, 2012; Arcangelo, Fitzgerald, Carroll, & Plumb, 1996; Hall, 2005; Keltner, Gruenfeld, & Anderson, 2003; Nancarrow & Borthwick, 2005; Sebas, 1994) On the other hand, when leadership facilitation is present – active support and rewards for innovation, soliciting input from staff, and promoting a healthy environment – front line providers experience higher levels of relational coordination (Apker, Propp, & Zabava Ford, 2005; Denti & Hemlin, 2012; Frankel et al., 2006; Hagedorn & Heideman, 2010; Helfrich et al., 2011; Helfrich et al., 2007; Helfrich et al., 2009; Sulu, Ceylan, & Kaynak, 2010). Given strong status and hierarchy relationships and mixed interactions from the literature between leadership and coordination, we further explore: *(Q4) Leadership and the association of leadership facilitation with relational coordination expressed by different professional roles.*

By paying close attention to individual voices describing phenomena outside of, but perhaps related to our constructs of interest, new themes can emerge that may expand our understanding of both the individual constructs, as well as the inter-relationship among constructs like relational coordination, leadership facilitation, solidarity culture, and team
participation. Using an inductive approach, we pursue emergent themes: (Q5) Emerging constructs from front line providers based on Inductive Analysis of new themes and themes related to relational coordination, leadership facilitation, solidarity culture, and team participation.

Data and Methods

The qualitative data analysis was conducted with a hybrid inductive and deductive coding and thematic development approach (Fereday & Muir-Cochrane, 2006). Capturing and describing the organizational constructs of relational coordination, leadership facilitation, solidarity culture, and team participation with first person narrative voices provides a richer understanding of each of these terms. The deductive component of the study begins with the sub-themes of each of these constructs as initial codes, i.e., relational coordination is the main code, and the sub-themes consist of accurate, timely, frequent, and problem-solving communication, and shared knowledge, shared goals, and mutual respect as the sub codes.

The inductive component of the study explores emerging constructs and closely related phenomena that arise from the interviewee’s perspective surrounding our main teamwork constructs. The initial themes and sub-themes of relational coordination, leadership facilitation, solidarity culture, and team participation, were used primarily Q1-Q4. An inductive coding scheme was used for Q5 for emergent aspects related to the constructs (Miles & Huberman, 1994).

This study uses data from a (PCORI) Patient-Centered Outcomes Research Institute grant that is examined patient activation and engagement, patient outcomes, and teamwork characteristics in two Accountable Care Organizations (PCORI Grant: IHS-1310-06821). A total of 49 primary care clinical interview respondents were selected from two organizations (Advocate and HealthCare Partners), and from 16 primary care practices that were randomly within these two ACO’s. Site visits were conducted by teams of six clinician and social scientist investigators during May 18-21, 2015. The study includes interviewee respondents from several professional disciplines including; 14 Medical Doctors & 2 Doctors of Osteopathy; 19 Registered Nurses & 1 Nurse Practitioner; 13 Medical Assistants. The sampling matrix of individual respondents are drawn from each professional group to ensure a representative sample size corresponding to typical primary care front line practices (Huber et al., 2003; Miles & Huberman, 1994). To understand the practice boundaries, the research team asked study sites to describe the various roles that made up the practices and asked individual respondents about tenure within the practice, duration of work with current practice, and demographic variables consisting of age, sex, and race.

The semi-structured interview guide used to understand the teamwork constructs based on prior research can be found in the Figure 3 of the Appendix (Shortell et al., 2015). The focus was on what the team did to engage diabetes and cardio-vascular disease patients in their care and coordinate their care. Individual one hour interviews were conducted and audio taped and then transcribed verbatim. Following qualitative methodology and deductive analytic design methods for Q1-Q4, and inductive analytic approach for Q5. Coding was conducted until thematic saturation was found (Miles & Huberman, 1994). Atlas-ti qualitative software was used for content analysis. Codes were started with the themes (primary teamwork construct) and sub-themes (underlying definition and key ideas behind construct) of relational
coordination, team participation, solidarity, and leadership, when starting the coding process. While questions Q1-Q4 follow a more traditional deductive analytic approach, the emerging constructs pursued with Q5 are more inductive and follow a constructionist paradigm – where the researcher’s inquiry is aimed at understanding and expanding individual constructs that emerge (Guba & Lincoln, 1994; Miles & Huberman, 1994). The inductive component of the study generated new codes as they emerged from the interviews.

Two researchers each coded five interviews (10%) which is the generally accepted percentage to establish good reliability and validity Inter Rater Reliability (IRR) in qualitative research (Hallgren, 2012; Pope, Ziebland, & Mays, 2000). In our study we follow the accepted method to establish IRR while understanding that other researchers have questioned the use of IRR in qualitative research (Armstrong, Gosling, Weinman, & Marteau, 1997). Each researcher coded the interviews using the agreed upon codes for the main codes of interest including; relational coordination, participation, leadership, and solidarity. We calculated the reliability as the number of agreements over the total number of agreements and disagreements between researchers using 70% as the benchmark number for intercoder reliability (Lombard, Snyder-Duch, & Bracken, 2002; Miles & Huberman, 1994). Our initial reliability among the 2 coders was 42%. It is normal for qualitative research reliability to be below 50% for the initial agreement between coders (Downe-Wamboldt, 1992; Lombard et al., 2002). The two researchers who coded the initial 5 interviews worked together to clarify the coding schema and coded 2 additional interviews. The post-discussion IRR resulted in improved agreement among coders to 76%, which meets the threshold of having at least 70% agreement for IRR in qualitative research (Garrison, Cleveland-Innes, Koole, & Kappelman, 2006; Stempler, 2001).

**Analysis and Findings**

In this study, we explored five areas of inquiry that assessed how doctors, nurses, and medical assistants perceive relational coordination and team constructs like leadership facilitation, team participation, and solidarity culture. For clinical respondents, the communication domains of relational coordination where more pronounced than the relational aspects. Frequency of communication was expressed as an essential component of good teamwork by several respondents that describe chronic disease patient care as an ongoing process to be managed continuously between multiple team members.

Team participation was articulated as respondents mentioned feeling like they can frequently provide or work with information or propose alternatives at the team level, and that they felt like active participants in the team process. For solidarity culture, respondents had a mixture of positive and negative feelings about how close they felt to the rest of the team. Medical assistants (MA’s) and doctors both expressed a strong sense of team identity which makes sense in ambulatory practices where MA’s are assigned to doctors on every team. Nurses had less consistent expressions of team solidarity and role clarity and scope of practice were often mentioned as enabling participation or being a limitation depending on how much freedom they experience. When respondents spoke positively about participation and being able to share their viewpoint on the team, they were likely to also express relational coordination aspects like enhanced communication or mutual respect.

Table 1 in the appendix offers a view of each team construct including; relational coordination, team participation, solidarity culture, and leadership facilitation, sorted by the
three represented professions. For relational coordination, several of the doctors we interviewed described; the importance of the relationships in primary care, how they focus on communication and share learnings across the front-line teams, and articulated the importance of respect towards patients and team members. Nurses expressed a mixture of positive and negative relational coordination often related to the kind of role clarity they experienced with case managers/care coordinators experiencing the best relationships and communication among nurses.

Medical assistants often prioritized communication with each other, with patients, and with their doctor. Some MA’s expressed concerns about communication among external staff members and described co-location as an important aspect for good communication. For team participation doctors and medical assistants along with case managers/care coordinators expressed high levels of team participation compared to staff nurses. Doctors differed in their views about the increases of team huddles and meetings with most of them being positive, but several also commenting on the time pressure and constraints. Doctors practice in close partnership with their medical assistants and thus many of the MA’s have a clear supporting role and sometimes act as translators for patients and doctors.

MA’s expressed a high level of participation and activity in our ambulatory care practices. Like team participation, a solidarity culture or feeling of belonging and contributing was more strongly expressed by doctors, care coordinators, and medical assistants than staff nurses. Nurses that have worked longer with their teams, seemed to enjoy a stronger sense of belonging. Leadership facilitation had the largest variation in terms of both positive to negative expressions from respondents, as well as having a strong difference between the professions. The next sections describe each of the main teamwork constructs and our guiding questions in more detail starting with relational coordination.

**Relational Coordination:** *How do doctors, nurses, and medical assistants in primary care teams of ACO’s view and express aspects of relational coordination among their peers and with other professions?*

The interviews show that relational coordination elements like communication, shared goals, and respect came through quite clearly as critical components to successful practice interactions and task coordination for interviewees. The relational sub-components of RC like mutual respect, shared goals, and shared knowledge expressed by interviewees offers a rich array of insights about the context and meaning of these constructs. Respect has been described in the literature as central to effective teamwork (Dieleman et al., 2004; Michan & Rodger, 2000; Pullon, 2008). Respect is a core aspect of relational coordination and articulated across doctors, nurses, and medical assistants. As one Medical Assistant (MA) describes respect while covering for another MA, “It's my organized chaos, I know exactly where it is and how it is. But when I go and cover her, for her to be okay, and to be able to respect me, I have to do things her way.” Respect was described by respondents as existing between multiple levels of the organization, among different professional roles, and between person and technologies. Having *mutual respect* between professionals, across professional roles, and between provider and patient is not always easy in healthcare, as one nurse points out, “when I started here the physician that I worked with the most wasn't 100 percent on board yet. It took a lot of time to for him to see my strengths, and what I could do, and what value I could be to him. And once
that happened, I had 100 percent engagement with the physician. But I know some of my counterparts don’t have that same luxury”.

Relational Coordination also includes shared goals which were described by interviewees at several sites. Shared goals for team members are described in the literature as essential aspects of learning and innovation (Lee-Kelley & Blackman, 2005), and high team performance outcomes (McComb, Green, & Compton, 1999). Having shared goals among team members at times can conflict with the desire to have control over an aspect of care as described by a nurse practitioner, “I think part of the problem is that at the medical assistant level they aren’t real familiar with what I can do and I think there’s also a little bit of a control issue with some of them. Once they see what I can do, even if it’s helping them make a phone call, they start to give up a little bit of that control.”

Shared knowledge and problem solving and the ability to overcome challenges as a team are an important component of relational coordination. Several interviewees gave examples of how they solved problems jointly with other care providers to improve patient care or overcome an administrative challenge. For example, shared problem solving is explained by a medical assistant, “I had a patient who was very upset. He couldn’t get through to see the doctor. He needed this, and he needed that. I called the Doc and said, “I’m sorry to call you after hours, but can I get the okay to double book the morning so I can put this patient in to be seen because he has this issue?” And the doctor said do it. And we did.” This example illustrates that not only is shared knowledge about patients important, but that shared problem solving communication may be linked to knowledge/learning to be effective.

In addition to the relational components described above, the communication aspect of RC among and between team members is central to the idea of relational coordination (Gittell & Logan, 2015). Accurate, frequent, timely, and problem solving types of communication are central aspects of how RC measures task coordination. Respondents from our interviews reported a variety of communication enabling or impeding circumstances and technologies. For example, the electronic medical record (EMR) is a well-established form of communication that relies on different disciplines entering their data and information in a timely and accurate way. Several respondents remarked about the improvements of the EMR, and how the addition of memos and notes have improved accuracy in communication between disciplines. As one medical assistant points out, using the EMR to communicate has become the norm, “We create tasks in the EMR, which is clinic care, and that’s how we communicate to each other about patients.” Team huddles are another way that members frequently communicate with each other every morning to review schedules and patients coming in for that day. For example, a medical assistant describes the huddle when she says, “Physicians attend the huddles. We get in a group and we meet before we see the patients. We go over the openings in the schedule of physicians.”

In the practices we studied, there were also different types of instant messaging, email, task managers, as well as in person and phone calls between clinicians that support enhanced team communication. Technology enabled communication appears to be the norm in some of these practices that often rely on messaging and prompts rather than in person exchanges. An example of using technology to improve communication is articulated in the following way by a nurse, “we have the issue of being on two stories, so there’s the reception desk in the front, I’m down here, and the docs and the patients are upstairs. So, there’s a lot of running up and down
the stairs, but IM (instant messaging) helps a lot. We can communicate that way. We can also pick up the phone and call each other if we need to”. In this case, the nurse views the technology as enabling both the timeliness and the frequency with which the nurse and physician can reach each other.

**Team Participation and Relational Coordination:** Are there differences in healthcare professions describe the relationship between team participation and relational coordination?

Team participation is defined as individuals feeling that they can contribute and interpret information, participate freely and propose alternatives, or disagree, and participate in decision making (Alexander et al., 2005). Alexander’s team participation concept measures how team members engage with other team members, promote healthy communication, and experience a shared understanding of teamwork. Understanding team participation processes helps us understand how team members work together, cooperate, and communicate to achieve outcomes (Kirkman & Rosen, 1999). Our interview questions related to team participation (Figure 3) probe how team members feel about contributing information, their ability to offer alternative suggestions during meetings, and how they participate in the decision-making process.

Respondents described good team participation including; improved ability to share information, shared decision making processes, and the ability to voice alternatives during team meetings. Some teams include receptionists as part of the team, “They(work with the team. They check the patients in and they are the first ones to see the patient. If there is any delay, patients come to the desk and ask the reception, "Is there a delay with the physician?" and the receptionist will look on the screen and see where the patient is in the processes. If we are delayed they message us and say, "This patient is waiting and they want to know how much longer."

When physicians acknowledge the team and the contribution of medical assistants, team members feel like they participate as one doctor told us, “I think we see new trends in medicine and the trend right now is more for teamwork and partnership with the patient and with our staff. Everyone is a team player. If you have a good medical assistant she makes your day. I mean a lot of my patients feel so comfortable with her. I’ve been fortunate. . . sometimes they don’t want to bother me so they’ll call her, and they know her on a first name basis. She’s very approachable. They’ll call her and she’ll be like, “Oh I’ll take care of this” and she always says, “Please call me if you have any concerns,” like your medication.” The doctor describes team participation and the link between being an active team player and respecting each of the roles and how they contribute to care coordination.

Sometimes physicians are less clear about teamwork and how other team members like dieticians participate in the care process. A dietician describes how some physicians are still learning how she can participate more fully, and how to work with her to improve patient care when she says, “Once I got here and the physicians learned that they could trust me and they could see that I pretty much know what I’m doing <laughs>. I’m knowledgeable and they started referring patients more and more. She has me see almost every diabetic patient she has that she has difficulty with so that we can work together on those. So yeah it’s evolving and I think it’s continuing to evolve.”
New roles and evolving clinical roles can make it a challenge to understand how various players can participate in patient care. Some practices have medical assistant just getting vital signs and rooming patients, while others take full advantage of what the role can do, “our medical assistants are pretty involved, they triage the patients and they bring the patients in to exam rooms. They check for vital signs, they go over past medical history, review the problem, and review the past medications. They do most of the work with the quality measures and then with preventative care, for example, when did the patient have colonoscopies, mammograms and for diabetes; hemoglobin A1cs, foot care, and eye exam.” This kind of medical assistant role is not the traditional practice role seen at many primary care practice sites where medical assistants primarily room patients and take basic vital signs.

From the interviews, respondents characterized a broad array of how medical assistants and nurses are utilized and how they feel about participating in patient care. Some teams utilize the medical assistant role to practice at the top of their license, fully engaging their capacity and making them feel part of the team. Since the MA role has more clarity in terms of scope of practice compared to nursing, nurse respondents had stronger positive and negative associations with participation. Team participation thus had a strong ownership or individual agency component, with medical assistants voicing strong feelings about their ability to participate fully in the practice care coordination and patient care. When interviewees described a strong sense of participation, they also often told us about their joy in taking part in taking care of patients, and the importance of their role to patient care.

**Solidarity Culture, Team Participation and Relational Coordination:** A closer look at the relationship between solidarity culture, team participation and relational coordination offers new insights into how and when these constructs are or are not related.

Our study uses Krawelski's team solidarity measure which is comprised of a 4-item subscale composite drawn from the validated “Group Practice Organizational Culture Instrument” (Kralewski et al., 2005; Kralewski et al., 1996). Team solidarity measures concepts like, “I have a strong sense of belonging, it’s hard for me to leave my colleagues, I openly share challenges with colleagues”. Team cohesiveness or solidarity is measured by questions that probe if team members feel free to share their view and have a sense of belonging. For several respondents, there was a close association between active team participation and a sense of belonging. Respondents that felt like they belonged also reported that they participated more proactively during practice meetings and huddles. Team participation had a more active voice where respondents described being energized by huddles or team meetings. Solidarity culture was expressed in a more passive voice as “being part of” or “belonging” to the team or practice.

In study 1 of the dissertation, solidarity was not found to be associated with relational coordination (Huber et al., Study 1). One possible explanation is that team participation and relational coordination measure activities like huddling, patient care actions, or team meetings, and that solidarity instead captures a more passive sense of belonging as articulated by this nurse, “My team communicates well. My team is actively engaged in their job and their job responsibilities. We go the extra mile to help the patients, and team members feel like they belong to the team”. There is a subtle distinction here between first the relational coordination communication aspect and the team participation, and then the sense of belonging that is more passive.
Solidarity may also be utilized as a proxy measure for how wide the boundary of a team is, how inclusive it is, and which team members feel part of the team (Pouthier, 2017). Medical assistants who occupy lower positions of power in the traditional team, can either feel isolated or part of the team often depending on being able to practice to a full scope of responsibility and being acknowledged for the work they do as a nurse remarked in an earlier quote (Anderson et al., 2012; Keltner et al., 2003; Magee & Smith, 2011). When lower ranking power position roles feel part of the team, there can be a concordant strong sense of team solidarity as expressed by this medical assistant, “I work for them because I believe in what we do. If it wasn’t for the care that they provided to my mother, I wouldn’t work here. So, from the appointments to getting home healthcare - they do a fantastic job of patient care all around.”

A respondent described well how solidarity culture and team participation can be closely linked by the following statement, “It’s just knowing the patient’s needs. We work as a team, because if patients aren’t getting the right information, then it’s about drilling down and seeing what that need is. So sometimes that’s a barrier, but it’s a barrier that we work through together.” The medical assistant expresses the sense of belonging to the team as well as problem solving and a sense of participation. Interviewees also commented on appreciating other people on the team, and the solidarity felt on more innovative teams, “if it’s something that needs to really be worked on, we work on it and get it fixed, whatever it takes, whatever standards it needs to get fixed to. Because when it’s something that needs to be worked on, we work together as a team and get it done.” Solidarity seems to set a tone or foundation for that sense of belonging to the team, in contrast to work activities or tasks that occur with active participation and clear communication between team members.

Solidarity culture is exemplified by comments from a medical assistant who said, “we all bring our ideas together . . . we have rules for the road, we have buy-in, and we’re moving in a direction”. Solidarity culture includes both a structural component like rules, guidelines, standards or common practices, as well as a sense of belonging, “we make sure patients are taken care of . . . we take care of them like they are a family member”.

Trust was also mentioned as a critical component of solidarity, “we have a culture of trust . . . we are all in this together”. Trust for solidarity may be like mutual respect for relational coordination. While it is hard to tease apart respondent’s comments on trust and respect, it may be that trust among team members relates more to a sense of belonging and acceptance, whereas mutual respect has an action orientation in that team members respect each other’s practice styles and patient care approaches.

A physician describes the solidarity culture in the following way, “we have worked together for a long time, there is unity here in primary care, everyone is a team player, everyone is active in patient health outcomes”. While relational coordination focuses on relational and communication aspects of tasks, solidarity culture as expressed by our respondents appears to have a stronger personal and familiar characteristic, acting as a unifier among front line care providers.

**Leadership and Relational Coordination:** How do comments about leadership and leaderships association with relational coordination reflect similarities and differences between professions?

Leadership in our study is defined by a validated 7-item measure from the Organizational Readiness for Change (ORCA) survey and captures leadership and management
Characteristics that impact team members (Hagedorn, Heideman, 2010; Helfrich, et. al., 2009, 2011). Questions probe how management supports the team in improving patient care, creating a positive environment, soliciting feedback, and supporting change in the practice. Leadership as a construct captures external support of the practice and management characteristics that impact the front-line practice.

Leadership facilitation was described quite differently depending on the professional role (doctor, nurse, or medical assistant). Doctors often described the leadership as larger organization leadership and management of the practice, whereas nurses and medical assistants often included doctors in their description of leadership. The similarities and differences between providers may also have aspects of undefined role clarity between doctors and nurses (Harms, Ewen, Metsker, Swanson, & Oas, 2017). Undefined scope of practice or role boundary issues sometimes surfaced as communication or coordination challenges, with each role pointing toward the other for responsibility of a task (Okuno-Jones, Siehoff, Law, & Juarez, 2017).

Compared to the other team constructs, leadership had a more strongly polarized set of responses with interviewees either being very positive or negative about the leadership of the practice and the larger organization. Negative leadership was described as very disruptive not only to the team but also to patient care as articulated by this physician, “The other doctor that I used to share this office with decided it was time to leave, she felt like she was scolded all the time . . . I mean, honestly we’re getting squeezed every which way and with all of the lip service that everybody gives to primary care being the foundation . . . they don’t pay us for it because they base everything on RVUs.”

Some medical assistants described feeling anxious and confined, “Overall, everything’s better but with corporate there’s a lot of corporate guidelines and policies and procedures. The biggest thing with that has been learning all these policies . . . I feel like that’s one of those biggest changes in people, people have been very nervous and anxious, I think they always feel like they’re being monitored.” The opposite feelings and descriptions are given from other practices where front line providers and staff feel they are supported and empowered. Positive leadership includes staff members that feel supported by leadership in terms of education, communication, and general support, “I think our supervisors give us a lot in terms of education and communication. Like some medical assistants can’t even talk to the docs, and we have more communication with the docs, and they educate us about patient care. So, I think our clinic is pretty good. <laughs>.”

Leaders that take responsibility and support the team are illustrated by this manager’s comment, “I will give credit to the team if they’re high performing, but if they’re not performing well that meant that we as leadership did not take responsibility first. Physician leaders that are active and engaged in front line leading describe their role as being proactive, “We are very proactive, it’s doing what’s best for the patient, so I think we are very transparent and try to engage the staff. The positive leadership experience is characterized by more interaction between staff members and leadership, whereas the negative leadership comments are often described in “us and them” language.

The more positive leadership practices articulate their leadership as a support mechanism, and as creating a positive work environment conducive to professional growth. As one nurse reported, “I know leadership at the site, they are always open to feedback and ask
what is it that we can do better”. Leadership in these teams also tended to enhance relational coordination or task alignment by creating supportive structures and creating an environment that rewards the team for delivering high quality care.

**Emergent Themes:** Emerging constructs from front line providers based on inductive analysis of new themes related to relational coordination, leadership facilitation, solidarity culture, and team participation. Emerging themes from the interviews include; the role of trust and impact of information technology, the role of ownership (profit vs not-for profit), regulatory changes, the role of huddles and team meetings, perceptions of changing roles and responsibilities, and the role of “invisible structures” like human resource templates, guidelines, and procedures.

The role of trust emerged and was most closely related to statements about respect and direct patient care processes. The nature of trust is described by this nurse when she responded, “making sure those patients are taken care of like they’re a family member. So, there’s so much to do and to make sure a practice is on board and to have a culture where there’s trust within the practice. Where you can trust your providers, where you can trust your MA’s and your patients can trust in you is key.” There is also trust that is enabled through information technology systems. The notion of technology enabled trust, or building trust via technologies was made clear when we asked about communication between team members. Health information systems and communication systems appear to be important not only to communication but also to building trust for team members as expressed by this MA, “we are located on two stories, so there’s the reception desk in the front, I’m down here, and the docs and the patients are upstairs. but instant messaging helps a lot, you know, we can communicate that way and stay connected”. Technology enabled communication is an important aspect for practice members, respondents described productive interactions using electronic health records, patient portals, lync managers, instant messaging, email, and phone.

Patient hand-offs are the ability to share patients quickly and correctly ensuring both high quality and safety for patients. Prior studies have found that teams that have high levels of trust are more likely to be able to cover each other and ensure good patient hand-offs in a reliable way (Gittell, 2013). Covering patients for each other like one medical assistant covering for another, expressed trust in the following way, “when I go and cover for her, for her to be okay and to be able to trust me, I have to do things her way.”

Establishing trust across professional boundaries is a central theme described by a doctor like this, “They(nurses) have been excellent, actually, because I do get feedback faster. I know that this patient is being cared for very well. I know that would be a challenge if I did not have a care manager, and in the past I have had to use a lot of my time and my staff’s time to find the resources to make sure that that’s been covered by the insurance. They (nurses) are in contact with the other out-of-area network nurses and care managers, and so I can trust them.” Building a culture of trust for an entire team is challenging but well stated by this medical assistant, “making sure those patients are taken care of like they’re a family member. So, there’s so much to do and to make sure a practice is on board and to have a culture where there’s trust within the practice. Where you can trust your providers, where you can trust your MA’s and your patients can trust in you is key.”

The role of team “huddles” was discussed by several interviewees who mostly view the huddles as a positive way to exchange information and plan for the day. The respondents
mentioned role responsibilities and scope of practice that are quickly changing and directly impact how team members coordinate care and interact with each other. Finally, the role of processes and “invisible” structures like background information systems and organizational templates (guidelines, HR procedures) emerged as either supporting or impeding teamwork. Each of these areas could be further studied as these supporting structures may either impede or support relational coordination.

Discussion
In this study, we explored how front line clinicians in ambulatory accountable care practices describe their relationships with each other, how they communicate, and work together as a team. We searched for how respondents describe micro-organizational constructs including; relational coordination, leadership facilitation, solidarity culture, and team participation. By using in their own words and language, we explored each of these constructs and gathered information about how team characteristics like leadership, solidarity, and participation relate to relational coordination, and explored similarities and differences among professions including doctors, nurses, and medical assistants.

Team coordination is an essential component of high performing multi-disciplinary care outcomes in the primary care setting (King et al., 2008; Marsh, 2017). Front line ambulatory doctors, nurses, and medical assistants in our study described both the advantages and challenges of working in fluid, flexible, and often uncertain environments where task coordination is critical for team success. Relational coordination’s relationship and communication aspects were described in their own words as respondents shared communication patterns, shared goals, shared knowledge and mutual respect among team members. Respondents described in detail the task interdependence of complex interactions among different roles in healthcare delivery and patients, and the linkages between leadership facilitation, team participation, and solidarity culture and relational coordination among team members and patients.

Team participation and solidarity culture were often linked in how respondents spoke and articulated feelings about team level processes, interactions, and structures. Active participation in decision making, team meetings and huddles were described in detail by respondents as they articulated how information is processed and care is coordinated. Like leadership, participation had a strong link to coordination as respondents commented about information sharing and communicating with each other. Solidarity was described as a sense of belonging on the team using words and language like “unity, we are a team, teamwork, friendship, and family.” In contrast to the active language of relational coordination and participation, solidarity was often discussed more passively, indicating a foundational tone or culture, rather than a task or action orientation.

Leadership facilitation as described by our respondents demonstrate both the positive or negative impact physicians, directors and the larger organization can make in either supporting or impeding the team towards improved patient care and a productive environment conducive to continual improvement. Leadership as described by physicians captured external support of the team and management characteristics that impact the front-line team. Nurses and medical assistants described leadership as coming from both physicians and/or the larger organization. It is important to note that leadership as a theme was described very positively or
very negatively – with few respondents having a neutral view. Leadership was a polarized theme compared to the other themes in the study. Leadership facilitation also clearly defined the context and environment in which these ambulatory team members practice. Good leadership facilitation skills translated to front line respondents feeling supported, engaged, and as having resources to deliver great patient care.

Several additional themes emerged from the inductive analysis that relate to our team constructs and the most interesting one for relational coordination may be “trust”. Respondents frequently mentioned trust as a key driver of their teamwork and task coordination. The relational coordination construct measures a closely related construct of mutual respect, but views from the front lines told us that “trust” may be a key driver to their performance. The organizational behavior team literature is also quite rich in describing the important role of trust in high performing teams in many industries including healthcare (De Dreu & Weingart, 2003; Mach, Dolan, & Tzafrir, 2010; Simons & Peterson, 2000). Future empirical work could explore how adding trust to the relational coordination construct may improve its functioning, reliability, and validity in ambulatory care settings. Our findings are limited by several factors including; the relatively small sample size, qualitative methodologic limitations, specific ambulatory care practice team members, and the semi-structured interview template that did not allow for deeper follow up questions.

Conclusion
It is hopeful to note that many respondents emphasized words like “we, us, together, and team”. For example, one medical assistant respondent said, “Teamwork is most important, we’re communicating more with the patient, and we have supervisors that give us more education materials than before.” The “we” nature of the remark and the feeling of teamwork is palpable and was expressed quite clearly throughout many of the interviews. Becoming a high performing team or an organization that has superior coordination practices among individuals may be both complex and challenging, but perhaps an easy first step is to consider using more words like, “we, us, and together” (Haynes et al., 2009).

There are several key points for clinical and management practice leadership that were mentioned by front-line team members. Relationships between patients and providers, and between providers, is critical to a well-functioning ambulatory care practice. Respondents told us that the technology enabled communication either supports or hinders front-line relationships. Thus, building a human centered design enabled communication system may help front line care coordination. Establishing clear roles, especially between nurses and doctors in primary care is important for enabling trust, building shared knowledge, and supporting nurse engagement and team participation. Ensuring that team huddles are effective and meet the needs of both patients and team members is important. Using quality improvement or meeting management techniques to enhance teamwork may improve both team participation and build a solidarity culture. Leading with a relational stance, based on support and facilitation of team members may support greater patient centered care delivery in busy ambulatory care practices.
Appendix

Figure 1: Teamwork constructs and sub-components including: Relational Coordination, Team Participation, Leadership Facilitation, and Solidarity Culture.
Figure 2: Relational Coordination, Solidarity Culture, Team participation, and Leadership Facilitation Survey (PCORI): Team Assessment Survey Questions

Relational Coordination
How frequently do the people in each of these groups (Primary Care Provider, Nursing, Medical Assistant) interact with you in taking care of diabetes and/or cardiovascular disease?
- Frequent Communication: Do they frequently communicate with you about providing care to patients with diabetes and/or cardiovascular disease?
- Timely Communication: Do they communicate with you in a timely way about providing care to patients with diabetes and/or cardiovascular disease?
- Accurate Communication: Do they communicate with you accurately about providing care to patients with diabetes and/or cardiovascular disease?
- Problem Solving Communication: When there is a problem with providing care to patients with diabetes and/or cardiovascular disease, do people in each of these groups blame others or work with you to solve the problem?
- Shared Goals: Do people in each of these groups share your goals for providing care to patients with diabetes and/or cardiovascular disease?
- Shared Knowledge: Do people in each of these groups know about the work you do with patients with diabetes and/or cardiovascular disease?
- Mutual Respect: Do people in each of these groups respect the work you do with patients with diabetes and/or cardiovascular disease?

Team Participation
We are interested in the extent of your agreement or disagreement with each of the statements below, as they relate to the team providing care to patients with diabetes and/or cardiovascular disease.
- I frequently contribute information
- I frequently interpret information
- I can comfortably disagree with others
- I feel free to participate actively
- I usually propose alternatives
- I usually evaluate alternatives
- I frequently participate in making decisions

Leadership Facilitation
We are interested in the extent of your agreement or disagreement with each of the statements below, as they relate to your practice site leadership and management.
- Reward clinical innovation and creativity to improve care
- Solicit opinions of clinical staff regarding decisions about patient care
- Seek ways to improve patient education and increase patient participation in treatment
- Make sure that we have the time and space necessary to discuss changes to improve care
- Strongly support practice change efforts
- Promote an environment that is an enjoyable place to work
- Create an environment where things can be accomplished

Solidarity culture
We are interested in the extent of your agreement or disagreement with each of the statements below for culture.
- We have a strong sense of belonging to the practice
- It would be hard for me to leave my colleagues at this practice
- Team members openly share their patient care challenges and failures with each other
- There is a well-defined pecking order among team members
Figure 3: Semi-Structured Interview Guide: These questions reflect only the questions related to teamwork or respondent background and are part of a larger set of research questions for the (PCORI Grant: IHS-1310-06821). For the entire interview guide please contact the corresponding author Dr. Steven Shortell, shortell@berkeley.edu.

Individual and Organizational Characteristics and Teamwork. The next questions ask about design of teams and continuity of care.

1) Can you briefly tell us about your current position and responsibilities?
2) How long have you been in the position?
3) How long have you been working at this clinic?
4) Patient Empanelment
   a) Are patients empaneled with a clinician? What percentage of patients is empaneled?
   b) Are patients empaneled to NPs/Pas or only to MDs?
   c) What is the panel size by physician FTE? Maximum size?
   d) Who sets panel size?
   e) Do you adjust panel size to consider factors such as the age, sex, severity of illness for the patients being treated? If yes, how do you do this?
   f) Do you close panels when they reach the maximum? Do you limit the number of active patients at your clinic? If so, how do you do this?
5) Team-Based Care
   a) How many teams are there?
   b) What is the composition of a team?
   c) Does the same MA work with the same clinician every day? If not, have you tried it and what were the barriers?
   d) What does the ______ do?
      i) MA
      ii) RN
      iii) Receptionist/clerk
      iv) Other team members (coach, panel manager, behavioralist)
   e) Do you have clinical visits with non-clinician team members (RNs, pharmacists, LVNs, MA, health coaches)? For which issues? Are there standing orders for these visits?
   f) Are there team meetings? How often?
      i) Which team members participate usually or always?
      ii) What topics/issues are discussed at team meetings?
      iii) Do team meetings highlight quality scores or patient feedback?
   g) Are teams co-located?
   h) Is there electronic messaging?
      i) Is there a daily or twice daily huddle?
   j) Is it easy for team members to interact frequently during the day?
   k) Is there a behavioral health specialist? When do patients see a behavioral health specialist? Are they integrated into the primary care practice? Are they co-located? How do transitions occur?
   l) Do you have a special program for high-cost, high-utilizer patients with complex medical or psychosocial issues?
   m) What are areas in which your practice is considering changing roles to promote better team-based care?
   n) Do you do workflow mapping? How often? How do you do it?
   o) Do you have standing orders?
      i) For pre-op labs?
      ii) For prescription renewals?
      iii) For pre-visit chronic illness lab?
      iv) For pre-visit acute symptom testing?
p) Do team members have easy access to the same EHR? Which team members? Even those who work off-site? Describe how this works in practice.

q) Which features of the current EHR are conducive to teamwork? Patient engagement? Which features inhibit teamwork? Patient engagement?

r) Are team members hired with an explicit focus on teamwork? Patient engagement? If so, which team members? Describe how this works in practice.

s) Are team members trained with an explicit focus on teamwork? Patient engagement? If so, which team members? Describe how this works in practice.

t) Is there a conflict resolution process available to team members for ongoing disagreements about teamwork? Patient engagement? If so, which team members have access to this process? Describe how this works in practice.

u) Are there shared rewards or recognition for team members tied to teamwork? Patient engagement? If so, which team members? Describe how this works in practice.

6) Continuity of Care
   a) Do you measure continuity of care? If so, how? How often?
   b) Do you define continuity as with a clinician or with a team?
   c) What proportion of patient visits are with their PCP? Proportion of patient visits within their team?
   d) Do you have a run chart of continuity?
   e) Do teams review continuity data?
   f) Are people who answer phones trained to promote continuity of care? How?
   g) Are physicians required (or encouraged) to squeeze in their patients (but not the patients of other clinicians)?
   h) What do patients do for care when the clinic is closed?
### Table 1: Matrix of Providers and Team Constructs

<table>
<thead>
<tr>
<th>Role\Team Construct</th>
<th>Relational Coordination</th>
<th>Team Participation</th>
<th>Solidarity Culture</th>
<th>Leadership Facilitation</th>
</tr>
</thead>
</table>
| **Doctor**          | • Respondents had both positive and negative responses to “mandatory huddles” and team meetings. While these structures offer a good exchange of information and communication, some MD’s view this as extra work.  
• Time constraints are viewed as a major barrier to enhanced team participation by MD’s.  
• Respondents feel in accountable for the patient care and thus have a very strong sense of providing and interpreting information, proposing alternatives, and making patient care decisions.  
• Most doctors described their role as a central aspect of primary care, with the patient at the center of the care process.  
• Variation in medical knowledge was described as a barrier to enhanced belonging by some MD’s who feel that they are solely responsible for the patient care.  
• Enhanced EHR systems, patient portals, emails, and reminder calls are viewed as enabling a sense of belonging to the practice and team.  
• A wide range of responses that view the larger organization as leadership that either promotes patient care or is focused on costs/revenue often related to patient volume.  
• Lack of resources and limited time with patients is seen by some as a major challenge to delivering great care.  
• Increased complexity in the patient population is a major challenge.  
• Leading with a relational focus, i.e., person focused leadership with staff, colleagues, and patients was mentioned by several respondents. | **Nurse** | **Construct** | **Role** | **Team** | **Participation** | **Solidarity Culture** | **Leadership Facilitation** |
| **Nurse** | • Relationship with doctors has a range of responses with some nurses experiencing high levels of respect and autonomy, while others struggle.  
• Role clarity is a major theme driving positive or negative feelings about communication and relationship with physicians.  
• Nurses report having good relationships with MA’s and improved communication with such additions as EHR notes and instant messaging.  
• Care manager role is a connector between patients and providers, and between provider and provider.  
• The Case Manager role is appreciated and respondents report feeling engaged with patients and on the team.  
• There is a wide variation in terms of how active the role of nurses is between practices. When RN’s feel supported and able to practice at the top of their license they report active participation, but when their role feels limited or not appreciated they struggle to be active team members.  
• Care manager nurses feel more empowered and describe how they contribute information, can actively engage and challenge patient care decisions, and propose new ideas for making decisions.  
• Nurses who have more tenure on the team report feeling closer to the team.  
• Nurses with active cross-boundary between patients and various care providers describe a sense of belonging and team spirit.  
• Practices with active team huddles and participative decision making have more engaged nurses that feel like they can share their perspective during meetings.  
• Nurses that can work independently but collaborate daily with other team members describe friendships among staff members and a clear sense of belonging.  
• Scope of practice is an issue for some nurses that feel they aren’t permitted to practice at the top of their license.  
• In some instances, challenges of time pressure and competing priorities are perceived as being a leadership challenge.  
• Staffing issues and overloaded care providers are the top concerns of nurses.  
• Case managers report having good relationships with management and feeling supported by leadership.  
• Nurses, especially NP’s and Care Managers describe their leadership role as important to the practice and patients, i.e., leading team huddles and meetings.  
• There is variation in how connected nurses feel about the larger organization leadership ranging from quite positive to negative. | **Construct** | **Role** | **Team** | **Participation** | **Solidarity Culture** | **Leadership Facilitation** |
| Medical Assistant | MA’s often reported good connections with doctors, nurses, and other team members.  
|                   | • Co-location is important for good communication for medical assistants.  
|                   | • Challenges with external team members, i.e., call center coordination, was mentioned by several MA’s who often interact with the center.  
|                   | • MA’s act as connectors and boundary spanners between core roles (MD, RN) and ancillary staff (educators, nutritionists, and health coaches).  
|                   | • Establishing clear communication and knowledge sharing was described by several respondents as a central aspect of their daily work.  
| Respondents | • Respondents describe their supporting role in patient centered care (patient advocate role) as being very active and important to the team.  
|             | • MA’s often work in close partnership with patients and team members and talk about improving the information flow between people as well as the ability to propose alternatives where appropriate.  
|             | • In some cases, MA’s describe acting as translators for patients and see their role as a patient and family member advocate.  
|             | • Strong emphasis for many respondents about teamwork, and reaching across disciplines to take care of patients.  
| MA’s | • MA’s describe a strong sense of belonging to the team.  
|      | • There appears to be some division and differences among MA’s who are contract vs full time staff members in how engaged and embedded they feel on the team.  
|      | • Respondents describe a strong commitment to the patients and communities they serve with overlapping professional and personal affiliations to the community.  
|      | • MA’s feel very close to the patient populations and communities, and describe their role with “family and friendship” type language.  
| Respondents | • Respondents often feel supported in terms of resources and time to do their work.  
|             | • Some MA’s describe a frustration with the additional paper work and EHR system with changing leadership.  
|             | • MA’s feel supported in their role by physicians and the larger organizations – this appears to be in part because of role clarity and a clear mandate about what the work consists of each day.  
|             | • Delegation seems to work well in many practices where MA’s feel a clear sense of support for their work by the larger organization and other team members. |
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Shaw, R. 1990. Mental health treatment teams. *Groups that work (and those that don’t).* *Creating conditions for effective teamwork*: 330-357.


3. Improving Care Transitions Management: Examining the Role of Accountable Care Organization Participation and Expanded Electronic Health Record Functionality

Abstract

Objective: Examine the extent to which physician organization participation in an Accountable Care Organization (ACO) and electronic health record (EHR) functionality are associated with greater adoption of care transition management (CTM) processes.

Data Sources/Study Setting: 1,398 physician organizations from the third National Study of Physician Organization survey (NSPO3), a nationally representative sample of medical practices in the United States (January 2012 – May 2013).

Study Design: We used data from the third National Study of Physician Organization survey (NSPO3) to assess medical practice characteristics including; CTM processes, ACO participation, EHR functionality, practice type, organization size, ownership, public reporting, and pay for performance participation.

Data Collection/Extraction Methods: Multivariate linear regression models estimated the extent to which ACO participation and EHR functionality were associated with greater CTM capabilities, controlling for practice size, ownership, public reporting, and pay for performance participation.

Principal Findings: Approximately half (52.4%) of medical practices had a formal program for managing care transitions in place. In adjusted analyses, ACO participation (p<0.001) and EHR functionality (p<0.001) were independently associated with greater use of CTM processes among medical practices.

Conclusions: The growth of ACOs and similar provider risk-bearing arrangements across the country may improve the management of care transitions by physician organizations.

Key Words: care transitions, accountable care organizations, electronic health records, public reporting, and pay-for-performance.
Many medical care transitions occur throughout the healthcare delivery system and can involve complex coordination among providers and patients, i.e. provider to provider transitions, inpatient to outpatient transitions, and in-hospital transitions (Arora & Farnan, 2008). Managing care transitions from inpatient to outpatient settings is critical to improving patient outcomes and reducing cost, but little is known about the organizational characteristics of physician practices that can promote or deter the effective management of hospital to outpatient care transitions. About half of adults in the United States experience a medical error after a hospital discharge and 19-23% suffer an adverse event, most often related to a drug event occurring during inpatient to outpatient care transitions (Kripalani, Jackson, Schnipper, & Coleman, 2007). Harmful and costly hospital readmissions resulting from poor care transitions are increasingly scrutinized by U.S. payers and policymakers in order to promote quality and efficiency while reducing total costs of care (Bisognano & Boutwell, 2009). Better management of care transitions is particularly important for the growing number of adults with multiple chronic illnesses (Vogeli et al., 2007).

Previous research underscores the challenges of implementing and sustaining new organizational processes to support inpatient to outpatient care transitions (Kripalani, Theobald, Anctil, & Vasilevskis, 2014). As more physician practices participate in federal and commercial accountable care organizations (ACOs), assessing the extent to which ACO participation supports the development and use of care transition processes among medical practices is an important area for investigation. The literature on care transitions management programs is extensive and many intervention programs have been developed, for example; Care Transition Intervention (Coleman, Parry, Chalmers, & Min, 2006); Transitional Care Model (Naylor, 2006); Project RED (Altfeld et al., 2013); Project BOOST (Hansen et al., 2013). Each of these bundled interventions include one or more of the following components: care coordinator roles, continuity of care between hospital and home, patient engagement, multi-disciplinary care approach, collaboration and communication, follow-up visits, medication reconciliation, electronic information exchanges, early warning systems, and care coordination and discharge planning (Hesselink et al., 2012). Evidence is still accumulating about structures and processes to improve the management of care transitions; however, little is known about organizational factors that promote the development of care transitions management (CTM) processes.

ACOs are increasingly held accountable for the cost and quality of care delivered to a defined group of patients (Shortell, Wu, Lewis, Colla, & Fisher, 2014b). ACOs structure financial incentives so that participating medical practices and hospitals invest in developing and improving CTM processes. Recent estimates indicate that there are more than 700 ACOs nationally and they are in almost in every state with about 55% of people living in geographic areas with an active ACO (Muhlestein, 2015). Roughly half of ACOs are public, with three different initiatives launched by CMS - a Pioneer program, shared savings program, and an advanced payment model (Shortell et al., 2015). Prior studies have shown that ACOs may improve quality and cost, (McWilliams, Landon, Chernew, & Zaslavsky, 2014; Song et al., 2012b) increase teamwork, and promote the adoption of electronic health information (Shortell et al., 2014a). Many consider the ability to coordinate care effectively through the use of care management processes and programs is central to achieving such results (Berwick, 2011). We
examine the association of ACO participation and electronic health record functionality with the use of CTM processes by medical practices, controlling for practice type, size, public reporting, and pay for performance participation. Moreover, we explore the potential mediating role of EHR functionality in explaining the relationship between ACO participation and greater use of CTM processes. Examining these relationships contributes to the literature on the management of inpatient to outpatient care transitions by highlighting the organizational factors that may promote or impede the development of CTM capabilities.

Medical practices participating in an ACO are more likely to be large in size, owned by physicians, use team-based care, have more primary care providers relative to specialists, and more likely to participate in public reporting and pay-for-performance programs (Shortell et al., 2014a). Controlling for these variables, we hypothesize that medical practices that participate in an ACO will have more CTM processes in place compared to practices that do not. Most CTM processes involve data analytic systems and/or electronic clinical information technology to manage patient transitions between the hospital and primary care practices (Hesselink et al., 2012). A high-level of EHR functionality is central to implementing the Coleman transitional care model, which relies on strong electronic communication across settings of care (Coleman et al., 2006; Naylor, 2006). In a systematic review, Hesselink and colleagues reviewed 36 major care transitions studies and found that 94.4% of these studies reported at least one electronic health record function to facilitate more effective care transitions, including electronic patient summaries, discharge plans, electronic discharge notifications, and electronic patient information sharing between hospital and physicians (Hesselink et al., 2012). Given the preponderance and ubiquity of EHR functionality that enhances transitional care efforts of ACOs, we hypothesize that EHR functionality will mediate the positive association of ACO participation and medical practice use of CTM processes.

Methods

Data

The data in this study use the third wave of the National Study of Physician Organizations (NSPO3) (Wiley et al., 2015). NSPO3 consisted of a forty-minute telephone survey of medical practices conducted between January 2012 and November 2013. The key respondents were either lead physicians or administrators most knowledgeable about the survey content in a nationally representative sample of physician practices and medical groups. Each of the participating respondents was paid $200. Medical groups of less than 20 physicians were eligible if at least 40% of physicians in the group were primary care providers or specialists including; cardiologists, endocrinologists, or pulmonologists, given that the focus of the study was on patients with chronic illnesses including asthma, congestive heart failure, depression, and diabetes. For medical groups of 20+ providers at least 30% of physicians had to be primary care providers or specialists treating these conditions for study inclusion. The sample design was a stratified random sample of US medical practices sampled from the IMS Healthcare Organizational Services Database in May 2011. The survey response rate was 50% yielding 1398 practices for analysis. In the NSPO3 survey, population ratio-adjusted weights were determined based on sampling probabilities with post-stratification adjustments. The weights were trimmed within primary sampling units based on the median plus three times the interquartile range, to avoid outliers that could adversely affect the results of the variances.
Dependent Variable

Care Transition Management (CTM) Processes. CTM processes were measured using a 7-point scale comprised of seven dichotomous “Yes vs. No” questions (α=0.71, range 0–7). Respondents were asked whether or not the practice had; (1) a formal care transitions program, and then asked whether the following CTM processes were in place: (2) physician notification by hospital within 2 hours after admitting patient to hospital, (3) physician notification by hospital within 2 hours after admitting patient to emergency department, (4) physicians receipt of patient discharge summary within 48 hours from hospital, (5) physician receipt of patient discharge summary within 48 hours from emergency department, (6) patient contacted within 48 hours of hospital discharge (support services and schedule follow-up), (7) patient contacted within 48 hours of discharge for medication understanding/reconciliation.

Independent Variables

ACO Participation. Respondents were asked whether they belonged to an ACO. The ACO participation question had 3 response options: 1) participation in an ACO, 2) planning to participate within the next 12 months; and 3) do not belong and are not planning to participate in an ACO. For ease of interpretation, we created a binary ACO participation variable by combining “planning” and “do not belong” as not participating an in ACO.

EHR functionality was measured by a 14-item composite measure of EHR functionality (α=0.89, range 0–14) based on the sum of the 14 dichotomous questions that assessed whether a majority of physicians use the EHR for patient problem lists, progress notes, prompts and reminders not specific to chronic conditions management, alerts for abnormal test results, electronic hospital discharge summaries at the main hospital, sending prescriptions directly to pharmacies, and communicating with patients via email. The 14-item EHR functionality includes functions consistent with Hesselink et al. (Hesselink et al., 2012). Recent studies of ACO’s have found that EHR functionality is positively associated with being part of an ACO (Shortell et al., 2014a; Wiley et al., 2015). To enable comparability with previously published research, we used the same variables to measure EHR functionality (Rodriguez et al., 2015b; Wiley et al., 2015). The expanded EHR functionality measure also includes information technology processes highlighted in Naylor’s care transition intervention and Coleman’s transitional care model (Naylor, 2006; Coleman et. al., 2006). The Appendix describes each of the 14 items comprising the EHR functionality composite.

Control Variables

We control for internal practice capabilities and external incentives found to be associated with both ACO participation and greater EHR functionality in prior research (McClellan, Casalino, Shortell, & Rittenhouse, 2013; Rittenhouse et al., 2011a; Shortell et al., 2014a; Wiley et al., 2015). Specifically, care transitions between the hospital and physician practices may be influenced by the composition of primary care physicians versus specialists working in the practice. Specialists and primary care physicians may receive different admission and discharge information at different times, and multi-specialty groups could also differ from each of these categories, so we controlled for practice type. We also controlled for practice size, ownership, public reporting, and pay for performance participation. Practice size may also be associated with care transitions, as larger practices have more resources to invest in care management and transition processes. Practice ownership may also influence care transition capabilities, as practices that belong to an HMO or integrated system could have more direct
communication across organizational boundaries and more advanced health information technology capabilities. External incentives in the form of public reporting of patient satisfaction and quality and pay for performance participation may also incentivize practices to enhance their care transition capabilities as financial reimbursement is often tied to such outcome measures as re-admissions (Shadmi et al., 2015).

Analysis

First, we examined response means and distributions for each of the seven CTM processes individually and then rank-ordered them from most used to least used. Bivariate analyses for each of the seven care transition items were analyzed, stratified by practices participating in an ACO vs. practices not participating in an ACO. For these analyses, we used one-way analysis of variance to examine the extent to which ACO participation, EHR functionality, practice type, organization size, ownership, public reporting, and pay for performance participation differed based on high, medium, and low categories of the CTM composite. Next, multivariate linear regression models estimated the relative association of ACO participation and EHR functionality, controlling for practice capabilities, external incentives. We used state fixed effects to control for state-level policy differences that may shape ACO participation, EHR functionality, and use of CTM processes. Since our CTM composite measure is a count measure (range: 0-7), we estimated our multivariate model using Poisson regression as a sensitivity analysis to assess the robustness of the main results with an alternative model specification. To examine the potential mediating impact of greater EHR functionality on the relation of ACO participation and greater CTM processes, we compared results of a model that included ACO but not EHR functionality (Model 1) and a model that included both ACO and EHR functionality (Model 2). We estimated the potential mediating effect by calculating the percentage change in the ACO coefficient between these two models. We considered a change of more than 20% in the ACO coefficient (Shadish et al. 2002) once EHR functionality was included, as evidence that more advanced EHR functionality may mediate the positive association of ACO participation and greater CTM processes.

As an additional sensitivity analysis, we estimated the regression models using a dichotomous measure of “basic EHR functionality” instead of the 14-item EHR functionality composite to explore the extent to which basic EHR functionalities vs. advanced features were driving the overall association of EHR functionality and CTM processes (Model 3). The electronic health record functions included in defining basic functionality included; a patient problem list, progress notes, patient medications, laboratory results, and electronic prescribing (Furukawa et al., 2014).

All results were weighted to be nationally representative of physician practices, adjusting for the complex survey design of NSPO3 and selection and nonresponse probabilities (Wiley et al., 2015).

Results

Approximately half (52.4%) of practices had a formal program for managing care transitions in place. Physicians receiving patient discharge summaries from the hospital and ED had the highest levels of practice adoption (77% and 69%) were the most commonly adopted CTM processes followed by 2-hour notifications of admission (54% and 51%), and contacting
patients post discharge (50% and 41%). Practices participating in ACOs were more likely to use each of the individual care transition processes except for physicians receiving discharge summaries from the hospital, where there were no significant differences in the adoption of this CTM process between ACO vs. non-ACO practices (Figure 1).

Table 1 highlights the terciles of CTM processes and differences in organizational characteristics between practices with different levels of CTM capabilities - “low” (0-2 capabilities) vs. “medium” (3-5 capabilities) vs “high” (6-7 capabilities). In bivariate analyses, practices with high CTM capabilities were more likely to be ACO participants (26.5% vs. 19.3% overall, p<0.001). Practices with medium CTM capabilities had greater proportions of primary care physicians relative to specialists (78.1% vs. 71.65 overall, p<0.001), while practices with high CTM capabilities were more likely to be mixed specialty practices (22.1% vs. 17.2, p<0.05), and specialist practices (11.7% vs. 11.2, p=<.05). Practices with medium CTM capabilities had the highest levels of participation in pay-for-performance (61.6% vs. 49%, p<0.001) and public reporting (54.5 vs. 47.5%, p<0.001) programs.

In the multivariate linear regression analysis, ACO participation (β=0.81, p<0.001) was significantly associated with greater care transition management capabilities (Table 2, model 1). The ACO effect size (β=0.88, p<0.001) was similar when the model included EHR functionality (Table 2, model 2). EHR functionality was moderately associated with greater CTM capabilities. Sensitivity analysis using a Poisson regression model resulted in similar findings as the main linear regression model.

As the ACO effect did not attenuate when EHR functionality was considered (Model 1 vs. Model 2), there is no evidence of a mediating role of EHR functionality in explaining the ACO participation - CTM capabilities relationship. These results suggest that ACO participation and EHR functionality have independent influences on the development CTM capabilities.

Our additional sensitivity analysis (Model 3) revealed that a dichotomous measure of basic EHR functionality was associated with less adoption of care transitions management processes (effect=−0.81, p<0.001). These results indicate that practice use of more advanced or expanded electronic health record functions, such as; physicians using EHR’s for drug interactions, reminders, and abnormal test results, collecting clinical quality data, electronic access for patient emergency department visits, hospital discharge summaries, and pharmacy records, and patient email communication, account for the positive association of EHR functionality and more developed CTM processes.

Discussion

We used a nationally representative sample of medical practices to examine the association of ACO participation, EHR functionality and medical practices’ care transition management capabilities and found that practices participating in ACO are more likely to adopt processes central to managing care transitions compared to non-ACO participants, controlling for practice type, size, ownership, public reporting, and pay for performance. EHR functionality was positively and independently associated with more CTM processes, consistent with previous research highlighting that EHR can enable the development of CTM capabilities (McClellan et al., 2013; Robinson et al., 2009; Wiley et al., 2015). We did not find support for our hypothesized mediating effect of EHR on the relationship between ACO participation and CTM capabilities. Rather, ACO participation and expansion of EHR functionality may have
independent positive influences on the development of care transition management capabilities. The results suggest that ACO participation without internal efforts to expand EHR functionality may be limited in expanding the use of structures and processes for improving care transitions.

Our results should be considered within the context of several limitations. First, other delivery system reforms might have fostered the development of CTM capabilities among practices. For example, the role of the American Recovery and Reinvesting Act (ARRA) and included Health Information Technology for Economic and Clinical Health (HITECH) Act, has greatly impacted the use of chronic care management processes, including care transitions (Sharma, Chandrasekaran, Boyer, & McDermott, 2016) and the Center for Medicare and Medicaid (CMS) has implemented several reimbursement and payment mechanism changes to hospital re-admissions that can cultivate the development and improvement of CTM capabilities, e.g., financial penalties for preventable readmissions and identifying clinical reasons for readmission like surgical site infection and obstructions (Leape, 2015; Merkow et al., 2015; O’Brien et al., 2015). Our analyses controlled for some aspects of delivery reform like public reporting of outcomes and pay for performance, but these variables are not exhaustive and other variables could be considered. Many of these improvement initiatives, however, are implemented at the state-level and we use state-fixed effects to control for state-specific policy differences that can impact the development of CTM processes. Second, while identifying the most informed practice leader for addressing factual questions, the responses are based on a single respondent and resources did not permit independent validation. It is also possible that practices that were included in our study differ from those that chose not to participate. The 50% response rate is consistent with other recent surveys of physician organizations and prior articles have described the slight differences between respondent and non-respondent practices in the NSPO3 survey (Wiley et al., 2015). Our analyses were weighted to partially account for these differences. Third, it is also possible that our analysis omitted variables important CTM structures and processes, e.g., the use of a care transitions nurse (Coleman et al. 2006), and thus our estimates may over or underestimate because of omitted variable bias. CTM composite measure does not cover all components of care transitions, for example; employing a transitional care nurse or care coordinator, home visits, medication self-management support, and other multi-disciplinary approaches to managing care transitions (Coleman et al., 2004; Naylor, 2006). Further studies could explore these components alongside the CTM processes we examined. Finally, no inferences can be drawn regarding causality, as it is certainly possible that practices with greater CTM capabilities or EHR functionality are more likely to join ACOs.

The CTM process measure used in our study does not cover all components of care transitions, for example; employing a transitional care nurse or care coordinator for care transitions management, home visits, medication self-management support, and other multi-disciplinary approaches to managing care transitions (Coleman et al., 2004; Naylor, 2006). Further studies could explore these components alongside the care transition management processes we examined. Additional next steps for research in this area could include; mixed methods or qualitative studies of the development, improvement, and sustainment of CTM structures and processes through ACO incentives, describing new and innovative care transition capabilities fostered through ACO participation, and utilizing claims data to explore the relation...
of CTM capabilities, patient-centered outcomes of care and hospital readmission rates. Since most care transitions studies focus on the process between the hospital and home or physician practice visit, it will be important to consider upstream care transition processes.

The effective management of care transitions is foundational to a well-coordinated healthcare delivery system, particularly given the growing number of aging Americans with chronic illness that receive care in a wide range of care settings. Improving care coordination and promoting EHR functionality may aid in achieving the triple aim of better care, improved population health, at reduced rate of growth in costs. The current research highlights the positive association of ACO participation and greater EHR functionality with the greater care transition management capabilities among practices. Our results highlight that practices may need to move beyond adopting basic EHR functions and move toward the use of advanced features that support the management of care transitions. The growth of ACO risk-bearing contracts in both the governmental and commercial sectors is likely to be associated, in part, with the expansion of medical practice capabilities to more effectively manage care transitions.
ACO practices and non-ACO comparisons were statistically significant at the p <0.001 level, with exception of the question assessing whether physicians receive patient discharge summary within 48 hours, which had a significance level of p<0.05.
Table 1. Comparison of Practice Characteristics by Extent of Practice Adoption of Care Transition Management Processes (CTM)

<table>
<thead>
<tr>
<th>Practice Characteristic</th>
<th>All Practices (%)</th>
<th>Low CTM Practices (%)</th>
<th>Medium CTM Practices (%)</th>
<th>High CTM Practices (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n=1,398)</td>
<td>(n=409)</td>
<td>(n=431)</td>
<td>(n=558)</td>
</tr>
<tr>
<td>Accountable Care Organization (ACO) Participation (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19.3</td>
<td>14.3</td>
<td>14.9</td>
<td>26.5</td>
<td>***</td>
</tr>
<tr>
<td>Specialty Mix</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100% Primary Care (%)</td>
<td>71.6</td>
<td>71.7</td>
<td>78.1</td>
<td>66.2</td>
</tr>
<tr>
<td>33-99% Primary Care (%)</td>
<td>17.2</td>
<td>17.5</td>
<td>11.1</td>
<td>22.1</td>
</tr>
<tr>
<td>&lt;33% Primary Care (%)</td>
<td>11.2</td>
<td>10.8</td>
<td>10.8</td>
<td>11.7</td>
</tr>
<tr>
<td>Practice Size</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-2 Physicians (%)</td>
<td>55.5</td>
<td>55.1</td>
<td>52.2</td>
<td>58.5</td>
</tr>
<tr>
<td>3-9 Physicians (%)</td>
<td>32.9</td>
<td>29.1</td>
<td>39.1</td>
<td>30.6</td>
</tr>
<tr>
<td>10-19 Physicians (%)</td>
<td>3.5</td>
<td>4.4</td>
<td>1.9</td>
<td>4.3</td>
</tr>
<tr>
<td>20+ Physicians (%)</td>
<td>8.1</td>
<td>11.5</td>
<td>6.8</td>
<td>6.7</td>
</tr>
<tr>
<td>Ownership</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physician Owned (%)</td>
<td>82.7</td>
<td>87.1</td>
<td>77.4</td>
<td>83.9</td>
</tr>
<tr>
<td>Hospital or Health System Owned (%)</td>
<td>13.2</td>
<td>7.5</td>
<td>20.0</td>
<td>11.6</td>
</tr>
<tr>
<td>Federally Qualified Community Health Center Owned (%)</td>
<td>4.1</td>
<td>5.4</td>
<td>2.6</td>
<td>4.5</td>
</tr>
<tr>
<td>Pay for Performance Index</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>no points (%)</td>
<td>49.0</td>
<td>47.1</td>
<td>61.6</td>
<td>39.9</td>
</tr>
<tr>
<td>1 point (%)</td>
<td>29.4</td>
<td>30.9</td>
<td>26.9</td>
<td>30.4</td>
</tr>
<tr>
<td>2 points (%)</td>
<td>13.1</td>
<td>11.7</td>
<td>5.4</td>
<td>20.5</td>
</tr>
<tr>
<td>3 points (%)</td>
<td>8.5</td>
<td>10.3</td>
<td>6.1</td>
<td>9.1</td>
</tr>
<tr>
<td>Public Reporting Index</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>no points (%)</td>
<td>47.5</td>
<td>50.4</td>
<td>54.5</td>
<td>39.7</td>
</tr>
<tr>
<td>1 point (%)</td>
<td>20.4</td>
<td>18.7</td>
<td>21.3</td>
<td>20.1</td>
</tr>
<tr>
<td>2 points (%)</td>
<td>32.1</td>
<td>30.9</td>
<td>24.2</td>
<td>39.6</td>
</tr>
</tbody>
</table>

Note: Low CTM practices had 1-2 CTM processesees, medium CTM practices had 3-5 CTM processes, and high CTM practices had 6-7 CTM processes; * p<0.05, ** p<0.01, *** p<0.001 indicate statistically significant differences for overall group comparisons.
Table 2: The Association of ACO Participation, Electronic Health Record Functionality, and Care Transitions Management Processes

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1 ACO</th>
<th>Model 2 ACO + EHR(14)+</th>
<th>Model 3 ACO + EHR(5)+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accountable Care Organization (ACO) Participation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not Participating in an ACO (ref)</td>
<td>-</td>
<td>-.814 ***</td>
<td>-.826 ***</td>
</tr>
<tr>
<td>Participating in an ACO</td>
<td>.814 ***</td>
<td>-.822 ***</td>
<td>-</td>
</tr>
<tr>
<td>Electronic Health Record Functionality</td>
<td>-</td>
<td>.043 **</td>
<td>-.812 ***</td>
</tr>
<tr>
<td>Specialty Mix</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 33% primary care physicians (ref)</td>
<td>-</td>
<td>-.043 **</td>
<td>-.591*</td>
</tr>
<tr>
<td>Between 33-100% primary care</td>
<td>1.083***</td>
<td>1.126 ***</td>
<td>.530**</td>
</tr>
<tr>
<td>100% primary care</td>
<td>-.530**</td>
<td>-.495**</td>
<td>-.441*</td>
</tr>
<tr>
<td>Practice Size</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-2 physician practice (ref)</td>
<td>-</td>
<td>-.663***</td>
<td>-.827***</td>
</tr>
<tr>
<td>3-9 physicians</td>
<td>-.663***</td>
<td>-.741***</td>
<td>-</td>
</tr>
<tr>
<td>10-19 physicians</td>
<td>-.960***</td>
<td>-1.091***</td>
<td>-.858*</td>
</tr>
<tr>
<td>20+ physicians</td>
<td>-1.69***</td>
<td>-1.838 ***</td>
<td>-1.185 ***</td>
</tr>
<tr>
<td>Ownership</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physician owned (ref)</td>
<td>-</td>
<td>-</td>
<td>-.277</td>
</tr>
<tr>
<td>Hospital or system owned</td>
<td>.064</td>
<td>-.233</td>
<td>.749***</td>
</tr>
<tr>
<td>Federally Qualified Health Center owned</td>
<td>-.206</td>
<td>-.277</td>
<td>.674</td>
</tr>
<tr>
<td>Public Reporting Index</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neither patient satisfaction nor quality is publicly reported (ref)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Either Quality or Patient Satisfaction</td>
<td>.034</td>
<td>-.042</td>
<td>.129</td>
</tr>
<tr>
<td>Both Quality and Patient Satisfaction</td>
<td>.559***</td>
<td>.521***</td>
<td>.432*</td>
</tr>
<tr>
<td>Pay for Performance Index</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Points (ref)</td>
<td>-</td>
<td>.489***</td>
<td>.238</td>
</tr>
<tr>
<td>One Point</td>
<td>.489***</td>
<td>.547***</td>
<td>.204</td>
</tr>
<tr>
<td>Two Points</td>
<td>1.12***</td>
<td>1.086***</td>
<td>.231</td>
</tr>
<tr>
<td>Three Points</td>
<td>-.099</td>
<td>-.209</td>
<td>-.194</td>
</tr>
<tr>
<td>Adjusted R-Squared</td>
<td>.268</td>
<td>.547***</td>
<td>.272</td>
</tr>
<tr>
<td>Adjusted F Value</td>
<td>16.07 ***</td>
<td>15.62 ***</td>
<td>7.52 ***</td>
</tr>
</tbody>
</table>

* p<0.05, ** p<0.01, *** p<0.001; The results also control for state fixed effects to adjust regression model estimates for state health policies and resources that could impact the development of care transitions management processes.

+ EHR(14) is the 14-item full electronic health record functionality, and the EHR(5) is the basic 5-item electronic health record functionality.
<table>
<thead>
<tr>
<th>Appendix. Expanded Electronic Health Record Functions Index (Range: 0-14 points) Adapted from (Rodriguez et. al., 2015; Wiley et al, 2015).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronic Documentation</td>
</tr>
<tr>
<td>- Practice makes available an electronic medical record (EMR) that contains the patient’s medications</td>
</tr>
<tr>
<td>- Majority of physicians in the practice use the EMR for the patient’s problem list</td>
</tr>
<tr>
<td>- Majority of physicians in the practice use the EMR for progress notes</td>
</tr>
<tr>
<td>Clinical Decision Support</td>
</tr>
<tr>
<td>- Majority of physicians in the practice use the EMR for potential drug interactions</td>
</tr>
<tr>
<td>- Majority of physicians in the practice use the EMR for prompts and reminders</td>
</tr>
<tr>
<td>- Majority of physicians in the practice use the EMR for alerts on abnormal test results</td>
</tr>
<tr>
<td>Quality Measurement</td>
</tr>
<tr>
<td>- Practice uses EMR to collect data for clinical quality measures</td>
</tr>
<tr>
<td>Physician order entry</td>
</tr>
<tr>
<td>- Majority of physicians in the practice transmit prescriptions electronically</td>
</tr>
<tr>
<td>Electronic access to data</td>
</tr>
<tr>
<td>- Majority of physicians have electronic access to clinical information on patient ER visits</td>
</tr>
<tr>
<td>- Majority of physicians have electronic access to clinical information on patient hospital discharge summaries</td>
</tr>
<tr>
<td>- Majority of physicians have electronic access to laboratory results</td>
</tr>
<tr>
<td>- Majority of physicians have electronic access to pharmacy record of prescriptions filled by patients</td>
</tr>
<tr>
<td>Electronic connectivity for patients</td>
</tr>
<tr>
<td>- Majority of physicians communicate with patients by email</td>
</tr>
<tr>
<td>- Patients can view their medical record online</td>
</tr>
</tbody>
</table>
References


Hackman, J. R. 1990. *Groups that work (and those that don't): creating conditions for effective teamwork.*


R手中的脚本内容。


