



Improving Health Care Delivery: Patient Care Integration and Manager Commitment

Citation

Fryer, Ashley-Kay. 2016. Improving Health Care Delivery: Patient Care Integration and Manager Commitment. Doctoral dissertation, Harvard University, Graduate School of Arts & Sciences.

Permanent link

<http://nrs.harvard.edu/urn-3:HUL.InstRepos:33493267>

Terms of Use

This article was downloaded from Harvard University's DASH repository, and is made available under the terms and conditions applicable to Other Posted Material, as set forth at <http://nrs.harvard.edu/urn-3:HUL.InstRepos:dash.current.terms-of-use#LAA>

Share Your Story

The Harvard community has made this article openly available.
Please share how this access benefits you. [Submit a story](#).

[Accessibility](#)

Improving Health Care Delivery:
Patient Care Integration and Manager Commitment

A dissertation presented

by

Ashley-Kay Fryer

to

The Committee on Higher Degrees in Health Policy

in partial fulfillment of the requirements

for the degree of

Doctor of Philosophy

in the subject of

Health Policy

Harvard University

Cambridge, Massachusetts

May 2016

© 2016 Ashley-Kay Fryer
All rights reserved.

IMPROVING HEALTH CARE DELIVERY: PATIENT CARE INTEGRATION AND MANAGER COMMITMENT

Abstract

This dissertation investigates how patient-perceived integrated care and manager commitment influence the improvement and integration of health care delivery. Using survey instruments, across three studies I examine potential mechanisms for improving health care delivery: patient perceptions of integrated care, a physician organization care management program, and manager commitment to a quality improvement program.

In Chapter Two, I examine how patient-perceived integrated care relates to utilization of health services. I assess relationships between provider performance on 11 domains of patient-reported integrated care and rates of emergency department (ED) visits, hospital admissions, and outpatient visits. I find better performance on two of the surveyed dimensions of integrated care are significantly associated with lower ED visit rates: information flow to other providers in doctor's office and responsiveness independent of visits. Better performance on three dimensions of integrated care is associated with lower outpatient visit rates: information flow to specialist, post-visit information flow to the patient, and continuous familiarity with patient over time. No dimension of integration is associated with hospital admission rates.

In Chapter Three, I use the same patient sample to evaluate the achievement of integrated care by a care management program (CMP) from the perspective of older patients with multiple chronic conditions. Survey results suggest that patient perceptions of integrated care vary substantially among survey items and domains. CMP enrollment is significantly associated with greater patient perceptions of care integration in two domains: connecting patients to home services and being responsive independent of visits, domains that were targeted for improvement

by the CMP. Enrollment in the CMP is not significantly associated with other domains of integration.

In Chapter Four, I assess whether and how senior and middle manager commitment to a falls reduction quality improvement (QI) program is associated with the successful implementation of the program. Survey results suggest managers' affective commitment to the program is positively associated with program implementation success across all manager levels surveyed (senior managers, middle managers, and assistant middle managers). Stronger frontline worker support for the falls QI program partially mediates the relationship between manager affective commitment and falls program implementation success for middle managers and assistant middle managers, but not for senior managers. Manager affective commitment to the falls program mediates the relationship between organizational support for the falls program and program implementation success across all manager levels.

Together, these studies advance our understanding of how patient-perceived integrated care, care management programs, and manager commitment to a quality improvement program influence the integration and improvement of health care delivery. Findings demonstrate how patient reports of integration can be useful guides to improving health systems. Dissertation results also provide empirical evidence of a relationship between manager commitment—at both the middle and senior manager levels—and successful QI program implementation. In addition, these studies provide practical implications for physicians and hospital managers seeking ways to improve the quality and integration of health care delivery.

Table of Contents

| | |
|---|------|
| Abstract..... | iii |
| Table of Contents..... | v |
| List of Tables and Figures | vii |
| List of Appendices..... | viii |
| Acknowledgements | x |
| Executive Summary..... | 1 |
| Chapter One: Background and Significance | 7 |
| 1.1 Integrated Patient Care | 7 |
| 1.1.1 The need for integrated patient care | 7 |
| 1.1.2 Defining integrated patient care..... | 9 |
| 1.1.3 The importance of the patient’s perspective on integrated care | 12 |
| 1.1.4 The Patient Perceptions of Integrated Care Survey | 14 |
| 1.1.5 Harnessing the potential of patients' perspectives of integrated care: Research opportunities and dissertation aims..... | 16 |
| 1.2 Quality Improvement Implementation and Organizational Change | 19 |
| 1.2.1 The challenges of quality improvement implementation and implications for health care organizations | 21 |
| 1.2.2 Theories of implementation and organizational change | 24 |
| 1.2.3 Commitment to organizational change | 28 |
| 1.2.4 Harnessing the potential of manager commitment to quality improvement: Research opportunities and dissertation aims..... | 35 |
| 1.2.5 Development of the Manager Influence over Quality Improvement Implementation Survey .. | 37 |
| 1.3 Summary | 41 |
| Chapter Two: Patient Perceptions of Integrated Care and their Relationship to Utilization of Emergency, Inpatient and Outpatient Services..... | 43 |
| Abstract | 43 |
| 2.1 Introduction | 44 |
| 2.2 Methods..... | 46 |
| 2.2.1 Survey instrument | 46 |
| 2.2.2 Survey sample..... | 47 |
| 2.2.3 Survey administration | 48 |
| 2.2.4 Demographic data | 48 |
| 2.2.5 Health care utilization data | 48 |
| 2.2.6 Data analysis | 49 |
| 2.2.7 Sensitivity analyses..... | 50 |
| 2.3 Results | 52 |
| 2.3.1 Survey response and non-response analysis | 52 |
| 2.3.2 Characteristics of respondents | 52 |
| 2.3.3 Relationship of patient perceptions of integrated care to utilization of care | 54 |
| 2.4 Discussion | 58 |
| Chapter 3: Achieving Care Integration from the Patients’ Perspective: Results from a Care Management Program | 61 |
| Abstract | 61 |
| 3.1 Introduction..... | 62 |
| 3.2 Methods..... | 64 |

| | |
|---|-----|
| 3.2.1 MGH care management program | 64 |
| 3.2.2 Survey instrument | 66 |
| 3.2.3 Survey sample..... | 68 |
| 3.2.4 Survey administration..... | 68 |
| 3.2.5 Demographic data | 69 |
| 3.2.6 Data analysis | 69 |
| 3.3 Results | 70 |
| 3.3.1 Sample characteristics..... | 71 |
| 3.3.2 Perceptions of integrated patient care..... | 73 |
| 3.4 Discussion | 80 |
| Chapter 4: Successful Quality Improvement Implementation: The Role of Senior and Middle Manager Commitment | 84 |
| Abstract | 84 |
| 4.1 Introduction | 85 |
| 4.2 Theory and conceptual framework..... | 87 |
| 4.3 Methods..... | 92 |
| 4.3.1 Study design and context | 92 |
| 4.3.2 Variables and measures | 94 |
| 4.3.3 Data analysis | 96 |
| 4.3.4 Sensitivity analyses..... | 98 |
| 4.4 Findings..... | 99 |
| 4.4.1 Survey response | 99 |
| 4.4.2 Characteristics of respondents | 99 |
| 4.4.3 Descriptive findings..... | 100 |
| 4.4.4 Relationship of program implementation success and manager affective commitment, frontline worker support, and organizational support..... | 102 |
| 4.4.5 Frontline worker support as a mediator of manager affective commitment and program implementation success | 104 |
| 4.4.6 Manager affective commitment as a mediator of organizational support and falls prevention program implementation success..... | 105 |
| 4.4.7 Results of sensitivity analyses | 107 |
| 4.5 Discussion | 108 |
| 4.5.1 Contributions to theory | 109 |
| 4.5.2 Practice implications..... | 110 |
| 4.5.3 Study limitations and future research | 111 |
| Chapter 5: Conclusions..... | 113 |
| 5.1 Summary of findings..... | 113 |
| 5.2 Dissertation implications..... | 116 |
| 5.3 Future research directions | 119 |
| 5.4 Conclusion..... | 121 |
| REFERENCES | 122 |
| APPENDIX A: Supplementary Materials for Chapter One | 132 |
| APPENDIX B: Supplementary Materials for Chapter Two..... | 157 |
| APPENDIX C: Supplementary Materials for Chapter Three..... | 167 |
| APPENDIX D: Supplementary Materials for Chapter Four | 168 |
| APPENDIX E: Supplementary Data Appendix for Chapter Four | 183 |

List of Tables

| | |
|---|-----|
| Table 1.1. Validated survey scales used in Manager Influence over Quality Improvement Program Implementation Survey | 40 |
| Table 1.2. Summary of dissertation aims | 42 |
| Table 2.1. Sample characteristics | 53 |
| Table 2.2. Mean patient utilization stratified by provider performance on PPIC domains..... | 55 |
| Table 2.3. Negative binomial regression of patient perceptions of integrated care and number of emergency department visits, inpatient stays, and outpatient visits | 57 |
| Table 3.1. Multiple dimensions of integrated care from the patient’s perspective | 66 |
| Table 3.2. Sample characteristics | 72 |
| Table 3.3. Patient Perceptions of Integrated Care Survey item response | 73 |
| Table 3.4a. Hierarchical linear regression of patient perceptions of integrated care | 77 |
| Table 3.4b. Hierarchical linear regression of patient perceptions of integrated care | 78 |
| Table 4.1. Nurse manager respondent characteristics | 100 |
| Table 4.2. Descriptive statistics of survey responses | 101 |
| Table 4.3. Multivariate hierarchical linear regression models | 103 |
| Table 4.4. Results of mediation analyses: frontline worker support as a mediator of association between manager affective commitment and implementation success | 105 |
| Table 4.5. Results of mediation analyses: manager commitment as a mediator of association between organizational support and implementation success..... | 106 |

List of Figures

| | |
|---|----|
| Figure 1.1. Hospital nursing hierarchy | 38 |
| Figure 3.1. Predicted probabilities of top box patient perceptions of integrated care among care management and standard care patients, by domain | 79 |
| Figure 4.1. Conceptual framework..... | 89 |

List of Appendices

| | |
|---|------------|
| Appendix A. Supplementary materials for Chapter One..... | 132 |
| Appendix A.1. Patient Perceptions of Integrated Care Survey 2.0 | 132 |
| Appendix A.2. Nurse middle manager interview guide..... | 140 |
| Appendix A.3. Manager Influence Over Quality Improvement Program Implementation Survey..... | 142 |
| Appendix B. Supplementary materials for Chapter Two | 157 |
| Appendix B.1. Patient Perceptions of Integrated Care Survey domains and items | 157 |
| Appendix B.2. Non-response analysis | 159 |
| Appendix B.3. Sensitivity analyses: two-part regression models | 160 |
| Appendix B.4. Negative binomial regression of patient perceptions of integrated care and number of emergency department visits | 161 |
| Appendix B.5. Negative binomial regression of patient perceptions of integrated care and number of hospital admissions..... | 163 |
| Appendix B.6. Negative binomial regression of patient perceptions of integrated care and number of outpatient visits..... | 165 |
| Appendix C. Supplementary materials for Chapter Three..... | 167 |
| Appendix C.1. Non-response analysis | 167 |
| Appendix D. Supplementary materials for Chapter Four | |
| Part one: additional regression models with individual perceived implementation as dependent variable..... | 168 |
| Appendix D.1. Relationship between manager affective commitment and implementation success..... | 168 |
| Appendix D.2. Relationship between manager affective commitment and frontline worker support..... | 169 |
| Appendix D.3. Relationship between frontline worker support and implementation success.. | 170 |
| Appendix D.4. Relationship between organizational support and implementation success..... | 171 |
| Appendix D.5. Relationship between organizational support and manager affective commitment..... | 172 |
| Appendix D.6. Relationship between organizational support and frontline worker support.... | 173 |
| Appendix D. Part two: additional regression models with hospital-perceived implementation as dependent variable..... | 174 |
| Appendix D.7. Relationship between manager affective commitment and hospital-perceived implementation success..... | 174 |
| Appendix D.8. Relationship between manager affective commitment and frontline worker support..... | 175 |

| | |
|--|------------|
| Appendix D.9. Relationship between frontline worker support and hospital-perceived implementation success..... | 176 |
| Appendix D.10. Relationship between organizational support and hospital-perceived implementation success..... | 177 |
| Appendix D.11. Relationship between organizational support and manager affective commitment..... | 178 |
| Appendix D.12. Relationship between organizational support and frontline worker support ... | 179 |
| Appendix D.13. Relationship between manager affective commitment, frontline worker support, organizational support and hospital-perceived implementation success..... | 180 |
| Appendix D.14. Results of mediation analyses: Frontline worker support as a mediator of association between manager affective commitment and hospital-perceived implementation success..... | 181 |
| Appendix D.15. Results of mediation analyses: Manager affective commitment as a mediator of association between organization support and hospital-perceived implementation success..... | 182 |
| Appendix E. Supplementary data appendix for Chapter Four: Analyses exploring manager affective commitment, normative commitment and continuance commitment to falls QI program implementation success ... | 183 |
| Appendix E.1. Correlations of key variables..... | 183 |
| Appendix E.2. Descriptive statistics of manager affective, normative, continuance commitment to change | 183 |
| Appendix E.3. Relationship between manager affective commitment, normative commitment, continuance commitment and implementation success, no control variables | 184 |
| Appendix E.4. Relationship between manager affective commitment, normative commitment, continuance commitment and implementation success | 185 |
| Appendix E.5. Relationship between manager affective commitment, normative commitment, continuance commitment, frontline worker support and organizational support to implementation success..... | 186 |
| Appendix E.6. Relationship between manager affective commitment, normative commitment, continuance commitment and hospital-perceived implementation success, no controls (OLS)..... | 187 |
| Appendix E.7. Relationship between manager affective commitment, normative commitment, continuance commitment and hospital-perceived implementation success..... | 188 |
| Appendix E.8. Relationship between manager affective commitment, normative commitment, continuance commitment, frontline worker support, and organizational support to implementation success | 189 |

Acknowledgements

I am profoundly grateful to the many individuals and organizations whose support enabled and enriched this dissertation. First, I have been tremendously fortunate to work with a truly unparalleled dissertation committee. I am thankful in particular to my dissertation chair, Sara Singer, and committee members, Amy Edmondson and Anita Tucker, for their thoughtful feedback and insightful guidance throughout my doctoral studies. I could not have asked for a better committee, comprised of incredible female mentors and role models, who continuously challenged me to improve as a researcher. I thank them for their intellectual contributions and their commitment to my success. I am a better scholar as a result of working with them.

Thank you to the Harvard Business School and the Harvard Graduate School of Arts and Sciences for the financial and administrative support that has allowed me to pursue my doctoral degree (HBS Wyss Doctoral Scholarship, 2012-2016). Throughout my doctoral studies I have relied upon the competent and caring support extended to me by the GSAS Ph.D. in Health Policy Program Office and the HBS Doctoral Programs Office. Thank you to Debbie Whitney, Jessica Livingston, and Ayres Heller of the Ph.D. in Health Policy Program Office and to John Korn, Jennifer Mucciarone, Karla Cohen, Marais Young, LuAnn Langan, Trevor Bierig, and Daria Russell of the HBS Doctoral Programs Office.

Several colleagues and collaborators on the broader research projects upon which this dissertation is based have been instrumental as facilitators of this work and contributors to the research presented in this dissertation. These individuals include Mark Friedberg, Ryan Thompson, Jeffrey Adams, and Jonathan Clark. Simo Goshev, at the Institute for Quantitative Social Science, provided invaluable feedback and technical expertise on my quantitative

analyses. I am also grateful to the Massachusetts General Hospital Physician Organization as well as the unidentified hospitals in which I conducted part of this research.

I wish to extend my sincere appreciation to the many faculty, fellow students, and friends whose feedback and encouragement enhanced this work. I benefited enormously from the suggestions and constructive advice I received from students, faculty, and colleagues when presenting developing pieces of this research at the Harvard Ph.D. in Health Policy Research Seminar, AcademyHealth Research Meetings, and Academy of Management Meetings. Faculty members such as Rob Huckman, Rafaella Sadun, Michel Anteby, Ryan Buell, Mike Toffell, Dennis Yao, among others, have also provided feedback that has vastly improved this work and my general research skills. In addition, the camaraderie of the tremendously talented students in my cohorts in the Health Policy Ph.D. program and HBS doctoral programs has inspired and sustained me throughout my doctoral experience. In particular, I'd like to thank Hummy Song, Ali Hamandi, Mihan Lee, Alexandra Feldberg, Catarina Fernandez, Tami Kim, and Ovul Sezar. I have learned so much from you over the past four years and remain eternally grateful for your continuing support and encouragement. I thank all my health policy management and HBS peers whom I have had the pleasure to know for all the wonderful memories that have contributed to my doctoral experience.

Finally, on a personal note, to my loving family, especially my husband Marco Basile, my parents Thomas and Theresa Fryer, and my sister Susanna Fryer: Without your continued support and encouragement in me, this research, and the degree it completes, truly would not have been possible. I dedicate this dissertation to you.

Executive Summary

Fifteen years ago the Institute of Medicine released a groundbreaking report, *Crossing the Quality Chasm: A New Health System for the 21st Century*. In this report the IOM argued that the current systems of health care failed to provide Americans with the high-quality health system they needed, wanted, and deserved (Institute of Medicine 2001). The report called for intensive efforts at all organizational levels to fundamentally redesign systems of care in order to deliver safe, timely, efficient, effective, equitable and patient-centered care.

Since the report's release, many health systems have strived to respond to the challenges of the "quality chasm," yet growing evidence demonstrates the U.S. health care delivery system continues to fall short of delivering high quality care. Patients often do not receive guideline-recommended processes of care (McGlynn et al. 2003). Nearly a third of administered tests, procedures, and medications are not evidence-based and are unnecessary (Brownlee 2007). Moreover, care delivery and risk-adjusted outcomes vary substantially across hospitals (Krumholz et al. 2007) and regions (Fisher et al. 2003). Such evidence illustrates how many health organizations have failed to make substantial transformations to achieve the IOM aims.

It is within the context of an increasingly challenging, complex, and interdependent health care system that we must strive to more effectively improve care delivery for patients. The growing specialization of providers and care settings has contributed to a system of care delivery that is highly fragmented. The provision and financing of health care in the United States is distributed across a variety of distinct entities, leading to disrupted relationships, poor information flows, misaligned incentives, and decreased quality of health care.

Against the backdrop of highly fragmented care delivery, our health system is facing an unprecedented challenge in the rising prevalence of patients with multiple chronic conditions, whose care delivery is especially complex and expensive (Bodenheimer 2008). As of 2012, approximately half of all U.S. adults—117 million individuals—had one or more chronic health condition (Ward, Schiller, and Goodman 2014). And the prevalence of chronic conditions among adults is only expected to increase in light of an aging population, increasing life expectancy, and advancing medical technology. Care delivery for these patients is particularly challenging to manage and costly because they receive care from multiple providers across a variety of care settings, take many medications, and are frequently hospitalized. Subsequently, there is an increasing need to try to better integrate health services for these patients who most need it.

The suboptimal performance of the U.S. health care system has led to large-scale efforts in creating, disseminating, and implementing quality improvement (QI) strategies to improve patient health and better integrate care delivery. Many believe that the systematic application of quality improvement methods can result in significant improvements in clinical processes and medical care outcomes (Batalden and Stoltz 1993; Berwick 2008; Laffel and Blumenthal 1989). Recent efforts have ranged from microsystem improvements to implement evidence based practices within hospital units to system-wide improvements such as adopting an organization-wide continuous quality improvement philosophy (Carman et al. 2010; James and Savitz 2011; Laffel and Blumenthal 1989; Shortell et al. 1998). Since the passage of the Affordable Care Act, many health reform programs, such as Accountable Care Organizations (ACOs), Patient-Centered Medical Homes (PCMHs), and care management programs, have made concerted efforts to improve the quality and integration of our health system.

Despite increasing efforts to improve health care delivery, however, recent empirical studies estimate implementation rates of evidence based practices to be less than 50% (Alexander and Hearld 2011; Klein and Knight 2005). Moreover, while many health reform efforts under the Affordable Care Act that strive to build more integrated health care and improve patient outcomes, such as accountable care organizations and patient-centered medical homes, have met with mixed results (Friedberg et al. 2014; Jackson et al. 2013; Larson et al. 2012; Reid et al. 2010). The gap between what we know, or what we intend, and what we do remains particularly pertinent in health care organizations.

Consequently, there is an important need for further research to understand how to improve integrated care delivery for patients, as well as how to more effectively implement quality improvement interventions. This dissertation seeks to address these research gaps by investigating, in three studies, particular drivers of health care delivery quality improvement. The specific aims of this dissertation are to 1) measure whether integrated patient care relates to patients' utilization of health care services; 2) evaluate whether an institutionalized care management program improves patient perceptions of integrated care; and 3) understand how senior and middle manager commitment influence the successful implementation of a quality improvement program.

In the first study, "Patient Perceptions of Integrated Care and their Relationship to Utilization of Emergency, Inpatient and Outpatient Services," coauthored with Mark W. Friedberg, Ryan W. Thompson, and Sara J. Singer and presented in Chapter Two, I examine how patient-perceived integrated care relates to utilization of health services. Integration of patient care has emerged as a priority for health care delivery, particularly for older adults with multiple chronic conditions, whose care delivery is especially complex and expensive. Patients, in

particular, are well positioned to assess integration of their care as they have a unique vantage across all the services they receive. But the relationship between patients' perceptions of care integration and their use of health services has not been well studied. To examine this relationship I use a novel and recently validated survey instrument, the Patient Perceptions of Integrated Care (PPIC) survey, among a random sample of 3,000 patients with multiple chronic conditions belonging to the Massachusetts General Hospital Physician Organization. I assess relationships between provider performance on 11 domains of patient-reported integrated care and rates of emergency department (ED) visits, hospital admissions, and outpatient visits. I find better performance on two of the surveyed dimensions of integrated care is significantly associated with lower ED visit rates: information flow to other providers in doctor's office and responsiveness independent of visits. Better performance on three dimensions of integrated care is associated with lower outpatient visit rates: information flow to specialist, post-visit information flow to the patient, and continuous familiarity with patient over time. No dimension of integration is associated with hospital admission rates.

In the second study, "Achieving Care Integration from the Patients' Perspective: Results from a Care Management Program," coauthored with Mark W. Friedberg, Ryan W. Thompson, and Sara J. Singer and presented in Chapter Three, I again use the Patient Perceptions of Integrated Care survey and evaluate the achievement of integrated care by a care management demonstration program from the perspective of older patients with multiple chronic conditions. While health reform has facilitated the creation of many programs such as Accountable Care Organizations (ACOs), Patient-Centered Medical Homes (PCMHs), meaningful use of electronic health records, and performance-based payment models that seek to integrate care, results of ongoing programs have so far been mixed, and none of these evaluations have considered

whether patients are experiencing their care as more integrated as a result of these interventions. Evaluating the patient's perspective on the extent of care integration could help providers to better understand the mechanisms through which patient outcomes improve and, importantly, the reasons why some interventions do not yield expected improvements. Using survey data obtained from a random sample of 3,000 patients with multiple chronic conditions belonging to the Massachusetts General Hospital Physician Organization, I compare patient perceptions across 11 domains of patient-reported integrated care between patients assigned to the care management program (CMP) and those receiving standard care. Survey results suggest that patient perceptions of integrated care vary substantially among survey items and domains. CMP enrollment is significantly associated with greater patient perceptions of care integration in two domains: connecting patients to home services and providing continuity of care outside of office visits, domains which were targeted for improvement by the CMP. Enrollment in the CMP is not significantly associated with other domains of integration.

In the third study, "Successful Quality Improvement Implementation: The Role of Senior and Middle Manager Commitment," presented in Chapter Four, I empirically assess whether and how senior and middle manager commitment to a falls reduction QI program is associated with the successful implementation of that program and, if so, whether organizational factors may help facilitate manager commitment to the QI program. While recent literature suggests that middle manager commitment to a QI program may influence program implementation success, quantitative evidence is scarce. Moreover, little is understood on ways in which affective commitment influences QI program implementation and how to foster senior and middle manager commitment to QI programs. Using a cross-sectional online survey I collected data from 246 nurse leaders (senior managers, middle managers, and assistant middle managers) from

30 U.S. hospitals. Survey results suggest that increased levels of managers' affective commitment to a falls prevention quality improvement program is positively associated with program implementation success across all manager levels surveyed. Higher levels of frontline worker support for the falls program partially mediates the relationship between manager affective commitment and falls program implementation success for middle managers and assistant middle managers, but not for senior managers. Increased levels of manager affective commitment for the falls program partially mediates the relationship between organizational support for the falls program and program implementation success across all manager levels.

Together, these studies advance our understanding of how patient-perceived integrated care, care management programs, and manager commitment to quality improvement programs influence the integration and improvement of health care delivery. Findings demonstrate how patient reports of integration can be useful guides to improving health system efficiency and illustrate how the PPIC survey instrument may serve as a tool for health delivery improvements and program evaluations. Dissertation results also empirically support the significant role of middle manager commitment in facilitating frontline worker support and bringing about successful QI program implementation and identifies a set of organizational factors that may foster manager commitment to a QI program. In doing so, this dissertation contributes to the literature on health care quality improvement, health care management, and implementation research. In addition, it provides practical implications for physicians and hospital managers seeking ways to improve the quality and integration of health care delivery.

Chapter One

Background and Significance

1.1 Integrated Patient Care

1.1.1 The need for integrated patient care

Tom Wilson, a 68-year old divorced veteran, lives alone in Fort Dodge, Iowa, a small community of 26,000 people nestled in the rolling hills of the Des Moines River Valley, 90 miles northwest of Des Moines, Iowa.¹ Wilson suffers from multiple chronic conditions, including: ischemic cardiomyopathy, chronic obstructive pulmonary disease, congestive heart failure, diabetes, kidney disease, depression, pulmonary hypertension, and back pain. In 2006, suffering from cardiac dysrhythmias, Wilson had a defibrillator implanted at his local health system, UnityPoint Health, Fort Dodge. Between 2011 and November 2012 Wilson visited his primary care physician four times, his pulmonologist six times, his renal physician two times, his cardiologist five times, and his gastroenterologist three times. He had been to the emergency room six times, the hospital three times, had four outpatient procedures, and was in skilled care for 13 days. Each of Wilson's hospital stays averaged 14-16 days. Wilson's care spanned nine different organizational entities in rural, Northwest Iowa and he was identified as the costliest patient to UnityPoint Health in 2012 (Edmondson, Fryer, and Hansen 2015).

Wilson is not an unusual patient in the United States, today. Nor is the complexity of his care regimen uncommon. As of 2012, approximately half of all U.S. adults—117 million individuals—had one or more chronic health conditions (Ward et al. 2014). Prevalence of

¹ Patient's name has been disguised and certain events have been modified.

chronic conditions among adults is only expected to increase in light of an aging population, increasing life expectancy, and advancing medical technology.

Care delivery for these patients is particularly challenging to manage and costly because they receive care from multiple providers across a variety of care settings, take many medications, and are frequently hospitalized. The complexities of care delivery for this particular group of patients is not only a significant burden on the patients themselves, but also on the caregivers attempting to coordinate their care delivery. One in four patients with a chronic condition will see at least three physicians, and the typical primary care physician coordinates care with 220 other physicians in 117 different practices (Pham, O'Malley, Bach, Saiontz-Martinez, & Schrag, 2009). And having multiple chronic conditions only exacerbates the complexity of care delivery. For example, in 2003 an average Medicare patient with type two diabetes but no comorbidities saw, on average, 5.6 physicians in a year. But a patient with 10 comorbidities saw 28.2 physicians (Niefeld et al. 2003).

Recently, patients with multiple chronic conditions have garnered particular attention in the health reform debate because these patients utilize more health care services and incur rising health care expenses. Evidence suggests that patients with multiple chronic conditions have more physician office visits, hospital stays, and pharmaceutical use (Lehnert et al. 2011). In the United States, approximately 65% of total health care spending is directed at the approximately 25% who have multiple chronic conditions (Anderson and Horvath 2004). Increased spending on chronic diseases among Medicare beneficiaries is considered a key factor driving the overall growth in spending in the traditional Medicare program (Riley 2007).

As the number of older adults with chronic conditions grows, attention has turned towards identifying ways to better integrate care delivery for these patients in an effort to improve their overall quality of care and reduce their overall health care expenditures.

1.1.2 Defining integrated patient care

The integration of health care delivery has emerged as a central challenge of the U.S. health system, particularly in light of our aging population, the growing prevalence of chronic conditions, and associated rise in health care utilization and expenditures. Integrated health systems have been promoted as a means to improve access, quality, and continuity of services in a more efficient way, especially for individuals with complex needs (Bodenheimer 2008; Valentijn et al. 2013). However, the delivery of integrated patient care is hampered by the fragmented supply of health and social services that result from the specialization, differentiation, and segmentation of care delivered in the United States. Such fragmentation results in suboptimal care, higher costs, and poor quality (Kodner and Spreeuwenberg 2002).

The concept of “integration” was introduced in organizational theory by Lawrence and Lorsch (1986) alongside the idea of differentiation. According to their theory, an organization has to adapt to what goes on in the outside environment. In order to do so, it tends to differentiate into parts. Consequently, all organizations are, to some extent, hierarchical structures that are comprised of separate, but interconnected components. However, the division, decentralization, and specialization found in more complex organizations often interfere with the efficiency and quality goals of an organization. Lawrence and Lorsch argue that for an organization to be viable, the functioning of these separate parts has to be integrated (Lawrence and Lorsch, 1986). Thus, the term integration was used to describe collaborative activities among differentiated units within an organization. Integration, in other words, is the “glue” that bonds the

organizational entity together, thus enabling it to achieve common goals and optimal results (Kodner and Spreeuwenberg 2002).

Lessons from the work of Lawrence and Lorsch emphasize the need for highly differentiated organizations to be integrated in order to achieve organizational effectiveness. Health care organizations in the U.S. are arguably among the most complex, interdependent, and differentiated organizations in society. Patients are often treated by a variety of different providers (such as primary care physicians, specialists, and advanced practice nurses) in a variety of different settings (such as in hospitals, outpatient centers, physician clinics, and nursing homes). Moreover, the current regulatory and payment environment also facilitates the inter-sectoral boundaries of care delivery.

To address the increasingly fragmented delivery system, many scholars have suggested that health care should be centered around developing more organized systems of care that reduce fragmentation and redundancy and promote greater continuity of care (Shortell et al. 2000; Tollen 2008). Shortell and authors advocate for the formation of integrated delivery systems as a vehicle to better integrate care. They define an integrated delivery system as a “network of organizations that provides or arranges to provide a coordinated continuum of services to a defined population and is willing to be held clinically and fiscally accountable for the outcomes and health status of the population served” (Shortell et al. 2000). While some evidence suggests that integrated delivery systems may provide care that is integrated (Shortell et al. 2000; Tollen 2008) other evidence has shown that attempts to integrate physician organizations with hospitals in order to improve quality and efficiency of care have not yielded improvements in patient care or organizational performance (Burns and Pauly 2002). This

conflicting evidence is important to note as it suggests that integrated organizations may not necessarily lead to integrated delivery of patient care.

In the health services literature, much ambiguity and lack of conceptual clarity surrounds the study of care integration. The concept of integration is notably ambiguous with regards to two issues: 1) the object of integration and 2) the essential components of integration. In fact, there is no commonly agreed upon definition of what constitutes integration of patient care and a range of conceptualizations as well as dimensions have been examined in the literature (Axelsson and Axelsson 2006; Grone 2001; Haggerty et al. 2003; Kodner and Spreeuwenberg 2002; Ouwens et al. 2005; Shortell et al. 2000; Simoens and Scott 2005; Valentijn et al. 2013). Terms such as “coordination”, “continuity”, and “collaboration” have all been used in association or interchangeably with integration. Moreover, integration has also been applied to a variety of different entities and purposes in the health literature. For example, it has been used to refer to organizational size, management arrangements, coordination of clinical services, and teamwork between providers and other health and social care professionals (Shortell et al. 2000; Simoens and Scott 2005).

Many different aspects of integration have also been emphasized in the literature, including vertical integration and horizontal integration (Axelsson and Axelsson 2006), organizational integration, functional integration, professional integration, and clinical integration (Shortell et al. 2000). Differing interpretations of the value of integration also abound: some suggest that integration allows for greater efficiency and operational effectiveness, or more flexible service provision, or better coordination and continuity of care for patients (Kodner and Spreeuwenberg 2002). Though there are varying conceptualizations of integration in the literature, many authors agree that the lack of conceptual clarity hampers our study and

understanding of care integration, and, more importantly, stands as a major barrier to promoting integrated care in both theory and practice.

Singer and authors recently made two important contributions in advancing research on patient care integration (Singer et al. 2011). First, authors argue that integration of organizations and organizational activities may or may not result in integration of care delivered to patients. Though an organization may have integrated functional processes, such integration may not necessarily lead to integrated patient care. Second, while most prior definitions of integration offered in health services literature suggest a one-dimensional construct, Singer et al. offer a multidimensional conceptualization of integrated patient care, with a particular emphasis on the patient. They define integrated patient care as patient care that is coordinated across professional facilities, and support systems; continuous over time and between visits; tailored to the patients' needs and preferences; and based on shared responsibility between a patient and caregivers for optimizing health (Singer et al. 2011).

It is this multidimensional definition of patient care integration that I refer to throughout this dissertation. This definition of integrated patient care is distinct from integrated delivery organizations, acknowledging that integrated organizational structures and processes may fail to produce integrated patient care. The definition also, notably, emphasizes the patients' central role as active participants in managing their own health by including patient centeredness and shared decision making as key elements of integrated patient care.

1.1.3 The importance of the patient's perspective on integrated care

As it increasingly becomes important to understand the ways in which patient care integration may be improved, it is helpful to consider how multiple perspectives may help shed light on the ability of health care systems to integrate care delivery for patients with multiple

chronic conditions. For example, we may study providers to understand how they may effectively communicate with each other across care settings or with patients to improve patient care integration. Alternatively, we can use administrative claims data to determine the conditions in which health services are more appropriately utilized. Or we can explore how managers of health delivery organizations may play a meaningful role in more efficiently operationalizing key systems for integrating patient care. Or, we can ask patients and their caregivers to help us understand under what conditions they perceive their care to be highly integrated, and whether their preferences and values are being considered in the care process.

While providers, caregivers, managers, and insurers observe important and distinct aspects of integrated patient care, and their perspectives deserve additional study, I argue that the patient's perspective on the ability of systems to integrate care warrants special attention. After all, patients are the only ones who can say whether care is integrated in ways that meet their needs and preferences. Only patients know the extent to which they feel empowered or helpless in managing their complex care regimen. And, unlike individual providers involved in a patient's care, patients, themselves, have a unique vantage of all the services they receive across multiple care settings. Furthermore, the patients' perspective may be especially informative in helping providers understand the mechanisms through which integration and patient outcomes improve. Consequently, there is an important need to measure integrated patient care from the patient's perspective. Such a measure would enable researchers to better examine the system-level correlates and organizational structures that may influence integrated patient care, as well as evaluate the association between higher levels of integrated patient care and the quality, utilization, and cost of care delivery.

1.1.4 The Patient Perceptions of Integrated Care Survey

The Patient Perceptions of Integrated Care Survey (PPIC) was originally developed to reflect the multidimensional definition of integrated patient care describe in the previous section (care that is coordinated across professional facilities, and support systems; continuous over time and between visits; tailored to the patients' needs and preferences; and based on shared responsibility between a patient and caregivers for optimizing health) (Singer et al. 2011). While many patient experience measures existed prior to the PPIC development, most notably the Consumer Assessment of Healthcare Providers and Systems (CAHPS) instruments, the PPIC survey goes above and beyond prior patient experience measures by containing unique items that 1) assess the extent of care coordination and continuity *across* a variety of care settings (primary care practice, specialist care, hospital care, home care) and 2) assess the extent to which care delivery is engaging patients and family members and meeting their needs and preferences.

The original PPIC survey, developed in 2010, included 29 items using a yes/no or four-point Likert agreement response scale, and was pilot tested among 1,289 patients within a safety-net health system in Massachusetts that included 13 primary care clinics. Psychometric analysis of survey responses supported a six-dimension model of integration that included the domains: 1) Coordination within care team; 2) Coordination across care teams; 3) Coordination between care teams and community resources; 4) Continuity: familiarity with patient over time; 5) Continuity: proactive and responsive action between visits; and 6) Patient-centeredness. Its development and validation have been previously described (Singer et al. 2013).

Although psychometric support for the original survey was satisfactory, the preliminary analysis revealed opportunities for improving the instrument. Subsequently, minor modifications were made to the survey that included separating dimensions of coordination to address

particular doctors and sites of care and specific information flows, considering separately information flow to primary doctors and to other care team members, and information flow to and from specialists. Findings also suggested dividing a single dimension related to continuity into dimensions addressing pre-visit coordination, post-visit coordination, and responsiveness outside patient visits. Additional opportunities for improving the instrument revealed by the pilot administration included rewording or replacing items to improve variance across practices and reduce cross-loadings, including by replacing dichotomous items with four-point scales, and adding items to bolster reliability of weaker or not fully articulated constructs.

In the studies discussed in Chapter Two and Chapter Three of this dissertation I use the modified PPIC survey (version 2.0) to address findings from the preliminary study. With study coauthors, I obtained feedback from an expert stakeholder panel, conducted an in-depth exploration of the experience of one patient and caregiver, performed cognitive testing of the revised instrument with a series of patients with complex care needs until reaching saturation (n=6), and obtained expert review of new items and the overall instrument from the Center for Survey Research at the University of Massachusetts, Boston.

The resulting PPIC 2.0 consists of 52 questions related to integrated care that are organized into 11 functional domains, plus 10 demographic items. These 11 functional domains offer actionable information on ways in which physician practices and new delivery models may seek to improve care integration as perceived by their patients. The integrated care domains include: 1) *information flow to primary provider*, which captures perceptions of how well the patient's primary provider is informed and up-to-date about care the patient receives from specialists; 2) *information flow to specialist* assesses how well the specialist is informed and up-to-date about care the patient receives from the primary provider; 3) *information flow to other*

providers in primary provider's office asks whether other physicians, nurses, clinicians and support staff in the primary provider's office are informed and up-to-date about care the patient receives; 4) *information flow post hospitalization* assesses the extent to which care team members who interact with the patient deliver consistent care and seem informed about the recent hospitalization; 5) *proactive action before visits* captures patients' perceptions of how well care team members prepare patients for upcoming appointments; 6) *post-visit information flow to the patient* evaluates how well care-team members follow-up with patients after an office visit; 7) *responsiveness independent of visits* asks whether care-team members reach out, respond, and are available to patients between visits; 8) *continuous familiarity with patient over time* measures the extent to which care-team members are familiar with the patient's past medical history and treatments; 9) *coordination with home and community services* captures how well care teams engage caregivers and caregiving organizations in the community (e.g. Meals on Wheels); 10) *patient-centeredness* evaluates the extent to which care delivery meets the patient and family members' needs and preferences; 11) and *shared responsibility* assesses how well the patient and his or her family share responsibility and engage in the provision of care and maintenance of good health. Please refer to Appendix A.1 to see a complete version of the PPIC 2.0 survey.

1.1.5 Harnessing the potential of patients' perspectives of integrated care: Research opportunities and dissertation aims

The growing prevalence of patients with multiple chronic conditions, whose care delivery is especially complex and expensive, has increased attention in the United States towards achieving better health care integration for this patient population. Since the passage of the Affordable Care Act, many health reform programs have targeted care delivery for high cost patients. Health reform has facilitated the creation of programs such as Accountable Care

Organizations (ACOs), Patient-Centered Medical Homes (PCMHs), meaningful use of electronic health records, care management programs and performance-based payment models that incentivize the provision of integrated patient care.

The PCMH model, for example, has emerged rapidly as a delivery system reform to reinvigorate US primary care. The model emphasizes particular attributes of primary care, focusing on access to care, long-term relationships with health care providers, and the provision of care that is comprehensive and coordinated. The principles also embrace a health professional team orientation grounded in evidence-based medicine and quality improvement. Medical home initiatives have encouraged primary care practices to invest in patient registries, enhanced access options, and other structural capabilities to enhance team-based primary care delivery. In exchange, medical homes receive enhanced payments. Dozens of privately and publicly funded medical home pilots are currently underway.

Yet, recent evidence on the effectiveness of medical home models remains mixed. Early medical home interventions suggest modest improvements around quality and patient experience. In an investigation of the GroupHealth Medical Home at year two, investigators find that the medical home led to improvements in patients' experiences, quality, and clinician burnout compared to control sites (Reid et al. 2010). Yet the GroupHealth Cooperative is arguably not a typical primary care practice. Indeed, Friedberg and authors point out recent evaluations may lack generalizability, often including only one payer, occurring in a 1-2 year time frame, or take place within large, integrated delivery systems atypical of most primary care practices (Friedberg et al. 2014). To address these limitations authors conducted a recent evaluation of the Southeastern Pennsylvania Chronic Care Initiative, one of the earliest and largest multipayer medical home pilots. The evaluation finds the PCMH model to be associated

with limited improvements in quality and is not associated with reductions in utilization of hospital, ED or ambulatory services, or total costs over three years.

Similar uncertainties around the effectiveness of ACO models and their ability to successfully integrate patient care while reducing health expenditures also exist. ACOs are voluntary groups of hospitals, physicians, and other health care providers that enter into a formal contract to work together to manage and coordinate care for a large group of patients, accepting responsibility for the quality and cost of the care provided. The ACO model had been heralded as a promising reform model intended to realign financial incentives to encourage the provision of more integrated care for patients while reducing health care costs. While evidence to date on ACO performance is quite limited, half (16) of the original 32-members of the Medicare ACO Pioneer Demonstration Program dropped out after failing to generate sufficient shared savings as of November, 2015.

Mixed findings from evaluations of health delivery reform programs that intend to improve patient care integration highlight the important need to better understand how and under what conditions delivery reform efforts may better integrate patient care, reduce unnecessary utilization and lower costs. No evaluations, to date, have considered whether patients are experiencing their care as more integrated as a result of these interventions. Evaluating the patient's perspective on the extent of care integration could help providers understand the mechanisms through which patient outcomes improve and, importantly, the reasons why some interventions do not yield expected improvements.

In an effort to address these broader research opportunities, one aim of this dissertation is to utilize the Patient Perceptions of Integrated Care Survey to:

1. Assess the relationship between patient perceptions of care integration and their utilization of health services.

2. Measure integrated patient care among elderly patients with multiple chronic conditions to understand its level and variation.
3. Compare perceptions of integrated care among patients in a specialized care management program (CMP) to those receiving regular care.

Chapter Two of this dissertation describes a study undertaken to address the first aim. Chapter Three of this dissertation describes a study undertaken to address aims two and three.

1.2 Quality Improvement Implementation and Organizational Change

Despite decades of efforts to improve the quality of health care in the United States, poor performance persists. In 2001 the Institute of Medicine released a groundbreaking report, *Crossing the Quality Chasm: A New Health System for the 21st Century*. The IOM argued that current systems of care fail to provide Americans with the high-quality health system they need, want, and deserve. The report called for intensive efforts at all organizational levels to fundamentally redesign systems of care (Institute of Medicine 2001). Since the report's release, many health systems have strived to respond to the challenges of the "quality chasm", yet growing evidence demonstrates the US health care delivery system still falls short of care that is safe, timely, effective, efficient, equitable and patient-centered. Patients often do not receive guideline-recommended processes of care (McGlynn et al. 2003). Moreover, care delivery and risk-adjusted outcomes vary substantially across hospitals (Krumholz et al. 2007) and regions (Fisher et al. 2003). Many health organizations have failed to make substantial transformations to achieve the IOM aims.

The suboptimal performance of the U.S. health care system has led to large-scale efforts in creating, disseminating, and implementing quality improvement (QI) strategies. A multitude of methods and techniques to improve quality have been used over the years at various levels of the health care system. The quality assurance (QA) movement took up particular prominence in

the field of health care after the Institute of Medicine's report 'To err is human: building a safer health system' (1999) QA is an effort to find and overcome problems with quality, often through directing the performance and behaviors of practitioners and institutions towards more appropriate and acceptable health outcomes (Goldstone 1998). The customary approach to QA in the hospital setting, for example, is to have an individual or group of individuals identify a quality concern and identify standards that define acceptable or unacceptable levels of performance. QA assumes that if serious failures are inspected, and eliminated, what remains is excellent quality. Continuous quality improvement (CQI), also known as total quality management (TQM), is another method of quality improvement that has gained traction in the health setting. CQI was developed and used extensively in industry with great success, and combines a scientific methodology with a management philosophy of improving processes continuously. The fundamental principles underlying CQI are the elimination of inappropriate variations and continuous improvement through constant effort to reduce waste, repetition in work, and inefficient processes (Goldstone 1998).

Many believe that successful implementation of quality improvement methods can result in significant improvements in clinical processes and medical care outcomes (Batalden and Stoltz 1993; Berwick 2008; Laffel and Blumenthal 1989). Recent efforts have ranged from microsystem improvements to implement evidence based practices within hospital units (for example, Peter Pronovost's efforts in reducing central-line associated bloodstream infections in Michigan (Pronovost et al. 2006)) to system-wide improvements such as adopting an organization-wide continuous quality improvement philosophy (for example, the Virginia Mason Medical Center's adoption of the Toyota Production System) (Carman et al. 2010; James and Savitz 2011; Laffel and Blumenthal 1989; Shortell et al. 1998).

Such improvement strategies arguably require effective organizational change, whether on a small or large scale. And successful organizational change is brought about by effective implementation, the period following adoption of an organizational change during which employees ideally become proficient and consistent in their use or practice of the change (Klein and Sorra 1996). Yet, recent empirical studies estimate implementation rates of evidence based practices to be less than 50% (Alexander and Hearld 2011; Klein and Knight 2005). Some estimates, in fact, indicate that as much as two-thirds of organizations' efforts to implement change fail (Burnes 2004). Consequently, there is an increasing need to understand the individual and organizational factors that influence implementation success.

1.2.1 The challenges of quality improvement implementation and implications for health care organizations

The U.S. health care system is often characterized as being highly complex, hierarchical, and fragmented, which makes the implementation of QI innovations particularly challenging. Although quality improvement holds promise for improving quality of care, organizations that try to adopt QI initiatives often struggle with their implementation (Alexander et al. 2006; Grol and Grimshaw 2003; Laffel and Blumenthal 1989; Shortell et al. 1998). While failure of successful quality improvement may be due to a poorly chosen intervention or a poor fit between the intervention and the organization, research suggests a more common explanation may not be due to the intervention adopted, but rather, due to implementation failure (Klein and Sorra 1996). For decades it was often assumed in the health care industry that implementation was inevitable and would proceed as planned once a decision was made to adopt a particular innovation or intervention. Yet, investigators who have studied implementation in the manufacturing setting draw a key distinction between innovation adoption (the decision to use an innovation) and

innovation implementation (the means by which an intervention is assimilated into an organization) (Klein and Sorra 1996). Literature strongly asserts that QI initiatives are unlikely to be effective in improving quality of care unless they are fully implemented and become part of the standard operating routines of organizations and their members (Alexander et al. 2006; Douglas and Judge 2001; Laffel and Blumenthal 1989; Shortell et al. 1998). Yet, even though literature on best practices in health care is robust, findings are often not implemented reliably (Berwick 2008).

Low implementation rates of evidence-based practices may be expected given the demands placed on individuals and organizations when implementing new, innovative practices. As Alexander and colleagues note, successful implementation often requires sustained leadership, extensive training and support, robust measurement and data systems, realigned incentives and human resource practices, and cultural receptivity to change (Alexander and Hearld 2011). Even Blumenthal and Kilo write, in the context of implementing continuous quality improvement (CQI), that “the changes in organizational culture, strategy, and tactics required to improve organizational processes continuously are so profound and daunting that no sane executive would pursue CQI if there was any conceivable alternative” (Blumenthal and Kilo 1998).

An additional layer of complexity to QI implementation in the health care setting is that barriers to implementation can arise at multiple levels in health care delivery—the patient level, the provider team or group level, the organizational level, the broader geographic market and policy level—thus compounding the chances of implementation failure (Ferlie and Shortell 2001). For example, implementation challenges at the provider level, in the form of physician reluctance, are often cited as common barriers to successful implementation in the health setting.

Blumenthal and Kilo, in their review of CQI efforts, note that it is especially difficult for hospitals to affect the behavior of physicians, who they deem are the most influential component of the health workforce (Blumenthal and Kilo 1998). And Berwick writes that the “barriers to physician involvement [in QI] may turn out to be the most single issue impeding success of QI in medical care” (Berwick 2008).

At the organizational level, barriers to implementation commonly cited among researchers include failure in leadership, in building necessary organizational infrastructure, and in building a supportive organizational culture for change. Shortell and authors, in a review of evidence on the clinical application of CQI, conclude that CQI is more likely to be effective under certain conditions. For CQI to flourish, the organization must be receptive to change, have sustained leadership, have measurement and data systems, and training and support. Important correlates of success that authors identify include participation of physicians, feedback to practitioners, and a supportive organizational culture for maintaining gains achieved (Shortell et al. 1998).

Health services researchers and health care systems are increasingly recognizing the critical role of implementation science in helping to establish the effective and systematic application of evidence-based practices and quality improvement innovations in health care organizations (Bammer 2003). Implementation research is the scientific study of methods to promote the systematic uptake of research findings and other evidence-based practices into routine practice, in an effort to improve the quality and effectiveness of health services (Eccles and Mittman 2006). Given the low rates of successful quality improvement implementation in the health care setting, additional research is needed to assess the necessary conditions in which implementation is effective in organizations and the potential factors that help foster successful

implementation. Fortunately, over the last few decades, there has been a growing literature around theories of implementation, which may help shed light on important influences of QI implementation success.

1.2.2 Theories of implementation and organizational change

An implementation theory can be used to predict or explain implementation success. As Weiner et al note, implementation theory explains how or why implementation activities (e.g. planning, training, and resource allocation), generate observed or desired outcomes (Weiner, Lewis, and Linnan 2009). Such a theory will offer a set of concepts and arguments that can be translated into testable hypotheses to predict or explain how or why different implementation activities produce differences in outcomes. Many implementation theories have been published to help promote effective implementation but have differing terminologies, focal areas, and definitions. While each is helpful in illuminating important factors and nuances to successful implementation, comparison of theories reveals considerable overlap as well as gaps.

Klein and colleagues developed an influential and pioneering implementation model that has since been adapted in a variety of settings. Authors developed a conceptual theory, which they later modified and tested in the manufacturing setting, which describes how implementation effectiveness results from the dual influence of an organization's implementation climate for a given innovation (i.e. employees' shared perceptions of the importance of innovation implementation within the team or organization) and the perceived innovation fit (i.e. the extent to which targeted users perceive that use of the innovation will foster or inhibit the fulfillment of their values). Authors hypothesized that employees' commitment to the use of an innovation is a function of the perceived fit of the innovation to employee's values (Klein and Sorra 1996).

In 2001, authors published a second article that tested their theory of implementation (Klein, Conn, and Sorra 2001). Unlike their theorized model in 1996, their modified model did not include the constructs of innovation-fit and commitment. Authors posited that two organizational characteristics (management support for implementation and financial resource availability) foster high quality implementation policies and practices (the array of innovation, implementation, organizational and managerial policies, practices and characteristics that may influence innovation use), which, in turn, engender a positive climate for innovation implementation, which leads to implementation effectiveness. Investigators tested their model in 39 manufacturing plants that were in the process of implementing a manufacturing resource-planning tool. Results suggest that financial resource availability and management support ultimately influence implementation effectiveness, but implementation policies and practices (IP&Ps) don't mediate the relationship of management support and implementation climate. Rather, management support has a direct relationship on implementation climate, and financial resources have a direct relationship with IP&Ps, and IP&Ps and climate simultaneously, rather than sequentially, influence implementation effectiveness.

Greenhalgh and authors took an important first step in applying implementation research to the health setting (Greenhalgh et al. 2004). Authors synthesized nearly 500 published sources across 13 fields of research to conceptualize the determinants of diffusion, dissemination and implementation of innovations in health service delivery and organization. They propose a comprehensive model to summarize their findings, grouping literature into six categories: 1) the innovation itself; 2) the adoption/assimilation process by individuals; 3) communication and influence; 4) the inner organizational setting; 5) the outer (interorganizational) context; and 6) the implementation process. While the majority of their review was focused on the diffusion and

dissemination of innovations, they did identify several elements that seemed to be associated with successful implementation from studies reviewed, which include having: an adaptive and flexible organizational structure; top management support and commitment; motivated and competent staff; funding; intraorganizational communication; and adaptation.

While Greenhalgh and colleagues synthesis is quite admirable in its breadth, it is not particularly actionable for practitioners and researchers seeking to measure and verify implementation processes. Damschroder and colleagues made a significant contribution to health care implementation research in developing The Consolidated Framework for Implementation Research (CFIR), which draws together the unique and common elements of 19 different theories and frameworks of implementation (including Klein and Greenhalgh) and offers an overarching typology to promote implementation study (Damschroder et al. 2009). Drawing heavily from Greenhalgh, the CFIR is composed of five major domains, with underlying constructs in each: intervention characteristics, outer setting, inner setting, characteristics of the individuals involved, and the process of implementation. The CFIR provides a list of explicitly defined constructs for which data can be collected.

The CFIR's comprehensiveness is both a great strength and weakness. With 39 constructs, it is arguably one of the most comprehensive implementation frameworks published. The number of constructs is likely indicative of how challenging the successful execution of implementation, as well as the study of implementation, is for both practitioners and researchers. However, the prospect of evaluating all 39 constructs is daunting. In fact, authors note that the CFIR need not be applied wholesale, as using all constructs can quickly mire evaluation efforts. But it's holistic framework does highlight most, if not all, important factors that contribute to implementation success. However, further research is needed to examine how to measure these

underlying constructs, and, more importantly, which constructs are of most importance in determining implementation success and under which circumstances.

I argue that one of the more important constructs of Damschroder's CFIR framework that is especially influential in determining implementation success is the influence of individuals involved in the implementation process. As Damschroder and colleagues note, "Organizational change starts with individual behavior change" (Damschroder et al. 2009). Klein et al.'s original theory of implementation hypothesized that employees' commitment to the use of an innovation was an integral component to achieving implementation success (Klein and Sorra 1996). Greenhalgh's comprehensive review of implementation theories also noted the importance of individuals in the implementation adoption process, explaining:

People are not passive recipients of innovations. Rather...they seek innovations, experiment with them, evaluate them, find (or fail to find) meaning in them, develop feelings (positive or negative) about them, challenge them, worry about them, complain about them, 'work around' them, gain experience with them, modify them to fit particular tasks, and try to improve or redesign them-often through dialogue with other users (Greenhalgh et al. 2004).

Damschroder and colleagues point out that little research has been done to gain understanding of the dynamic interplay between individuals and the organization within which they work, and how that interplay influences individual or organizational behavior change. Though little empirical work has been done to establish a foundation for how individuals influence implementation, there has been a growing theoretical evidence base on the role of employee commitment to organizational change that is very applicable to the study of implementation in the health care setting. The research described in Chapter Four of this dissertation seeks to address this research gap by focusing on the role managers and how their commitment to a quality improvement program may relate to the program's implementation success.

1.2.3 Commitment to organizational change

Commitment to organizational change has been postulated as a key psychological mechanism linking organizational efforts to implement planned change to behaviors of employees. Thus, employee commitment to change is believed to be important in achieving desirable organizational outcomes and overcoming resistance to change. In fact, many have argued that commitment is one of the most important factors involved in employees' support for change initiatives (Armenakis and Bedeian 1999; Conner and Patterson 1982; Herscovitch and Meyer 2002).

While employee "commitment" made an appearance in Klein et al.'s 1996 conceptual theory of implementation, it was not included in their empirical assessment in 2001. The CFIR touches somewhat on the topic of commitment in their construct of "individual knowledge & beliefs about the intervention", which they define as an "individuals' attitudes toward and value placed on the intervention", yet their construct falls short of capturing the multifaceted nature and important role that employee commitment to change may play in bringing about effective organizational change.

Despite its presumed importance, little attention has been paid to the definition and measurement of commitment within a change context. Past studies have conceptualized and measured commitment to change differently. Conner and Patterson propose that commitment to change reflects the internalization of a change program, which results from a three-stage process that brings an awareness of the change, followed by an acceptance of the change, and then the need for the change initiative (Conner and Patterson 1982). Their model is purely psychological, focusing on an employee's mental states in relation to the change. Coatsee (1999) builds on Conner and Patterson's model, incorporating both psychological factors around the change as

well as their interaction with objective factors. Coatsee argues that commitment to change reflects a state in which employees are made aware of a change, have the skills needed to implement it, are empowered to implement it, are motivated to do so by adequate rewards, and share the vision exemplified by the change. Separately, Armenakis and colleagues, in a literature review of change recipients, identified five key beliefs underlying a change recipients' motivations and commitment to support change efforts: belief that a change is needed; belief that a change is appropriate; belief that the change recipient and the organization can successfully implement a change; belief that formal leaders are committed to the success of a change and it is not a passing fad; and belief that the change is beneficial to the change recipient (Armenakis and Bedeian 1999).

Conners, Coatsee, and Armenakis' conceptualizations of commitment to change are notably one-dimensional, reflecting an employee's willingness to support the change. More recently, Herscovitch and Meyer (2002) argued that commitment to change is multidimensional. They define commitment to change as a mindset that binds an individual to a course of action deemed necessary for the successful implementation of a change initiative." They argue that this mindset that binds an individual to this course of action can reflect a) a desire to provide support for the change based on a belief in its inherent benefits ("affective" commitment to change), b) a sense of obligation to provide support for the change ("normative" commitment to change), or c) a recognition that there are costs associated with failure to provide support for the change ("continuance" commitment to change).

Results from a series of three studies by Meyer and colleagues suggest that the three components of commitment to change (affective, normative, and continuance) are distinguishable and related to an employees' self-reported level of behavioral support for change

(Herscovitch and Meyer 2002; Meyer et al. 2007). Studies indicate that employee affective commitment to change (having an emotional attachment to, identification with, and involvement in the change initiative) has the strongest positive correlation with desirable work behaviors (Herscovitch and Meyer 2002). Affective commitment may relate to engaging in activities that go beyond fulfilling job requirements, which may in turn promote implementation effectiveness, and is consequently my main variable of interest in Chapter Four.

While Meyer and colleagues' study results are helpful in establishing a foundation for understanding the important linkage between employee commitment and organizational change, additional research questions around the linkage between employee commitment and organization change remain. For example, what levels of employee commitment are necessary to influence organizational change? And through what mechanisms does employee commitment influence organizational change? Finally, given the presumed importance between employee commitment to organizational change and successful change implementation, further research is needed to identify what factors foster employee commitment to change. These questions, in part, motivate my study presented in Chapter Four.

Senior manager commitment to quality improvement

Literature, both from the manufacturing setting and health care setting, give strong support for the important role of senior leadership and commitment in influencing successful implementation. In industrial settings, leadership from the top is argued to be a critical factor for overcoming skepticism and reluctance of middle managers. It is only senior leadership that can establish quality as a top priority, create a corporate culture for quality, and mobilize the financial and human resources necessary to support organizational learning (Deming 1986; Juran 1988). Klein and colleagues found in their study of implementation in the manufacturing setting

that strong management support significantly predicts implementation effectiveness (Klein et al. 2001).

The important role of senior leadership in QI implementation has also been established in the health care setting. Berwick and colleagues (1996) have identified the support of management as one of the ten principles underlying successful QI efforts. In a qualitative study of eight hospitals, Bradley et al. found that higher performing hospitals had senior managers who were personally engaged in QI efforts, had good working relationships with medical staff, supported norms of interdepartmental collaboration, and ensured the availability of resources for QI efforts (Bradley et al. 2003). Lukas and colleagues, in a longitudinal qualitative study on 12 health systems who participated in the Robert Wood Johnson's Pursuing Perfection program, concluded that success hinged on leaders' efforts to set consistent direction, reinforce expectations, provide resources and accountability to support change, and create the climate and momentum for dramatic improvement by demonstrating authentic passion for and commitment to quality. Additionally, Weiner and colleagues, in a national survey of hospital leaders, found that top management leadership for quality and board leadership for quality was significantly and positively related to clinical involvement in CQI measures (Weiner and Shortell 1993).

While literature provides strong support for the important role of senior managers in organizational change, it is noteworthy to acknowledge that leaders need not come from the "top." Authority figures, whether from the top, middle, or frontline, can promote or inhibit the collective learning process by coordinating the activities in an implementation project. Those with power influence others' views, affecting how much effort is invested in implementing needed change. Edmondson and colleagues' study on the implementation of a minimally invasive technology for cardiac surgery calls attention to the role of the team leader rather than

the senior manager in leading change (Edmondson, Bohmer, and Pisano 2001). Similarly, Conley et al.'s study on effective implementation of a surgical safety checklist in hospitals suggests that implementation effectiveness hinges on the ability of implementation leaders to persuasively explain and adaptively show how to use the checklist (Conley et al. 2011). Lukas and authors find in their study of the Pursuing Perfection Campaign that leadership commitment to quality and change, beginning at the top of the organization but including all levels, is a critical element for organizational transformation (Lukas et al. 2007). And many authors also stressed the importance of physician leaders in the success of implementation efforts (Blumenthal and Kilo 1998; Weiner and Shortell 1993).

Middle manager commitment to quality improvement

Middle managers, in particular, may play a significant role in QI implementation in health care settings. A growing literature argues that organizational performance is heavily influenced by what happens in the middle of organizations rather than at the top (Burgess and Currie 2013; Dopson and Fitzgerald 2006; Floyd and Wooldridge 1994). By virtue of their position within the organizational hierarchy, middle managers may hold substantial influence over implementation success. They are close to day-to-day operations and frontline employees, relative to senior managers, and therefore may be better placed to recognize where potential implementation challenges may arise as well as to see the large picture of how implementation is progressing. Likewise, middle managers are also closer to senior management than frontline workers and thus may be privy to organizational strategy and policies that are intended to shape implementation practices. They are uniquely positioned to collect, synthesize, and distribute information throughout an organization during implementation activities.

Middle managers have historically been conceptualized as part of an organization's control system, specifically translating strategies defined at higher levels into actions at operating levels (Floyd and Wooldridge 1994). Individuals in middle managerial roles are typically defined as two levels below the CEO and one to two levels above line workers and professionals. Middle managers may include department heads, project or product managers, regional managers, etc. In the health care setting, a variety of health workers arguably may take on a middle manager role, including frontline managers, unit managers, functional managers, and division managers—all with a variety of clinical and non-clinical backgrounds.

The middle manager role in health care implementation efforts remains particularly understudied. However, evidence from management and strategy literatures suggest they may be pivotal in helping (or hurting) an organization bring about successful change (Balogun 2003; Burgess and Currie 2013; Currie and Procter 2005; Floyd and Wooldridge 1992, 1994). Historically, management literature painted middle managers as frequently impeding implementation efforts (Floyd and Wooldridge 1994). Middle managers were viewed as resisters to change or troublesome intermediaries who don't add value to an organization. Executives' views of middle managers suggest that they may pose barriers to change that may need to be side-lined if attempts at cooperation fail (Biggart, 1977). According to Floyd and Wooldridge, unsuccessful execution of strategy can be *caused by* middle managers who are either ill-informed or unsupportive of the chosen strategy (Floyd & Wooldridge, 1992).

The very evidence that illustrates middle managers are in a position to stop strategy execution suggests the importance of their role in implementation effectiveness. Indeed, middle managers have been widely recognized in the management and strategy literatures as playing a central part in the processes of change and, therefore, have a potentially critical role in the

determination of success or failure of major change initiatives in organizations (Floyd & Wooldridge, 2003; Schilit, 2007; Balogun, 2003; Kanter, 1985, 1986).

In a six-year qualitative study of middle managers Huy finds that middle managers made valuable contributions to the realization of radical change within an organization (Huy, 2001). Huy argues that middle managers are uniquely situated to communicate proposed changes across an organization due to their position between senior managers and frontline workers. Huy also suggests that middle managers' position one-level removed from frontline work enables them to see the larger picture of how implementation is progressing and, in turn, allows them to spur innovation. He likens middle managers to "problem solvers" who find enjoyment in figuring out how to make "the whole messy thing work" (Huy 2001). Dutton and colleagues show how middle managers shape change from below by directing the attention of top management through "issue selling" (Dutton et al. 2001). Kanter has written extensively on the important role middle managers have in engaging in secondary redesign of implementation; making changes to support the key change and introducing new arrangements to facilitate the change (Kanter 1981).

Though middle managers have been studied at length in other sectors, health services research has not focused on their potential role in QI implementation. Instead, literature in the field has primarily focused on the roles of top managers, physicians, and frontline workers in QI implementation. For example, Nieva and Sorra find that the involvement of senior management was crucial in the implementation of a safety culture assessment tool (Nieva & Sorra, 2003). Helfrich et al. find that implementation of new programs in cancer prevention and control research was related to physicians' commitment (Helfrich et al., 2007). Tucker et al. find in their study of organizational learning in intensive care units that better results may be achieved by more committed frontline staff (Tucker et al., 2007).

Little empirical research has been conducted on the role of middle manager commitment to QI implementation in the health setting. Birken and colleagues have recently made an important contribution in bringing attention to this topic by developing a theory of middle managers' expression of commitment as a key factor in determining implementation effectiveness. They posit that middle managers express their commitment to health care innovation implementation by diffusing and synthesizing information, mediating between strategy and the day-to-day activities, and selling innovation implementation (Birken, Lee, & Weiner, 2012). In a subsequent study, authors test their theory, identifying team leaders of a health disparities collaborative as middle managers and subsequently surveying and interviewing them. Regression results provided weak support ($p < 0.10$) for their hypothesis that middle managers' commitment is positively related to implementation effectiveness (Birken et al. 2013). Qualitative results highlight how middle manager proactivity (as exemplified by extra-role behaviors with a positive attitude) and commitment (as exemplified by effort and engagement) are critical to successful implementation.

1.2.4 Harnessing the potential of manager commitment to quality improvement: Research opportunities and dissertation aims

Middle manager commitment to organizational change is an understudied area in health services, thus presenting an important opportunity for further research. Evidence from the management and strategy literatures suggests the middle manager holds significant influence in realizing successful organizational change, yet additional research is needed to better understand how and in what ways middle managers in health care may influence quality improvement implementation. While Birken and colleagues' theory of the relationship between middle manager commitment and implementation effectiveness has garnered great interest and has

brought attention to this important area of research, there remain a number of significant gaps in current research efforts. First, there is no strong quantitative evidence in support of the relationship between middle manager commitment to a quality improvement program and the effective implementation of that program. In addition, there is no quantitative evidence, to my knowledge, that attempts to elucidate at what managerial level (senior management, middle management, frontline worker) commitment to organizational change influences implementation success. Moreover, the middle layers of an organization may extend beyond one particular middle manager role, which raises the question of whether there are different types of middle managers and whether their commitment to a quality improvement program may relate differently to implementation success. Furthermore, while the management and strategy literatures suggest that an important way middle managers influence organizational change is through enabling the success of frontline workers, little empirical work has established a quantitative link between middle manager commitment to a quality improvement program and frontline worker support of that program. And, finally, if middle manager commitment is an important determinant of implementation effectiveness, what factors affect employee commitment to organizational change?

In an effort to address these research gaps, a second set of aims in this dissertation are to:

1. Empirically assess the relationship between senior and middle manager affective commitment to a QI program and the program's implementation success.
2. Empirically assess whether frontline worker support for a QI program may mediate the relationship between senior and middle manager affective commitment to a QI program and the program's implementation success.
3. Identify organizational factors that may be associated with increased levels of senior and middle manager affective commitment to a QI program.

4. Empirically assess whether senior and middle manager affective commitment to a QI program may mediate the relationship of organizational support to the program and the program's implementation success.
5. Explore whether the above associations differ by manager level (senior manager, middle manager, assistant middle manager).

I choose to focus specifically on manager affective commitment given that prior literature suggests employee affective commitment to change has the strongest correlation to desirable work behaviors associated with change implementation compared to other forms of commitment to change (normative and continuance) (Herscovitch and Meyer 2002). Affective commitment may relate to engaging in activities that go beyond fulfilling job requirements, which may in turn promote implementation effectiveness. Chapter Four of this dissertation describes a study undertaken to address the aims outlined above.

1.2.5 Development of the Manager Influence over Quality Improvement Implementation Survey

In an effort to better understand how middle managers in the health care setting can influence quality improvement implementation I sought to identify a research context in health care delivery with a well-delineated middle manager role. In reviewing the literature and speaking to health care providers I settled on the hospital nursing hierarchy as an area to focus my research efforts. The hospital nursing hierarchy, characterized in Figure 1.1, begins with the chief nursing officer, the highest-ranking nurse executive, who is responsible for overseeing and coordinating a hospital's nursing department and its daily operations. The chief nursing officer directly oversees associate chief nurses (also sometimes referred to as nursing directors). Associate chief nurses or nursing directors are senior managers in the nursing department that are in charge of a hospital service line, such as critical care or surgery. Each associate chief nurse/nurse director, in turn, supervises nurse managers, who oversee typically one-to-two

hospital units and the frontline nurses who work on those units. An assistant nurse manager, clinical nurse leader/specialist, or nurse educator may also support the work of the nurse manager on hospital units and oversee the day-to-day activities of frontline nurses. I consider these latter two roles middle management, as they oversee the work of frontline nurses and report to senior nurse managers.

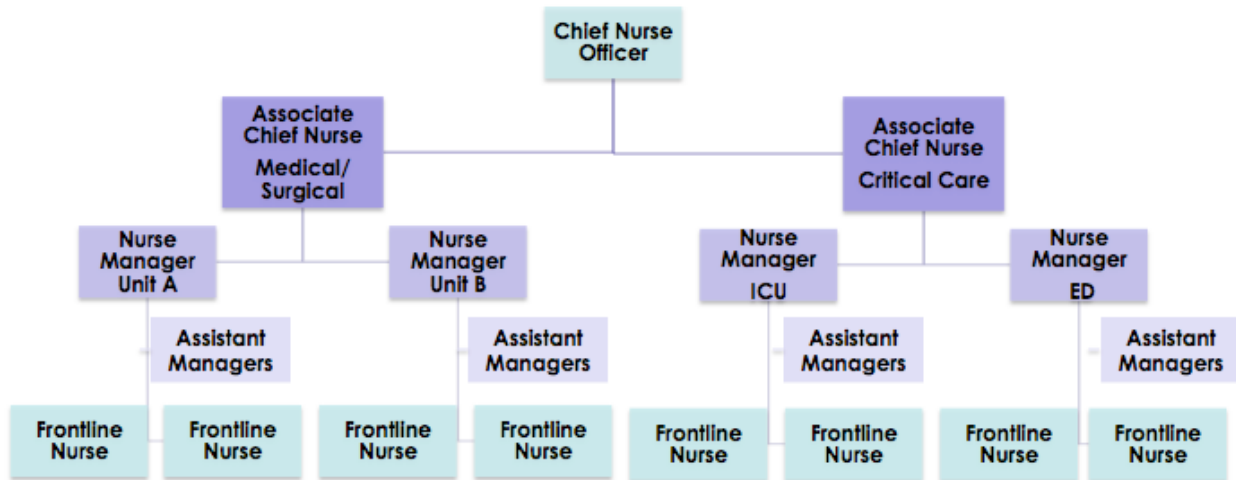


Figure 1.1 Hospital nursing hierarchy

Nursing is not only an ideal study context given the clearly defined hierarchy of managerial roles within the profession, but also because of nurses’ influence on quality improvement implementation in the hospital setting. Nursing is the nation’s largest health care profession and comprises the largest single component of hospital staff. Nurse leaders, in particular, are pivotal in creating structure, implementing processes for nursing care, and facilitating positive patient outcomes (Aiken et al. 2011; Anthony et al. 2005; Wong and Cummings 2007). In the literature, the nursing role is often considered integral to the quality improvement process (Ashley 2000; Gantz, Sorenson, and Howard 2003; Kirkman-Liff 2002). Frontline nurse leaders have been shown to positively influence patient outcomes, patient satisfaction and provider satisfaction across a broad range of clinical settings (Baggs et al. 1999;

Kim et al. 2010; Wong and Cummings 2007). The nurse managers and their assistants not only are well positioned to direct and oversee quality improvement implementation efforts on hospital units, but also are in close proximity to frontline nursing staff engaged in quality improvement activities.

To better understand my research setting and study population, and to inform survey development to address my research aims, I conducted a series of qualitative interviews with nurse leaders. In July and August of 2013, I carried out 12 semi-structured interviews with nurse managers from 12 different hospitals across the country. Hospitals ranged in size from small community hospitals to large academic medical centers. My sample was identified with the help of a nurse researcher colleague. Interview questions focused broadly on the practices nurse managers undertook in the implementation of quality improvement projects on their units; how they oversaw the implementation process; the types of implementation activities they engaged in to ensure implementation success; and the factors that influenced their own engagement in implementation. A copy of the interview guide can be found in Appendix A.2. I concluded interviewing subjects when I reached content saturation (Eisenhardt 1989). My interviews with nurse managers confirmed their role as middle managers (directly reporting to senior managers as well as overseeing the work of frontline employees) as well as their important contribution in bringing about effective quality improvement implementation on hospital units. Interviews also helped inform my survey development efforts by helping to identify variables that may be associated with increasing managers' levels of affective commitment and program implementation success.

My final survey instrument, the "Manager Influence over Quality Improvement Program Implementation" (MIQuIPI) survey, consisted of 62 items plus demographic questions.

Questions pertained specifically to the implementation of quality improvement programs for falls, pressure ulcers, catheter-associated urinary tract infection, C.Diff infection, MRSA infection, or central-line associated bloodstream infection. The survey contained items developed from existing and validated scales adapted to the research context, outlined in Table 1.1, as well as new items. Novel survey items were developed based on qualitative interviews and in consultation with the literature and included variables addressing organizational support for the quality improvement program (e.g. financial and personnel resources, implementation plan), manager activities related to quality improvement program implementation, respondent quality improvement training, and perceptions of colleague engagement in the quality improvement initiative. For most items, respondents used a seven-point Likert scale to indicate their level of agreement (1=strongly disagree, 7=strongly agree) with statements. A complete version of the survey instrument can be found in Appendix A.3.

Table 1.1. Validated survey scales used in the Manager Influence over Quality Improvement Program Implementation Survey

| | | |
|---|------------------------|---|
| Perceived implementation success (Noble and Mokwa 1999) | | A measure of the extent to which an implementation effort is considered successful by the organization. |
| Commitment to organizational change (Herscovitch and Meyer 2002) | Affective commitment | A desire to provide support for the change based on a belief in its inherent benefits. |
| | Normative commitment | A sense of obligation to provide support for the change. |
| | Continuance commitment | A recognition that there are costs associated with failure to provide support for the change. |
| Management support for implementation (Klein et al. 2001) | | A measure of the extent to which managers and supervisors are committed to and take an active interest in the successful implementation of the organizational change. |
| Frontline worker support for implementation | | A measure of the extent to which frontline workers are committed to and take an active interest in the successful implementation of the organizational change. |
| Respondent behavioral support for change (Herscovitch and Meyer 2002) | | A continuum of behavioral reactions an individual might exhibit in response to an organization change that ranges from active resistance to passive resistance to compliance to cooperation to championing. |

After survey development the survey was cognitively tested among a subset of nurse managers (n=6) who were previously interviewed. The survey was administered online to nurse leaders across 30 U.S. hospitals between November 2014 and January 2015. The survey was administered as a module in a larger multipurpose leadership survey to all nurse leaders (1,569) across hospital sites. Of those who accessed the larger survey, 53% (304) received the module with additional questions related to the implementation of their hospital's quality improvement programs. In order to obtain as large a sample as possible, respondents who indicated a falls quality improvement program currently underway on their units were administered survey questions specific to the implementation of that program. Survey results are described in Chapter Four of this dissertation.

1.3 Summary

The purpose of this chapter was to provide background and motivation for my overarching research aims (summarized in Table 1.2), which are intended to advance understanding of how patient-perceived integrated care, care management programs, and manager commitment to quality improvement programs influence the integration and improvement of health care delivery. Elements discussed in this chapter are repeated in subsequent chapters to highlight relevant contextual factors for each study and enable the independent reading of chapters reporting on the individual studies for those who may not have the opportunity to read the dissertation in full.

In what follows, I present results from three separate studies, in subsequent Chapters Two, Three and Four, in pursuit of addressing my dissertation aims. My hope is that this dissertation, in its entirety, offers insight into how patient perceived care integration may reduce unnecessary utilization (Chapter Two) and inform care management program integration efforts

(Chapter Three) as well as help enlighten our understanding of the ways in which manager commitment to a quality improvement program may influence the program’s implementation success (Chapter Four). The final chapter of this dissertation (Chapter Five) summarizes dissertation findings and discusses opportunities for future research.

Table 1.2. Summary of dissertation aims

| |
|---|
| First set of dissertation aims, improving patient care integration (Chapters 2 and 3): |
| 1. Assess the relationship between patient perceptions of integrated care and their utilization of health services. (Chapter 2) |
| 2. Measure integrated patient care among elderly patients with multiple chronic conditions to understand its level and variation. (Chapter 3) |
| 3. Compare perceptions of integrated care among patients in a specialized care management program (CMP) to those receiving regular care. (Chapter 3) |
| Second set of dissertation aims, improving QI implementation success (Chapter 4): |
| 1. Assess the relationship between senior and middle manager affective commitment to a QI program and the program’s implementation success. |
| 2. Assess whether frontline worker support for a QI program may mediate the relationship between senior and middle manager affective commitment to a QI program and the program’s implementation success. |
| 3. Identify organizational factors that may be associated with increased levels of senior and middle manager affective commitment to a QI program. |
| 4. Assess whether senior and middle manager affective commitment to a QI program may mediate the relationship of organizational support to the program and the program’s implementation success. |
| 5. Explore whether the above associations differ by manager level (senior manager, middle manager, assistant middle manager). |

Chapter Two

Patient Perceptions of Integrated Care and their Relationship to Utilization of Emergency, Inpatient and Outpatient Services

Abstract

Background: The growing prevalence of patients with multiple chronic conditions, whose care delivery is especially complex and expensive, has increased the importance of achieving better health care integration for this patient population. Patients may be well positioned to assess integration of their care, but the relationship between patients' perceptions of care integration and use of health services has not been studied.

Objective: To understand how patient-perceived integrated care relates to utilization of health services.

Design: We fielded the Patient Perceptions of Integrated Care survey, a recently validated instrument, among a random sample of 3,000 patients with multiple chronic conditions belonging to the Massachusetts General Hospital Physician Organization; 1,503 responses were collected (50% response rate). We assessed relationships between provider performance on 11 domains of patient-reported integrated care and rates of emergency department (ED) visits, hospital admissions, and outpatient visits.

Participants: The sample included patients who were 65 years or older and had multiple chronic conditions; 30% had been recently hospitalized; and 15% participated in an ongoing care management program (CMP).

Key Results: Better performance on two of the surveyed dimensions of integrated care (information flow to other providers in your doctor's office and responsiveness independent of visits, $p < 0.05$) was significantly associated with lower ED visit rates. Better performance on three dimensions of integrated care (information flow to your specialist, $p < 0.05$, post-visit information flow to the patient, $p < 0.001$, and continuous familiarity with patient over time, $p < 0.05$) was associated with lower outpatient visit rates. No dimensions of integration were associated with hospital admission rates.

Conclusions: In a single health system, patient perceptions of integrated care were associated with ED and outpatient utilization but not inpatient utilization. With further development, patient reports of integration could be useful guides to improving health system efficiency.

Key Words: integration, coordination, patient-centeredness, integrated patient care, utilization

2.1 Introduction

The growing prevalence of patients with multiple chronic conditions, whose care delivery is especially complex and expensive, has increased attention on achieving better health care integration for this patient population. Care delivery for patients with multiple chronic conditions is particularly challenging because these patients may be frequently hospitalized, take many medications, and/or receive treatment from multiple providers across a variety of care settings, including at home. Patients with multiple chronic conditions have garnered attention from policymakers, not only because of their worse health outcomes (Lee et al. 2007; Niefeld et al. 2003; Parekh and Barton 2010; Vogeli et al. 2007; Warshaw 2006; Wolff, Starfield, and Anderson 2002), but also because these patients utilize more services and contribute disproportionately to rising health care expenses (Lehnert et al. 2011). In the United States, approximately 25% of individuals who have multiple chronic conditions account for approximately 65% of total health care spending (Anderson and Horvath 2004).

Challenges around treating patients with multiple chronic conditions highlight the need for more integrated patient care. However, much ambiguity and lack of conceptual clarity surrounds the study of integration in the health services literature. The concept of integration in the literature is notably vague with regards to two issues: the object of integration and the essential components of integration. While most prior definitions of integration offered in health services literature suggest a one-dimensional construct, we offer a multidimensional conceptualization of integrated patient care, with a particular emphasis on the patient. We define integrated patient care as care that is coordinated across professionals, facilities, and support systems; continuous over time and between visits; patient and family centered; and based on shared responsibility between patients, family members, and caregivers (Singer et al. 2011). We

believe the patient's perspective on the ability of the health care system to integrate care may warrant special attention given that patients have a unique vantage across all the services they receive.

The Affordable Care Act has created programs such as Accountable Care Organizations (ACOs) and Patient-Centered Medical Homes (PCMHs) that share the underlying premise that integrated care delivery may lead to better patient outcomes and lower utilization of unnecessary health services (Riley 2007; Shortell and Casalino 2008; Shortell et al. 2000; Tollen 2008). However, the integration of organizations and organizational activities may or may not result in integration of care delivered to patients. Though an organization may have integrated functional processes, such integration may not necessarily lead to integrated patient care. In fact, results of these delivery models have so far have been mixed, and program evaluations fail to consider whether patients experience their care as more integrated as a result of interventions (Friedberg et al. 2014; Jackson et al. 2013; Larson et al. 2012; Nutting et al. 2009; Reid et al. 2010). Evaluating the patient's perspective on the extent of care integration could help policymakers and organizations better understand the mechanisms through which patient outcomes improve. The extent to which patient perceptions of care integration relates to lower utilization has not been addressed in the literature. Patients with complex, high-cost chronic illnesses provide an important vantage on the extent to which the care they receive is integrated.

To our knowledge, this study is the first to evaluate associations between patient perceptions of care integration and health care utilization. To assess patients' perceptions of care integration, we fielded a recently developed patient experience measure, the Patient Perceptions of Integrated Care (PPIC) survey (Singer et al. 2013) among Massachusetts General Hospital (MGH) patients with multiple chronic conditions. We report the relationship between patient

perceptions of integrated care and the number of emergency department visits, hospital admissions, and outpatient visits incurred over the two-years coincident with and following survey administration.

2.2 Methods

2.2.1 Survey instrument

The PPIC survey was originally developed to reflect the multidimensional definition of integrated patient care noted above (Singer et al. 2011). While many patient experience measures existed prior to the PPIC development, most notably the Consumer Assessment of Healthcare Providers and Systems (CAHPS) instruments, the PPIC survey goes above and beyond prior patient experience measures by containing unique items that 1) assess the extent of care coordination and continuity *across* a variety of care settings (primary care practice, specialist care, hospital care, home care) and 2) assess the extent to which care delivery is engaging patients and family members and meeting their needs and preferences. Its preliminary development and validation have been previously described (Singer et al. 2013). Although psychometric support for the original survey was satisfactory, preliminary analysis revealed opportunities for improving the instrument. These included separating dimensions of coordination to address particular doctors and sites of care and specific information flows. Findings also suggested dividing a single dimension related to continuity into dimensions addressing pre-visit coordination, post-visit coordination, and responsiveness outside visits. Additional opportunities for improving the instrument revealed by the pilot administration included rewording or replacing items to improve variance across practices and reduce cross-

loadings, including by replacing dichotomous items with four-point scales, and adding items to bolster reliability of weaker or not fully articulated constructs.

For the present study, we modified the original PPIC survey to address findings from the preliminary study. In addition, investigators obtained feedback from an expert stakeholder panel, performed cognitive testing of the revised instrument with a series of patients with complex care needs sufficient for reaching content saturation (n=6), and obtained expert review of new items and the instrument overall from the Center for Survey Research at the University of Massachusetts, Boston. The resulting PPIC 2.0 consists of 52 questions related to integrated care that are organized into 11 functional domains, plus 10 demographic items. The domains, defined in Appendix Table B.1 (with the full text of the constituent survey items) are: 1) information flow to primary provider, 2) information flow to specialist, 3) information flow to other providers in primary provider's office, 4) information flow post hospitalization, 5) proactive action before visits, 6) post-visit information flow to the patient, 7) responsiveness independent of visits, 8) continuous familiarity with patient over time, 9) coordination with home and community services, 10) patient-centeredness, and 11) shared responsibility. Please refer to Appendix A.1 to see a complete version of the PPIC survey. More information on the survey and its development is available at www.integratedpatientcare.org.

2.2.2 Survey sample

We drew a stratified random sample of 3,000 chronically ill patients from a population of 19,213 patients from nine primary care practices associated with MGH. The study was designed with 80% statistical power to detect significant differences between comparison groups. Patients had two or more chronic conditions, were at least 65 years old, and had a visit to a primary care provider within six months prior to survey administration. We oversampled recently hospitalized

patients (to ensure that 30% of sampled patients had been hospitalized within six months prior to being surveyed) and patients who were enrolled in a care management program that featured care integration enhancements for MGH's highest-risk, highest-cost patient population.

2.2.3 Survey administration

Between November 2012 and January 2013 we distributed paper-based surveys in English to participants up to three times in waves approximately six weeks apart. Survey packets were distributed through a private survey research firm via US mail and included a cover letter, the survey, and a postage-prepaid reply envelope. Approval to conduct this survey was granted in advance by the Harvard T.H. Chan School of Public Health and Partners Health Care institutional review boards.

2.2.4 Demographic data

For each patient in the sample, MGH provided demographic information (gender and age), health information (number and type of chronic conditions and whether a patient was hospitalized in the last six months), enrollment status in a specialized care management program (enrolled or not), and the name of the primary care practice and primary care physician responsible for the patient in the six months prior to administering the survey.

2.2.5 Health care utilization data

MGH provided the number of emergency department visits and hospital admissions at MGH, as well as the number of outpatient visits to the hospital (or affiliated health centers) for each patient, during the 2012 and 2013 calendar years.

2.2.6 Data analysis

First, we used descriptive statistics to assess the demographic characteristics of the sample population, including gender, age, race/ethnicity, education, self-reported health, and number and type of chronic conditions. We also stratified patient characteristics by health care utilization categories: zero emergency department visits vs. any emergency department visits; zero hospital admissions vs. any hospital admissions; and zero to one outpatient visits vs. two to seven outpatient visits vs. eight or more outpatient visits. Additionally, we assessed survey properties including item non-response by comparing patient characteristics of survey respondents to non-respondents. We evaluated differences between the sample of patients who responded to the survey and those who did not using a Fisher's exact test (Appendix Table B.2).

For each survey item we calculated the percentage of "top box" responses (the percentage of respondents reporting the most positive response; a common approach in reporting results from patient experience surveys) (Dyer et al. 2012; Elliott et al. 2009; Tom et al. 2012). We then calculated provider-level scores on each PPIC domain using the CAHPS standard method of accounting for item-level nonresponse. Specifically, we standardized each survey item to its population mean and then, within each domain for each provider, calculated the mean of these standardized responses, weighting all patients equally. We then excluded providers with fewer than 10 survey responses. Average rate of item nonresponse was less than 5%.

Next, we calculated descriptive statistics to explore the relationship of patient-perceived integrated care and utilization by comparing the mean utilization for patients of providers in the top performing quartile and bottom performing quartile for each integrated care domain. We estimated the relationship between the 11 integrated care domains and patient utilization using negative binomial regression models because our dependent variables measuring utilization are

counts of events per year. Likelihood-ratio tests confirmed that the negative binomial model was more appropriate than a Poisson model due to the skewness and over-dispersion of our outcome variables (the variance of each outcome variable was greater than its mean). A comprehensive model including all 11 integrated care domains as independent variables indicated that they were jointly significant for each measure of utilization (emergency department model $\chi^2=32.78$, $p<0.001$; hospital admission model $\chi^2=492.63$, $p<0.001$; outpatient model $\chi^2=318.85$, $p<0.001$), suggesting the appropriateness of more detailed exploration using individual integration variables separately in regression analyses. Final regressions controlled for the number of chronic conditions, self-reported health, hospitalization within prior six months of being surveyed, enrollment in the MGH care management program, and gender. We report results as incidence rate ratios (IRRs).

Analyses were performed using STATA/MP 13.1.

2.2.7 Sensitivity analyses

We carried out a series of sensitivity analyses using alternative model specifications and sample restrictions to assess the robustness of our findings. First, we used two types of two-part models—hurdle models and zero-inflated models—to assess the relationship between patient-perceived integration and utilization of care. Two-part models assume that the statistical process underlying individuals with zero counts of utilization and individuals with one or more counts of utilization can differ (Dyer et al. 2012). They are considered conceptually attractive for addressing health care utilization because of the high concentration of zero values in utilization data for some services (e.g., hospital admissions). Two-part models consist of a first stage in which one equation predicts the probability that a person has any utilization and a second equation that predicts the level of use for only those with utilization (Diehr et al. 1999).

Our first sensitivity analysis used a hurdle model, with a Logit model as the first stage, estimating the independent effects of patient perceptions of integration on whether an individual is likely to have zero or any health care utilization. The second stage was a negative binomial model, which measured the relationship of the independent variables and dependent variables, conditional on there being any utilization.

Our second sensitivity analysis applied a zero-inflated poisson regression model to our data. The zero-inflated model makes different assumptions than the hurdle model about the process underlying the generation of zeros (Dalrymple, Hudson, and Ford 2003; Duan et al. 1983; Lahiri and Xing 2004). While hurdle models assume there are two types of subjects (those who never experience the outcome and those who always experience the outcome at least once), zero-inflated models conceptualize subjects as those who never experience the outcome and those who can experience the outcome but don't always.

In addition to applying various model specifications, we also repeated analyses using alternative specifications for the 11 integrated care composite scores. First we standardized variables (rescaling variables to have a mean of zero and a standard deviation of one) before calculating composites. Second, we averaged item means to calculate a composite measure rather than averaging the percentage of top box responses. Finally, we repeated the analyses for providers with five or more survey responses and again for all providers, with no minimum sample size.

Results were robust to differences in model specification (Appendix Table B.3).

2.3 Results

2.3.1 Survey response and non-response analysis

Of the 3,000 patients surveyed, 1,503 responded (50% response rate). Among the returned surveys, we excluded from analysis 110 (7%) questionnaires, which did not have answers to questions in the centerfold of the survey, as well as 62 (4%) respondents who did not answer more than half of survey items. Lastly, we excluded from our sample providers who had fewer than 10 patients, 272 (18%) questionnaires. Respondents excluded from analysis did not significantly differ from respondents included in the final sample in terms of age, number of chronic conditions, self-reported health, care management program participation, gender, or race. The final analytic sample included 1,059 patients (70% of surveys returned).

A comparison of survey respondents to patients who did not respond showed that non-respondents had significantly higher rates of congestive heart failure, depression, and ischemic heart disease, had greater numbers of chronic conditions, and were more likely to have had a hospital admission in the six months prior to survey fielding (Appendix B.2).

2.3.2 Characteristics of respondents

Just over half of respondents (55%) were aged 75 or older (Table 2.1), and their average number of chronic conditions was 4.3. The most frequent chronic condition among respondents was ischemic heart disease (22%) followed by depression (17%). Twenty percent of respondents reported that their health was fair or poor; 48% had graduated from a four-year college; and 96% were white.

Table 2.1 Sample characteristics

| | All Respondents (N=1059) | ED Visits | | Hospital Admissions | | Outpatient Visits | | |
|--------------------------------------|-----------------------------|---------------------|-----------------------|---------------------|-----------------------|-----------------------------|-----------------------------|-----------------------------------|
| | | 0 visits (N=660) | Any visits (N=399) | 0 admits (N=680) | Any admits (N=379) | 0 to 1 Visits (N=156) | 2 to 7 Visits (N=436) | 8 or more Visits (N=467) |
| Patient Utilization | | | | | | | | |
| Mean ED visits | 1 | 0 | 2.7 | | | | | |
| Mean hospital admissions | 0.7 | | | 0 | 1.9 | | | |
| Mean outpatient visits | 8.8 | | | | | 0 | 4.5 | 15.7 |
| Chronic Conditions | | | | | | | | |
| CHF | 3.0% | 1% | 6% | 0.7% | 7.1% | 1.3% | 2.1% | 4.5% |
| Asthma | 1.0% | 0.6% | 1.8% | 0.7% | 1.6% | 0.0% | 0.5% | 1.9% |
| Diabetes | 5.1% | 2.6% | 9.3% | 3.2% | 8.4% | 0.6% | 4.4% | 7.3% |
| Depression | 17.4% | 14.6% | 22.1% | 13.2% | 24.8% | 16.7% | 13.8% | 21.0% |
| Ischemic heart disease (IHD) | 21.5% | 12.6% | 36.3% | 13.2% | 36.4% | 6.4% | 15.8% | 31.9% |
| Average number of chronic conditions | 4.3 | 3.6 | 5.3 | 3.6 | 5.5 | 3.5 | 3.9 | 4.9 |
| Self-reported health | | | | | | | | |
| Excellent, very good, or good | 79.6% | 86.2% | 68.5% | 84.0% | 71.5% | 85.5% | 85.2% | 72.4% |
| Fair or Poor | 20.4% | 13.8% | 31.5% | 16.0% | 28.5% | 14.5% | 14.8% | 27.6% |
| Age | | | | | | | | |
| 65 to Less than 75 | 45.2% | 51.4% | 35.1% | 48.8% | 38.8% | 36.5% | 50.5% | 43.3% |
| 75 or older | 54.8% | 48.6% | 64.9% | 51.2% | 61.2% | 63.5% | 49.5% | 56.8% |
| Gender (% male) | 48.1% | 48.5% | 47.4% | 46.6% | 50.7% | 35.3% | 47.7% | 52.7% |
| Education | | | | | | | | |
| Less than high school graduate | 6.8% | 5.6% | 8.8% | 6.6% | 7.1% | 9.2% | 8.0% | 4.9% |
| High school graduate or GED | 24.9% | 21.2% | 31.2% | 22.9% | 28.5% | 33.1% | 22.5% | 24.4% |
| Some college or 2-year degree | 20.8% | 17.3% | 26.9% | 19.2% | 23.7% | 20.4% | 19.9% | 21.8% |
| 4-year college graduate | 14.5% | 17.3% | 9.9% | 14.2% | 15.1% | 6.3% | 15.5% | 16.4% |
| More than 4-year college degree | 33.0% | 38.6% | 23.2% | 37.0% | 25.5% | 31.0% | 34.1% | 32.6% |
| Race/Ethnicity | | | | | | | | |
| White | 96.2% | 95.8% | 96.9% | 95.8% | 97.0% | 93.0% | 96.4% | 2.9% |
| Non-White | 3.8% | 4.2% | 3.1% | 4.3% | 3.0% | 7.0% | 3.6% | 97.1% |

Among respondents, the mean number of emergency department visits across two years (2012 and 2013) was one visit; the mean number of hospital admissions was 0.7, and the mean number of outpatient visits was 8.8. We also stratified respondent characteristics by utilization, and results suggest that respondents who utilize more health services are, not surprisingly, sicker (Table 2.1). Across all measures, patients with any emergency department visits, hospital admissions, and more outpatient visits have higher rates of chronic conditions, are older, and more frequently report their health as fair or poor. For example, 36% of patients with any emergency department visits have ischemic heart disease, compared to 12.6% of patients who had no emergency department visits. Likewise, of those patients with eight or more outpatient visits, 28% reported their health as fair or poor compared to only 15% of patients who had zero to one outpatient visits.

2.3.3 Relationship of patient perceptions of integrated care to utilization of care

Table 2.2 compares the mean patient utilization of emergency department visits, hospital admissions and outpatient visits for patients of providers who scored in the top quartile of integrated care versus patients of providers who scored in the bottom quartile of integrated care. Descriptive results suggest that across many integrated care domains, patients of providers who scored in the top quartile have lower utilization than patients of providers who scored in the bottom quartile. Domains where this trend holds across all utilization measures include information flow to one's specialist, information flow to other providers in primary provider's office, information flow post hospitalization, proactive action before visits, and post-visit information flow to the patient. For example, with regards to patient-perceived integration around proactive action before visits: patients of providers who scored in the top quartile compared to those who scored in the bottom quartile had, on average, 0.67 compared to 1.24

emergency department visits; 0.43 compared to 0.83 hospital admissions and 7.27 compared to 11.51 outpatient visits. This trend did not hold for three domains: information flow to primary care provider, coordination with home and community resources, and shared responsibility.

Table 2.2
Mean patient utilization stratified by provider performance on PPIC domains

| | N | Mean Number of Emergency Department Visits | Mean Number of Hospital Admissions | Mean Number of Outpatient Visits |
|--|-----|--|------------------------------------|----------------------------------|
| Information Flow to Primary Care Provider | | | | |
| Providers in Top Performing Quartile | 259 | 1.04 | 1.45 | 9.45 |
| Providers in Bottom Performing Quartile | 267 | 0.97 | 1.13 | 9.43 |
| Information Flow to Specialist | | | | |
| Providers in Top Performing Quartile | 216 | 0.87 | 0.91 | 9.75 |
| Providers in Bottom Performing Quartile | 208 | 1.04 | 1.33 | 12.3 |
| Information Flow to Other Providers in Primary Provider's Office | | | | |
| Providers in Top Performing Quartile | 124 | 0.85 | 1.16 | 9.53 |
| Providers in Bottom Performing Quartile | 128 | 1.59 | 1.36 | 10.41 |
| Information Flow Post Hospitalization | | | | |
| Providers in Top Performing Quartile | 74 | 2.21 | 1.62 | 10.57 |
| Providers in Bottom Performing Quartile | 75 | 2.27 | 1.81 | 11.8 |
| Proactive Action Before Visits | | | | |
| Providers in Top Performing Quartile | 281 | 0.67 | 0.43 | 7.17 |
| Providers in Bottom Performing Quartile | 267 | 1.24 | 0.83 | 11.51 |
| Post-visit Information Flow to the Patient | | | | |
| Providers in Top Performing Quartile | 263 | 0.94 | 0.76 | 7.82 |
| Providers in Bottom Performing Quartile | 248 | 1.3 | 0.86 | 9.35 |
| Responsive Independent of Visits | | | | |
| Providers in Top Performing Quartile | 301 | 0.97 | 0.72 | 9.17 |
| Providers in Bottom Performing Quartile | 335 | 1.11 | 0.61 | 8.64 |
| Continuous Familiarity with Patient Over Time | | | | |
| Providers in Top Performing Quartile | 289 | 1 | 0.78 | 7.67 |
| Providers in Bottom Performing Quartile | 266 | 1.27 | 0.92 | 11.68 |
| Coordination with Home and Community Resources | | | | |
| Providers in Top Performing Quartile | 252 | 1.32 | 1.05 | 10.01 |
| Providers in Bottom Performing Quartile | 243 | 0.99 | 0.6 | 7.93 |
| Patient-Centeredness | | | | |
| Providers in Top Performing Quartile | 260 | 1.07 | 0.78 | 9.66 |
| Providers in Bottom Performing Quartile | 277 | 1.2 | 0.71 | 9.09 |
| Shared Responsibility | | | | |
| Providers in Top Performing Quartile | 259 | 1.18 | 0.73 | 8.73 |
| Providers in Bottom Performing Quartile | 255 | 1.06 | 0.59 | 7.67 |

Table 2.3 summarizes results from negative binomial regressions, which estimate the relationship between patient perceptions of integrated care composites on the number of patient emergency department visits, hospital admissions, and outpatient visits, after adjusting for respondent demographic characteristics and health status. For more detailed regression analyses please see Appendix Tables B.4, B.5, and B.6. Regression analyses suggest that patient perceptions of more integrated care across many integration dimensions are significantly related to lower utilization, particularly for emergency department visits and outpatient visits. Increased perceptions of care integration around information flow to other providers in your doctors office as well as responsiveness independent of visits were associated with an expected decrease in emergency department visits by a factor of 0.22 ($p<0.05$) and 0.12 ($p<0.05$) respectively. A lower risk of outpatient visits was also associated with higher patient perceptions of care integration for information flow to your specialist (IRR=0.38, $p<0.05$), post-visit information flow to the patient (IRR=0.27, $p<0.001$), and continuous familiarity with patient over time (IRR=0.15, $p<0.05$). No significant associations were found between patient perceptions of integration and the number of hospital admissions, though the incident rate ratios were below one in nine out of 11 integrated care domains, suggesting there may be an association across many domains of increased perceptions of care integration and a reduced likelihood of hospital admissions.

Table 2.3

**Negative binomial regression of patient perceptions of integrated care and number of emergency department visits, inpatient stays, and outpatient visits
(Incident rate ratios reported)**

| Integrated Care Domain | N | ED Visits IRR | Inpatient Stays IRR | Outpatient Visits IRR |
|---|------|------------------|------------------------|--------------------------|
| Information Flow to Your Doctor | 829 | 0.26 [0.30] | 0.41 [0.29] | 0.78 [0.58] |
| Information Flow to Your Specialist | 805 | 0.56 [0.95] | 0.24 [0.21] | 0.38* [0.17] |
| Information Flow to Other Providers in Your Doctors Office | 486 | 0.22* [0.16] | 1.57 [0.83] | 0.77 [0.52] |
| Information Flow Post Hospitalization | 269 | 0.86 [0.42] | 0.55 [0.20] | 1.07 [0.40] |
| Proactive Action Before Visits | 1044 | 0.14 [0.22] | 0.74 [0.63] | 0.25 [0.26] |
| Post-visit information flow to the patient | 962 | 0.32 [0.55] | 0.68 [0.62] | 0.27*** [0.10] |
| Responsive independent of Visits | 994 | 0.12* [0.10] | 0.75 [0.52] | 0.74 [0.67] |
| Continuous familiarity with patient over time | 1043 | 0.11^ [0.14] | 0.37 [0.33] | 0.16* [0.11] |
| Coordination with Home and Community Resources | 932 | 0.94 [0.71] | 1.53 [0.79] | 0.76 [0.56] |
| Patient-Centeredness | 1026 | 0.15^ [0.18] | 0.70 [0.65] | 0.74 [0.54] |
| Shared Responsibility | 992 | 0.14 [0.18] | 0.62 [0.77] | 1.08 [0.74] |

Notes: Results derived from independent negative binomial regression models. Incident rate ratios reported. Models control for gender, self-reported health, number of chronic conditions, whether patient was in a specialized care management program, and whether patient was hospitalized in prior six months to being surveyed. Robust standard errors reported in parentheses.

^p<0.10; *p<0.05; **p<0.01; ***p<0.001.

2.4 Discussion

This study is the first, to our knowledge, to examine the relationship of patient perceptions of care integration and utilization of health care services. This study helps to establish an evidence base for the relationship between patient-perceived integrated care and reduced health services utilization. Findings imply that a number of integrated care dimensions may be associated with a lower likelihood of health services utilization. In particular, more patient perceived-integration regarding information flow to other providers in doctor's office and responsiveness of providers independent of visits was significantly associated with fewer emergency department visits. Likewise, more patient-perceived integration around information flow to one's specialist, post-visit information flow to the patient, and continuous familiarity with the patient over time were significantly associated with a lower likelihood of outpatient visits. One possible explanation for finding no significant associations between patient perceptions of integrated care and reduced likelihood for inpatient stays may be that inpatient stays were more likely to be necessary among this group of very sick patients.

Given that numerous health delivery reform models currently seek to increase the integration of care delivery for patients in an effort to improve patient outcomes and satisfaction and reduce health expenditures, further exploration of the relationship between patient perceptions of integrated care and patient utilization of health services is needed. Our findings suggest that patient perceptions of different aspects of care integration may relate to their utilization of health services and that different dimensions of patient-perceived integration may vary in their relationship to emergency department, inpatient, and outpatient utilization. Additional analytical work would confirm these findings and help practitioners, scholars, and policymakers better understand the ways in which patient perceptions of integrated care may or

may not lead to lower health services utilization, and also how more integrated care may relate differently to different types of health services utilization.

Our findings should be considered in light of study limitations. Our sample size was relatively small, homogeneously white, and limited to the greater Boston area. Results thus may not be generalizable to patients with other racial backgrounds and to patients from other geographic areas. Making the survey available in other languages is one strategy that would make the survey more broadly accessible. There is also concern for selection bias. While our response rate was relatively strong (50%), our non-response analysis indicated that older and sicker patients were more likely not to respond to our survey. Consequently, our respondents may be relatively healthier than the patient population with multiple chronic conditions, in which case our results likely overestimate levels of perceived integration. If this bias also resulted in less variance in our measures of perceived integration, this could have also reduced our ability to detect significant relationships, suggesting our findings are conservative.

In addition, because our utilization measures came from one academic medical center, we are unable to capture health services utilization of our sample if it occurred outside MGH. Thus, utilization may be underestimated. Moreover, our utilization measures did not distinguish necessary utilization from unnecessary utilization. While there are existing algorithms that can help identify appropriate utilization (Billings, Parikh, and Mijanovich 2000), we did not have access to sufficient information to apply them. Also, given the complexity of the patient population under study, our ability to adjust sufficiently for patients' need for integrated patient care may not have been adequate. While we were able to adjust for the number and type of chronic conditions patients had, whether a patient had been hospitalized recently, whether the patient participated in a care management program, and other demographic characteristics, we

were unable to control for other variables, such as general levels of optimism, which may be related to patient utilization of health services.

Finally, while the PPIC survey has undergone extensive testing, the version used in this study is still under revision and was used here to pilot integrated care domains suggested by earlier psychometric analysis (Singer et al. 2013). Further modifications to the survey instrument could alter relationships between integrated care domains and utilization.

Despite these limitations our analysis offers an important contribution by offering an initial exploration of the relationship between integrated care and utilization of health services. Moreover, survey results lend support to the PPIC survey as a tool that offers a multidimensional assessment of integrated care, which could provide more detailed guidance to providers and policymakers seeking to improve the integration of patient care. As programs intended to improve care integration under the Affordable Care Act and other reform efforts are implemented, it will be increasingly important to assess how well such programs are integrating care as perceived by their patients and reducing unnecessary utilization. To build an evidence base on patient care integration, more empirical work will be required to apply the PPIC instrument in a larger and more nationally representative sample. Additional research is also necessary to further elucidate the relationship between different kinds of service utilization and integrated care, as well as associations between patient experience of integrated care to an organization's structural characteristics and patient outcomes.

Chapter 3

Achieving Care Integration from the Patients' Perspective: Results from a Care Management Program

Abstract

Background: Integration of care has emerged as a central challenge of health care delivery, particularly for older adults with multiple chronic conditions. Recent health reform efforts encourage the integration of care delivery across providers. Yet, the ability of such programs to deliver integrated care has not been evaluated from the patient's perspective. To our knowledge, this study is the first to evaluate the achievement of integrated care by a care management demonstration program from the perspective of older patients with multiple chronic conditions.

Methods: We administered the Patient Perceptions of Integrated Care (PPIC) survey, a recently validated instrument, among a stratified random sample of 3,000 patients with multiple chronic conditions belonging to the Massachusetts General Hospital; 1,503 responses were collected (50% response rate). We compared patient perceptions across 11 domains of patient-reported integrated care between patients in the CMP and those receiving standard care.

Results: Survey results suggest that patient perceptions of integrated care vary substantially among survey items and domains. CMP enrollment was significantly associated with greater patient perceptions of care integration in two domains: connecting patients to home services ($p < 0.001$) and providing continuity of care outside of office visits ($p < 0.01$). Enrollment in the CMP was not significantly associated with other domains of integration.

Conclusions: Findings suggest care management programs have the potential for improving aspects of care integration and illustrate how the PPIC survey instrument may serve as a tool for program evaluation.

Key Words: integration, coordination, patient centeredness, care management

3.1 Introduction

Integration of patient care has emerged as a priority for health care delivery, particularly for older, high-cost adults with multiple chronic conditions. As the number of older adults with chronic conditions grows (Ward et al. 2014), attention has turned towards identifying ways to better integrate care delivery for these patients in an effort to improve quality and reduce health care expenditures. Care delivery for these patients is particularly expensive and challenging to manage because they often receive care from multiple providers, take many medications, and are frequently hospitalized. In the Medicare population, the average beneficiary sees seven different physicians and fills nearly 20 prescriptions in a year (Anderson 2004). Within one year, the typical primary care physician coordinates care with 229 other physicians in 117 different practices (Pham et al. 2009). The complexity of care delivery for these patients gives them a unique vantage on the totality of care they receive.

A large opportunity exists to improve care integration and delivery for patients with multiple chronic conditions. Some evidence links “integrated delivery systems,” which we define as structurally integrated organizations capable of providing a continuum of health care services (Shortell et al. 2000; Shortell, Gillies, and Anderson 1994), with better quality and efficiency of care delivery (Tollen 2008; Weeks et al. 2010). However, integration of organizations and their activities is conceptually distinct from integration of care delivery as perceived by patients (Ouwens et al. 2005; Singer et al. 2011). Integrated organizational structures and processes may fail to produce integrated patient care from the patient’s point of view. We define integrated care as care that is coordinated across professionals, facilities, and support systems; continuous over time and between visits; patient and family centered; and based on shared responsibility between patients, family members, and caregivers (Singer et al. 2011). Our conceptualization of care

integration distinguishes it from organizational integration and emphasizes the patients and family members' central roles as active participants in managing a patient's health.

Since the passage of the Affordable Care Act, many health reform programs have targeted care delivery for high cost patients. Health reform has facilitated the creation of programs such as Accountable Care Organizations (ACOs), Patient-Centered Medical Homes (PCMHs), meaningful use of electronic health records, and performance-based payment models that seek to integrate care. In January 2015, Medicare began paying physicians a care management fee intended to promote better care integration (Pear 2014). However, results of ongoing programs have so far been mixed, and none of these evaluations have considered whether patients are experiencing their care as more integrated as a result of these interventions (Friedberg et al. 2014; Jackson et al. 2013; Nutting et al. 2009; Reid et al. 2010). Evaluating the patient's perspective on the extent of care integration achieved by programs like these could help providers to better understand the mechanisms through which patient outcomes improve and, importantly, the reasons why some interventions do not yield expected improvements.

To our knowledge, this study is the first to evaluate the achievement of integrated care by a care management demonstration program from the perspective of older patients with multiple chronic conditions. To assess patients' perceptions, we used a recently developed patient experience measure, the Patient Perceptions of Integrated Care (PPIC) survey (Singer et al. 2013). We report findings from the survey and compare perceptions of care integration among patients enrolled and not enrolled in the program.

3.2 Methods

3.2.1 MGH care management program

The Massachusetts General Hospital's (MGH) care management program (CMP) was launched on August 1, 2006, as part of the Centers for Medicare and Medicaid Services' Care Management for High Cost Beneficiaries (CMHCB) Demonstration program. The principal objective of the CMHCB demonstration was to test a risk-based contracting model and primary care-based intervention strategies for Medicare fee-for-service beneficiaries who were high cost and/or had complex chronic conditions. The intention of the CMHCB demonstration was to reduce future costs, improve quality of care and quality of life, and improve beneficiary and provider satisfaction.

The CMP program featured care enhancements for MGH's highest-risk, highest-cost patient population. Patients were selected to participate in the CMP based on specific criteria for level of disease severity, based on the Centers for Medicare and Medicaid Services' Hierarchical Condition Categories (HCC) risk score, annual health care costs, and clinical linkage with MGH (at least two prior MGH visits within the prior 12 months, and at least 50% of hospital stays at MGH). Initially, 2,619 patients, approximately 15% of the MGH Medicare population, were invited to participate in the CMP (Ferris et al. 2010).

Program goals included reducing health care costs through reductions of preventable hospitalizations and emergency room visits, and optimizing the role of nurse care managers. To achieve these goals, the CMP was structured to facilitate communication between patients and care managers, patients and physicians, care managers and physicians, and among care managers and other care management professionals. Patient care managers and their one-on-one relationship to CMP patients represent the core element of the MGH CMP. Care managers

developed relationships with patients over time through in-person interactions during physician office visits, telephone calls, during hospitalizations, and occasional home visits. They continually assessed patient needs, collaborated with physicians to develop treatment plans, educated patients, and facilitated communication and delivery of patient care among the patient's multidisciplinary care team. The MGH care management model emphasized maintaining contact with patients before and between doctor visits as well as connecting patients to home and community services via the "community resource specialist" role, whose specific task was to collate community resources/services (such as transportation to physician visits, setting up patients with Meals on Wheels, or connecting them to local community and civic organizations) to support patients and work with care managers to appropriately deploy these resources (McCall, Cromwell, and Urato 2010). The CMP team also included mental health providers, given the high burden of mental health issues present among the CMP population, and a pharmacist.

A formal evaluation of the MGH program and CMHCB conducted in 2010 indicated that the CMP reduced the rate of increase of acute care hospitalizations and Emergency Department visits (but not 90-day readmissions), reduced the mortality rate within the intervention group of beneficiaries, improved beneficiary reported satisfaction related to communication with providers, and achieved substantial, statistically significant cost savings. This evaluation includes more in-depth descriptions of the MGH CMP and CMHCB (McCall et al. 2010).

Though the MGH CMP was considered successful as a result of its ability to lower mortality and reduce health care costs by lowering unnecessary utilization, information about the mechanisms through which these outcomes may have been achieved is limited. Better care integration is considered a possible explanation (McCall et al. 2010). However, the program's

ability to integrate care has not been evaluated from the patient’s perspective. This study is designed to evaluate—according to patients—whether, and in what ways, care in the CMP is better integrated than care for those receiving standard care.

3.2.2 Survey instrument

The PPIC survey is designed to measure integration of patient care among individuals with multiple chronic conditions for whom such integrated care is likely to be critically important (Singer et al. 2013). Based on preliminary analysis and cognitive testing (Singer et al. 2013), the original PPIC survey was modified to create PPIC 2.0, which consists of 52 questions that are organized into 11 functional integrated care domains, plus demographic items (see Table 3.1 for dimension descriptions and sample items). In its current form, the instrument measures 11 functional domains of integrated care that can be used to compare interventions intended to improve the integration of care and as a quality improvement tool intended to guide the refinement of delivery system innovations. The survey recognizes the centrality of patients, their needs and preferences, and the role that they and their family members play as active participants in their care. (Please see Appendix A.1 for a complete version of the PPIC survey or Appendix B.1 for the full text of the constituent survey items).

Table 3.1 Multiple dimensions of integrated care from the patient's perspective

| Dimension | Description | Sample Survey Item |
|---|---|---|
| Information flow to primary care provider | A patient's primary care provider stays up-to-date about the patient’s medical condition and delivers consistent and informed care for the patient. | In the last 6 months, how often did you have to remind your primary care provider about care you received from specialists? |
| Information flow to specialist | A patient's specialist is up-to-date about the patient's medical condition and delivers consistent and informed care for the patient. | In the last 6 months, how often did the specialist seem to know the important information about your medical history? |

Table 3.1 Multiple dimensions of integrated care from the patient's perspective (continued)

| Dimension | Description | Sample Survey Item |
|--|---|---|
| Information flow to other providers in primary provider's office | All providers in the primary care provider's office are up-to-date about the patient's medical condition and deliver consistent and informed care for the patient. | In the last 6 months, how often did other staff seem up-to-date about the care you were receiving from your primary care provider? |
| Information flow post hospitalization | After a patient's hospitalization, all care-team members (which may include clinicians, support staff, and other personnel who routinely work together to provide medical care for a specified group of patients) deliver consistent and informed patient care, regardless of the team member providing them. | After your most recent hospital stay, did anyone from your primary care provider's office contact you to ask about the condition you were in the hospital for? |
| Proactive action before visits | Care-team members reach out and remind patients of upcoming appointments and inform the patient about what to expect. | Before your most recent visit with your primary care provider, did you get a reminder from this provider's office about the appointment? |
| Post-visit information flow to the patient | Care-team members inform patients of test-results in a clear and timely manner after a patient's visit. | In the last 6 months, when your primary care provider ordered a blood test, x-ray, or other test for you, how often did anyone from this provider's office follow up to give you those results? |
| Responsiveness independent of visits | Care-team members reach out and respond to patients between visits; patients can access care and information 24/7. | In the last 6 months, how often has anyone from your primary care provider's office contacted you between visits to see how you were doing? |
| Continuous familiarity with patient over time | Care-team members are familiar with the patient's past medical condition and treatments. | When you see your primary care provider, how often do you have to repeat information you have already given to someone in your provider's office? |
| Coordination with home and community resources | Care teams consider and coordinate support for patients by other teams offered in the community (e.g., Meals on Wheels). | In the last 6 months, how often did anyone from your primary care provider's office ask if you needed more services at home to manage your health conditions? |

Table 3.1 Multiple dimensions of integrated care from the patient's perspective (continued)

| Dimension | Description | Sample Survey Item |
|------------------------|---|--|
| Patient - centeredness | Care-team members design care to meet the needs and preferences of patients, family members and other informal caregivers. | In the last 6 months, how often did your primary care provider discuss whether you were getting the health care you wanted? |
| Shared responsibility | The patient, patient's family, and care team share responsibility for providing care and maintaining the patient's health; processes enhance patients' engagement in self-management. | When anyone from your primary care provider's office gave you instructions about how to manage your health conditions, how often were you able to follow these instructions? |

3.2.3 Survey sample

We drew a stratified random sample of 3,000 chronically ill patients from a population of 19,213 patients who had two or more chronic conditions, were at least 65 years old, and who had a visit to a primary care provider within six months prior to survey administration (between March and August, 2012) at one of the nine physician practices belonging to MGH. We oversampled recently hospitalized patients, ensuring that 30% of sampled patients had been hospitalized within six months prior to survey administration. We also oversampled CMP enrollees to allow for sufficient comparison between CMP and non-CMP patients.

3.2.4 Survey administration

We distributed paper-based surveys in English to participants up to three times in waves spaced approximately six weeks apart between November 2012 and January 2013. Survey packets were sent through a private survey research firm via US mail and included a cover letter explaining the project and requesting participation and signed by MGH leaders, a survey instrument, and a postage-prepaid reply envelope. No incentives were offered to patients in our

sample. However, physician practices were given practice-level PPIC summary reports in exchange for allowing their patients to be surveyed.

3.2.5 Demographic data

For each patient, MGH provided demographic information (gender, age), health information (number of chronic conditions, hospitalization in the last six months), enrollment status in the specialized CMP (enrolled or not enrolled), and the names of the primary care practice and primary care physician responsible for the patient in the six months prior to the PPIC survey fielding.

3.2.6 Data analysis

First, we examined survey properties by measuring item nonresponse, comparing patient characteristics of survey respondents to non-respondents, and calculating the percentage of top box responses (the percentage of respondents reporting the most positive response; a common approach to reporting patient experience measures) (Dyer et al. 2012; Elliott et al. 2009; Tom et al. 2012). We used a Fisher's exact test to evaluate differences between the sample of patients who responded to the survey and those who did not. We then evaluated sample characteristics of survey respondents, comparing those who received care through the CMP to those who received standard care. Next, for each respondent, we created measures representing each of the 11 integrated care domains. We did this by averaging the percentage of "top box", i.e., most positive, responses, weighting each item equally (a common approach in reporting results from patient experience surveys (Dyer et al. 2012; Elliott et al. 2009)) of a given respondent across items within each survey domain, creating a top box domain score for each respondent.

We fit hierarchical linear models with each integrated care domain as a dependent variable; enrollment in the CMP, self-reported health, number of chronic conditions,

hospitalization within prior six months of being surveyed, race, and gender as the independent variables; and random intercepts for practices and physicians (i.e., we fit 3-level hierarchical models, which accounted for the affiliation of individual patients with physicians and within physician groups). A likelihood-ratio test comparing linear regressions to two- and three-level models found significant differences, confirming the appropriateness of using three-level models (Snijders and Bosker 1999). Finally, to illustrate differences in perceptions between CMP and standard care patients, we used regression results to estimate the predicted probabilities of perceived integrated care for each of our domains. We report the average of these predicted probabilities comparing CMP and standard care patients across domains.

In sensitivity analyses, we repeated the above analyses using alternative specifications for the 11 integrated care domain scores: first, by standardizing variables (rescaling variables to have a mean of zero and a standard deviation of one) before calculating domains, and second, by averaging item means to calculate a domain measure rather than averaging the percentage of top box responses. Results were robust to differences in model specification (available on request). We considered p-values less than 0.05 statistically significant. All analyses were performed using STATA statistical software (version 13.0; StataCorp). Approval to conduct this survey was granted in advance by the relevant institutional review board of the participating institutions.

3.3 Results

We received 1,503 questionnaires from MGH patients (50% response rate), a strong patient experience survey response rate (Bergeson et al. 2013; Elliott et al. 2009). Of these, we excluded from the analytical sample 110 (7%) questionnaires from respondents who did not answer questions within the survey centerfold and 62 (4%) from respondents who did not answer more than half of survey questions. The respondents excluded from analysis did not significantly

differ from respondents included in the final analytic sample according to age, self-reported health, number of chronic conditions, care management program assignment, gender, or race. The final analytic sample included 1,331 observations (89% of surveys returned).

Compared to survey respondents, patients who did not respond had significantly higher rates of congestive heart failure, depression, and ischemic heart disease ($p < 0.05$), had greater numbers of chronic conditions ($p < 0.001$), were significantly older ($p < 0.01$), and were more likely to have had an inpatient stay in the six months prior to survey fielding ($p < 0.001$). The difference in the proportion of CMP participation between respondents and non-respondents was non-significant (Appendix Table C.1).

3.3.1 Sample characteristics

Slightly more than half of survey respondents were at least 75 years of age (Table 3.2), and 95% were white. As expected, compared to those not enrolled in the CMP, respondents enrolled in the CMP reported having more chronic conditions (mean 4.8 chronic conditions per respondent in the CMP versus 4.1 among those receiving standard care; $p < 0.001$), worse health status (39% of respondents in the CMP reported their health status as fair or poor versus 19% of those receiving standard care; $p < 0.001$), and were older (82% of respondents in the CMP were 75 years of age or older vs. 49% of those receiving standard care; $p < 0.001$).

Table 3.2 Sample characteristics

| | Care Management Program (N=191) | Standard Care Program (N=1,140) | P-Value (two-tailed)* |
|--|---------------------------------|---------------------------------|-----------------------|
| Chronic Conditions | | | |
| CHF | 6.8% | 3.7% | 0.045 |
| Asthma | 2.1% | 1.2% | 0.337 |
| Diabetes | 10.5% | 4.1% | 0.000 |
| Depression | 25.7% | 16.4% | 0.002 |
| Ischemic heart disease (IHD) | 40.3% | 19.3% | 0.000 |
| Average number of chronic conditions | 4.8 | 4.1 | 0.001 |
| Self-reported health | | | |
| Excellent | 5.3% | 12.3% | 0.005 |
| Very good | 17.5% | 31.6% | 0.000 |
| Good | 38.6% | 37.4% | 0.757 |
| Fair | 33.9% | 15.6% | 0.000 |
| Poor | 4.8% | 3.0% | 0.329 |
| Age | | | |
| 65 to Less than 75 | 17.8% | 51.2% | 0.000 |
| 75 or older | 82.2% | 48.8% | 0.000 |
| Gender (% male) | 51.5% | 47.5% | 0.669 |
| Education | | | |
| 8th grade or less | 1.8% | 2.9% | 0.390 |
| Some high school, but did not graduate | 5.9% | 4.6% | 0.466 |
| High school graduate or GED | 36.8% | 24.4% | 0.001 |
| Some college or 2-year degree | 20.5% | 21.5% | 0.765 |
| 4-year college graduate | 15.8% | 13.8% | 0.489 |
| More than 4-year college degree | 19.3% | 32.9% | 0.000 |
| Race/Ethnicity | | | |
| White | 94.6% | 95.21% | 0.752 |
| Black | 2.4% | 2.15% | 0.850 |
| Asian | 0.0% | 1.08% | 0.177 |
| Other | 3.0% | 1.56% | 0.213 |
| Hispanic | 1.3% | 1.2% | 0.953 |

Note: P-values derived from two-tailed significant tests examining differences between CMP and standard care program respondents.

3.3.2 Perceptions of integrated patient care

Across individual survey items, response patterns showed general agreement among CMP and standard care patients regarding which items received relatively more or less top box response (see Table 3.3). For example, respondents answered predominantly in the top box regarding their primary care provider knowing the important information about a recent hospital stay (93% of CMP patients and 97% for standard care patients) and receiving reminders from their provider’s office about their upcoming visit with their primary care provider (92% for CMP patients and 96% for standard care patients). Likewise, items receiving the lowest percentage of responses in the top box were also consistent among CMP and standard care patients. Relatively small proportions of both groups reported that anyone from their primary care provider’s office always asked if they needed more services at home to manage their health condition in the last six months (23% for CMP patients and 12% for standard care patients). Also, few patients from either group said that in the last six months anyone from their primary care provider’s office always contacted them between visits to see how they were doing (24% for CMP patients and 14% for standard care patients).

Table 3.3 Patient Perceptions of Integrated Care Survey item response (% Top Box)

| | Care Management Program (CMP) (N=191) | Standard Care Program (N=1,140) | Difference (CMP – Standard Care) |
|---|--|--|---|
| Information Flow to Primary Care Provider | | | |
| In the last 6 months, how often did your primary care provider seem informed and up-to-date about the care you got from specialists? (% Always) | 77.1% | 81.0% | -3.9% |
| In the last 6 months, how often did you have to remind your primary care provider about care you received from specialists? (% Never) | 73.7% | 80.0% | -6.3% |
| In the last 6 months, how often did your primary care provider talk with you about the medicines prescribed by specialists? (% Always) | 50.0% | 58.9% | -8.9% |

Note: Data are not adjusted for covariates.

Table 3.3 Patient Perceptions of Integrated Care Survey item response (continued)
(%Top box)

| | Care Management Program (CMP) (N=191) | Standard Care Program (N=1,140) | Difference (CMP – Standard Care) |
|--|--|--|---|
| Information Flow to Specialist | | | |
| In the last 6 months, how often did the specialist seem to know the important information about your medical history? (% Always) | 73.8% | 73.5% | 0.3% |
| When you see the specialist, how often do you have to repeat information that you have already given to your primary care provider? (% Never) | 53.3% | 64.7% | -11.3% |
| When you see the specialist, how often does he or she repeat tests that you have already had? (% Never) | 64.6% | 70.3% | -5.7% |
| Information Flow to Other Providers in Primary Provider's Office | | | |
| In the last 6 months, how often did other staff seem up-to-date about the care you were receiving from your primary care provider? (% Always) | 69.2% | 69.6% | -0.4% |
| In the last 6 months, how often did other staff talk with you about care you received from your primary care provider? (% Always) | 41.0% | 45.6% | -4.6% |
| In the last 6 months, how often did these other staff seem to know the important information about your medical history? (% Always) | 65.7% | 62.6% | 3.1% |
| Information Flow Post Hospitalization | | | |
| After your most recent hospital stay, did anyone from your primary care provider's office contact you to ask about the condition you were in the hospital for? (% Yes) | 75.4% | 73.7% | 1.7% |
| After your most recent hospital stay, did anyone from your primary care provider's office give you advice to help you manage the condition you were in the hospital for? (% Yes) | 92.5% | 89.1% | 3.4% |
| How often did you follow this advice? (% Always) | 77.8% | 84.1% | -6.3% |
| After your most recent hospital stay, did your primary care provider seem to know the important information about this hospital stay? (% Yes) | 93.1% | 97.2% | -4.1% |
| Proactive Action Before Visits | | | |
| Before your most recent visit with your primary care provider, did you get a reminder from this provider's office about the appointment? (% Yes) | 91.9% | 96.1% | -4.3% |
| Before your most recent visit with your primary care provider, did you get instructions telling you what to expect or how to prepare? (% Yes) | 72.2% | 77.3% | -5.1% |
| How often has your primary care provider cancelled or changed the date of an appointment? (% Never) | 66.1% | 67.7% | -1.5% |
| When your primary care provider cancels or changes the date of an appointment, how often is this a big problem for you? (% Never) | 74.2% | 78.7% | -4.5% |
| When you miss an appointment with your primary care provider, how often does someone from this provider's office contact you to make a new appointment? (% Always) | 44.4% | 59.2% | -14.8% |

Note: Data are not adjusted for covariates.

Table 3.3 Patient Perceptions of Integrated Care Survey item response (continued)
(%Top box)

| | Care Management Program (CMP) (N=191) | Standard Care Program (N=1,140) | Difference (CMP – Standard Care) |
|--|--|--|---|
| Post-visit Information Flow to the Patient | | | |
| In the last 6 months, when your primary care provider ordered a blood test, x-ray, or other test for you, how often did anyone from this provider's office follow up to give you those results? (% Always) | 79.2% | 82.7% | -3.5% |
| In the last 6 months, how often did you get these test results in a timely manner? (% Always) | 74.9% | 77.9% | -3.0% |
| In the last 6 months, how often did you have to request your test results before you got them? (% Never) | 83.3% | 87.2% | -3.8% |
| In the last 6 months, how often were these test results presented in a way that was easy to understand? (% Always) | 78.7% | 81.4% | -2.7% |
| Responsive Independent of Visits | | | |
| In the last 6 months, how often has anyone from your primary care provider's office contacted you between visits to see how you were doing? (% Always) | 23.7% | 13.7% | 9.9% |
| In the last 6 months, when you tried to contact your primary care provider's office after regular office hours, how often did you get an answer to your medical question in a timely manner? (% Always) | 63.6% | 69.5% | -5.9% |
| Continuous Familiarity with Patient Over Time | | | |
| When you see your primary care provider, how often do you have to repeat information you have already given to someone in your provider's office? (% Never) | 67.2% | 67.4% | -0.2% |
| In the last 6 months, how often did your primary care provider seem to know the important information about your medical history? (% Always) | 84.1% | 86.6% | -2.4% |
| In the last 6 months, how often did your primary care provider seem to know the important information about your work or life at home that you have discussed in the past? (% Always) | 63.0% | 70.4% | -7.4% |
| Coordination with Home and Community Services | | | |
| In the last 6 months, how often did anyone from your primary care provider's office ask if you needed more services at home to manage your health conditions? (% Always) | 22.8% | 12.2% | 10.6% |
| In the last 6 months, how often did anyone from your primary care provider's office help you get more services at home to manage your health conditions? (% Always) | 43.8% | 47.2% | -3.4% |
| Patient-Centeredness | | | |
| In the last 6 months, how often do you think your primary care provider understood what you wanted from your health care? (% Always) | 84.4% | 83.8% | 0.6% |
| In the last 6 months, how often did your primary care provider ask you for your ideas about managing your own health? (% Always) | 44.7% | 48.4% | -3.7% |
| In the last 6 months, how often did your primary care provider discuss whether you were getting the health care you wanted? (% Always) | 54.5% | 54.9% | -0.4% |

Note: Data are not adjusted for covariates.

**Table 3.3 Patient Perceptions of Integrated Care Survey item response (continued)
(%Top box)**

| | Care Management Program (CMP) (N=191) | Standard Care Program (N=1,140) | Difference (CMP – Standard Care) |
|---|--|--|---|
| Shared Responsibility | | | |
| When anyone from your primary care provider's office gave you instructions about how to manage your health conditions, how often were you able to follow these instructions? (% Always) | 72.2% | 74.9% | -2.7% |
| In the last 6 months, how often have you and anyone from your primary care provider's office talked about how you were supposed to take your medicine? (% Always) | 48.0% | 54.1% | -6.1% |
| In the last 6 months, how often have you taken your medicine as prescribed? (% Always) | 89.3% | 91.7% | -2.3% |
| In the last 6 months, how often have you and anyone from your primary care provider's office talked about what to do if you have a bad reaction to your medicine? (% Always) | 34.3% | 39.6% | -5.2% |

Note: Data are not adjusted for covariates.

After adjusting for respondent demographic characteristics and health status, coefficient estimates from hierarchical linear regressions (Table 3.4a and Table 3.4b) indicate that compared to respondents receiving standard care, CMP enrollees had top box scores that were 10 percentage points higher on two domains of integrated care: coordination with home and community services ($p < .001$) and responsiveness independent of visits ($p < .01$). For all other domains, differences between patients in the CMP and those receiving standard care were non-significant after controlling for covariates in hierarchical models.

Table 3.4a Hierarchical Linear regression of patient perceptions of integrated care

| | (1) | (2) | (3) | (4) | (5) | (6) |
|--|---|--------------------------------------|--|---|---|---|
| | Information Flow to Primary Care Provider | Information Flow to Specialist | Information Flow to Other Providers in Primary Provider's Office | Information Flow Post Hospitalization | Proactive Action Before Visits | Post- Visit Information Flow to the Patient |
| In Care Management Program (receiving standard care) | -0.04 [0.03] | -0.04 [0.03] | -0.01 [0.05] | 0.02 [0.04] | -0.02 [0.02] | 0.02 [0.03] |
| Self-reported Fair or Poor Health (excellent, very good or good self- reported health) | -0.08** [0.03] | -0.06* [0.03] | -0.06 [0.04] | -0.08* [0.03] | -0.04* [0.02] | -0.09*** [0.02] |
| Number of Chronic Conditions (two chronic conditions) | | | | | | |
| 3 chronic conditions | 0.06* [0.03] | 0.04 [0.03] | 0.03 [0.05] | 0.00 [0.05] | -0.02 [0.02] | -0.00 [0.03] |
| 4 or more chronic conditions | 0.12*** [0.03] | 0.05 [0.03] | 0.06 [0.05] | 0.01 [0.05] | -0.01 [0.02] | 0.01 [0.02] |
| Was Hospitalized Within Last 6 Months | 0.01 [0.03] | -0.00 [0.03] | 0.05 [0.04] | 0.06* [0.03] | -0.01 [0.02] | -0.01 [0.02] |
| Male (female) | -0.02 [0.02] | -0.01 [0.02] | -0.02 [0.03] | 0.00 [0.03] | -0.02 [0.01] | -0.02 [0.02] |
| White (non-white) | 0.13* [0.06] | 0.06 [0.06] | 0.06 [0.08] | 0.01 [0.07] | -0.02 [0.03] | -0.02 [0.04] |
| Constant | 0.57*** [0.06] | 0.61*** [0.06] | 0.51*** [0.09] | 0.77*** [0.08] | 0.85*** [0.04] | 0.84*** [0.05] |
| N | 938 | 911 | 562 | 339 | 1,171 | 1,068 |
| No groups | | | | | | |
| Physicians | 137 | 136 | 109 | 100 | 145 | 137 |
| Practices | 9 | 9 | 9 | 9 | 9 | 9 |
| Chi2, overall model | 35.04 | 11.19 | 7.39 | 10.89 | 11.62 | 16.09 |
| Log likelihood | -266.70 | -271.10 | -303.85 | -46.72 | 68.21 | -206.99 |

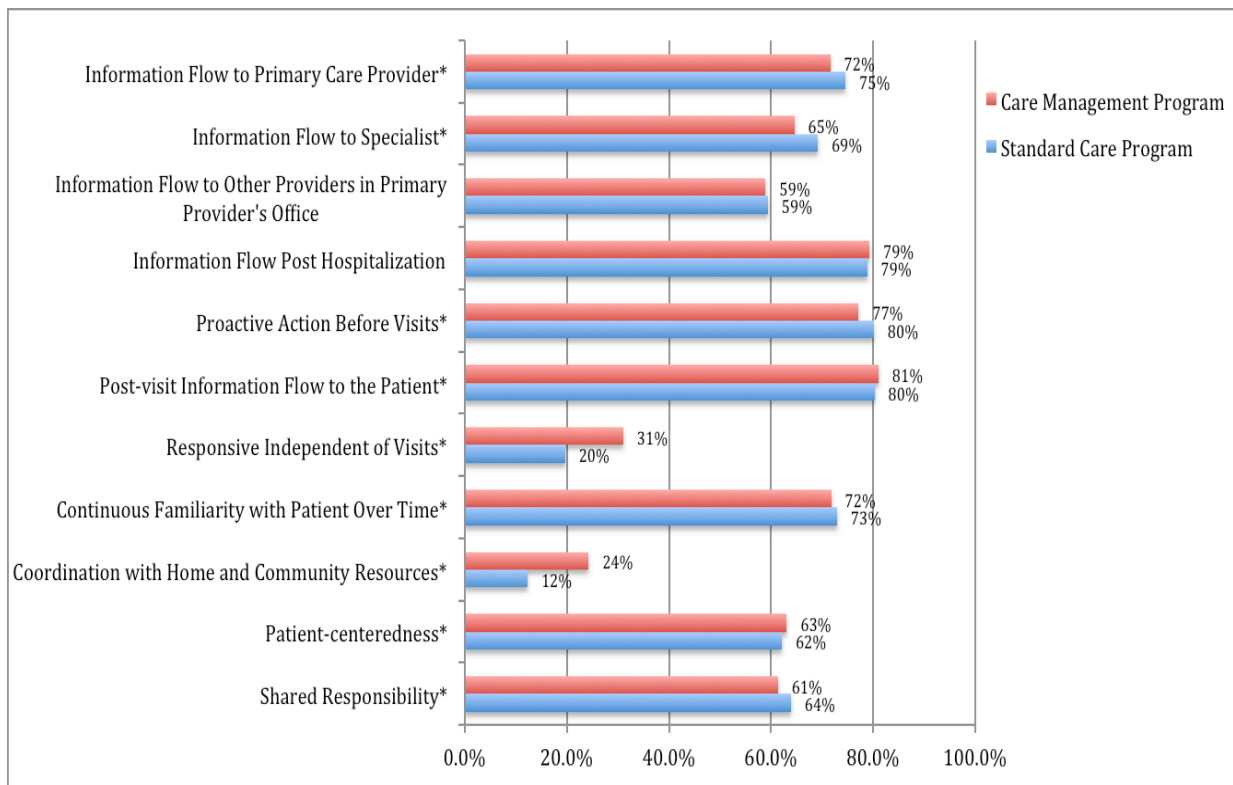
Notes: Results derived from three-level hierarchical linear regressions. Dependent variable is an integrated care domain. Robust standard errors reported in parentheses. *p<0.05; **p<0.01; ***p<0.001

Table 3.4b Hierarchical linear regression of patient perceptions of integrated care

| | (7) | (8) | (9) | (10) | (11) |
|---|--|---|---|--------------------------|--------------------------|
| | Responsiveness Independent of Visits | Continuous Familiarity with Patient over Time | Coordination with Home and Community Services | Patient- centeredness | Shared Responsibility |
| In Care Management Program (receiving standard care) | 0.10** [0.03] | -0.01 [0.03] | 0.10*** [0.03] | 0.02 [0.03] | -0.02 [0.03] |
| Self-reported Fair or Poor Health (excellent, very good or good self-reported health) | -0.03 [0.03] | -0.06* [0.02] | 0.06 [0.02] | -0.06 [0.03] | -0.06** [0.02] |
| Number of Chronic Conditions (two chronic conditions) | | | | | |
| 3 chronic conditions | 0.07* [0.03] | 0.01 [0.03] | 0.01 [0.03] | 0.02 [0.03] | 0.02 [0.03] |
| 4 or more chronic conditions | 0.09** [0.03] | 0.03 [0.02] | 0.05 [0.02] | 0.03 [0.03] | 0.03 [0.02] |
| Was Hospitalized Within Last 6 Months | 0.08** [0.03] | 0.03 [0.02] | 0.10*** [0.02] | 0.04 [0.03] | 0.06 [0.02] |
| Male (female) | -0.01 [0.02] | -0.01 [0.02] | -0.00 [0.02] | 0.02 [0.02] | 0.02 [0.02] |
| White (non-white) | -0.05 [0.05] | -0.01 [0.04] | 0.02 [0.05] | 0.06 [0.05] | -0.01 [0.04] |
| Constant | 0.17** [0.06] | 0.73*** [0.05] | 0.05 [0.05] | 0.54*** [0.06] | 0.61*** [0.05] |
| N | 1,117 | 1,170 | 1,050 | 1,148 | 1,118 |
| No groups | | | | | |
| Physicians | 143 | 145 | 139 | 145 | 142 |
| Practices | 9 | 9 | 9 | 9 | 9 |
| Chi2, overall model | 38.43 | 11.32 | 55.01 | 10.66 | 19.02 |
| Log likelihood | -463.63 | -316.31 | -258.13 | -481.92 | 264.9 |

Notes: Results derived from three-level hierarchical linear regressions. Dependent variable is an integrated care domain. Robust standard errors reported in parentheses. *p<0.05; **p<0.01; ***p<0.001

Predicted probabilities estimated from regression models indicate that the average percentage of top box responses for each integrated care domain varied substantially between CMP and standard care patients (Figure 3.1). For both groups, integration with home and community services and responsiveness independent of visits had the lowest scores among those assessed by the PPIC survey: 12% of responses for those receiving standard care and 24% of responses among patients enrolled in the CMP fell in the top box for the home and community services domain; 20% of standard care patients and 31% of responses among patients enrolled in the CMP fell in the top box for the home and community services domain; 20% of standard care patients and 31% of CMP patients responded in the top box to items in the responsiveness independent of visits domain; whereas other domains received almost 60% or more top box responses among both groups of patients.



Note: Predicted probabilities derived from three-level hierarchical linear regression models (Table 3.4) controlling for self-reported health, number of chronic conditions, hospitalization within last six months, and gender. * denotes two-tailed t-test comparing CMP vs. standard care integrated care domain means <0.05.

Figure 3.1
Predicted probabilities of top box patient perceptions of integrated care among care management and standard care patients, by integrated care domain

3.4 Discussion

No study to our knowledge has previously evaluated achievement of multiple patient-reported dimensions of integrated care from the patients' perspective by a demonstration program. Our results suggest that the CMP we evaluated produced improvements in two important functional domains of integration: coordination with home and community services and responsiveness independent of visits. Of all domains, these two had the lowest scores, and thus offered the largest potential improvement. These two domains were also targeted for improvement by the CMP. Specifically, the MGH CMP program emphasized continuous contact between complex beneficiaries and their providers as well as assistance in connecting beneficiaries with services in the home and community. This finding suggests that targeted programmatic integration efforts can positively impact the integration of care as perceived by patients. However, the generally low levels of perceived integration in these two domains in particular also highlight potential challenges in improving the integration of care for this very sick population. Moreover, there seemed to be no detectable spillover effects of the CMP on other domains of integrated care that we assessed. This may have been because scores for other domains were higher, offering less room for improvement.

Survey results also suggest that patient perceptions of integrated care vary substantially among survey items and domains. Response patterns suggested general agreement between CMP and standard care patients regarding relative levels of integration (i.e., they agreed about which items and domains reflected areas where patients experienced strong and weak integration). Although prior patient experience surveys, such as the clinician and group and patient-centered medical home versions of the Consumer Assessment of Health Care Providers and Systems (CAHPS) surveys (McCall et al. 2010) have been used to evaluate CMPs, these surveys were not

designed to measure multiple aspects of integrated patient care as defined by our conceptual framework (Singer et al. 2011; Solomon et al. 2005). The variation by domain that we observed suggests that a clear understanding of the performance of these programs requires considering multiple dimensions. The PPIC survey offers a multidimensional assessment of integrated care that could provide more detailed guidance to providers seeking to improve the integration of care received by their patients. As programs intended to improve care integration under the Affordable Care Act and other reform efforts are implemented, it will be increasingly important to assess programs' progress, particularly from the patient's perspective. Assessing multiple dimensions of integration may enable more detailed identification of components of integrated care that provide useful benchmarks against which ongoing efforts can be assessed.

Our findings should be considered in light of study limitations. First, our patient sample was homogenous in some respects (i.e., 95% of respondents were white), so our results may not extend to health systems serving patient populations with other racial compositions. Second, the number of CMP patients was modest, limiting statistical power to detect differences between CMP and usual care. Third, although the survey response was relatively strong for a patient experience survey (50%) (Bergeson et al. 2013; Goldstein et al. 2005), there nevertheless remains the possibility of selection bias. As our nonresponse analysis indicated, patients who did not respond to our survey were significantly older and sicker compared to those who did. Moreover, sicker patients in our sample were more likely to report lower levels of perceived care integration, even after adjusting for covariates. Since our CMP sample was sicker compared to our standard care sample, this may be one explanation for why standard care patients were more likely to report higher levels of perceived integration across many domains compared to CMP patients. Our nonresponse analysis indicates that our sample may be healthier than the sample

population as a whole and that results likely overestimate levels of perceived care integration. However, given that differences in non-response between standard care and CMP program participants were not significant, we believe that selection bias would have minimal impact on our main results.

Fourth, this observational study was a cross-sectional comparison and conducted six years after the intervention began, so we cannot make causal inferences from the observed associations between CMP enrollment and achievement of integrated care, nor can we infer the extent to which the program's interventions begun six years ago were sustained. And while the CMS evaluation of the CMP program highlighted encouraging results, such as significantly lower mortality rates and costs, the evaluation did find some shortcomings associated with the CMP, particularly its inability to reduce rates of 90-day hospital readmissions, which may suggest not all components of the program were effective (McCall et al. 2010). Of note, assessment and comparison of 30-day hospital readmission rates were not included as part of the CMS evaluation.

A final limitation is the potential for our findings to be affected by spillover of care management activities from CMP to standard care patients. Such spillover would have resulted in an underestimate of the impact of the CMP on perceived integrated care. While we cannot rule out the possibility of spillover, we believe it was limited because key structural features of the CMP were not available through standard care. For example, only CMP patients had access to care manager support and other program interventions. On the other hand, CMP and standard care patients frequently used the same physicians who may have adopted or modified clinical practices as a result of experience in the CMP program. Moreover, recent health delivery reform efforts, such as the medical home and accountable care organization, models of care delivery

which emphasize the coordination of care for patients and in which the MGPO participates, may have increased focus of the physician group on coordination and integration of patient care delivery in both the CMP and standard care groups.

Our findings suggest CMPs have the potential for improving aspects of care integration and validate the PPIC survey as a useful instrument for program evaluation. Given the complexity of care delivery for older and chronic patients, and the growing population of those with chronic conditions, it is increasingly important to evaluate the patient perspective when making a full assessment of programs designed to integrate care for patients with multiple chronic conditions. Assessments should seek patients' perceptions on multiple dimensions of integrated care in order to obtain information at a level of specificity that informs improvement efforts.

Chapter 4

Successful Quality Improvement Implementation: The Role of Senior and Middle Manager Commitment

Abstract

Background: While recent literature suggests that middle manager commitment to a quality improvement (QI) program may influence program implementation success, quantitative evidence is scarce. Moreover, little is understood about the ways in which senior and middle manager commitment influence QI program implementation success and how to foster such commitment among managers.

Purpose: The aim of this study is to empirically assess whether and how senior and middle manager commitment to a QI program is associated with the successful implementation of that program and the organizational factors that foster manager commitment to a QI program. In particular, we focus on affective commitment, which is an emotional attachment to, identification with, and involvement in the QI program.

Methodology: We draw on existing survey measures of manager commitment and adapt the items to our context of patient fall reduction quality improvement programs. We administered a cross-sectional survey to 246 nurse leaders (81% response rate) from 30 U.S. hospitals between November 2014 and January 2015. We use hierarchical linear regression to assess the relationships among manager affective commitment, frontline worker support, and organizational support for the falls QI program, with the program's successful implementation. We also assess the potential mediating effect of frontline worker support for the QI program on the relationship between manager affective commitment to the program and program implementation success. We also test the mediating effect of manager affective commitment on the relationship between organizational support for the QI program and the program's implementation success. We examine these relationships for the full sample of nurse managers and separately for senior managers, middle managers, and assistant middle managers.

Findings: Managers' affective commitment to a falls QI program is positively associated with program implementation success across all manager levels. Stronger frontline worker support for the falls program partially mediates the relationship between manager affective commitment and falls program implementation success for middle managers and assistant middle managers, but not for senior managers. Manager affective commitment for the falls program mediates the relationship between organizational support for the falls program and program implementation success across all manager levels.

Practice implications: Increasing levels of senior and middle manager affective commitment to a QI program could improve program implementation success and facilitate frontline worker support for the program. Types of organizational support for the QI program, such as having a clear implementation action plan or holding managers directly accountable for program results, may foster increased levels of affective commitment to the QI program among managers and, in turn, lead to increased program implementation success.

4.1 Introduction

The suboptimal performance of the U.S. health care system has led to large-scale efforts to create, implement, and disseminate quality improvement (QI) strategies. Although QI efforts hold promise for improving the quality of health care delivery, organizations that try to adopt QI programs often struggle with their implementation (Alexander et al. 2006; Grol and Grimshaw 2003; Laffel and Blumenthal 1989; Shortell et al. 1998). Studies estimate that fewer than half of evidence-based guidelines are successfully implemented (Alexander and Hearld 2011). A key reason for this failure is likely not due to the intervention adopted, but rather, due to implementation failure (Klein et al. 2001; Klein and Sorra 1996).

Low implementation rates of evidence-based practices may be expected given the demands placed on individuals and organizations when implementing new, innovative practices. A robust literature of implementation research illustrates how successful implementation requires sustained leadership, extensive training and support, robust measurement and data systems, realigned incentives, and cultural receptivity to change (Alexander and Hearld 2011). While current health care implementation research identifies a number of individual and organizational factors that influence successful QI effectiveness (Damschroder et al. 2009; Greenhalgh et al. 2004), an understudied though growing area of research focuses on the role of middle manager commitment in effective QI implementation (Birken et al. 2013; Birken, Lee, and Weiner 2012).

Middle managers play a particularly important role in QI implementation in health care settings because of their strategic location between executive leaders and frontline workers. Prior research suggests that organizational performance is heavily influenced by what happens in the middle of organizations rather than at the top (Burgess and Currie 2013; Dopson and Fitzgerald 2006; Floyd and Wooldridge 1994). By virtue of their position within the organizational

hierarchy, middle managers may hold substantial influence over implementation success. They are close to day-to-day operations and frontline employees, relative to senior managers, and therefore may be better positioned to recognize where potential implementation challenges may arise as well as to see how the overall implementation is progressing. They inform, motivate, and direct frontline workers with regards to program implementation and seek resources or span boundaries to address implementation challenges when they arise. Likewise, middle managers are also closer to senior managers than frontline workers and are thus privy to and may help influence organizational strategy and policies that are intended to shape implementation practices.

Recently, there has been growing interest in research on the role of middle manager commitment in health care QI implementation. Commitment has been postulated as a key psychological mechanism that influences behaviors of individuals in bringing about successful organizational change (Aremenakis and Bedeian 1999; Conner and Patterson 1982; Herscovitch and Myer 2002). Birken and colleagues have put forth a theory of how middle managers are key to the effective implementation of health care innovations, suggesting that middle management commitment to innovation implementation is essential in facilitating shared perceptions of the extent to which innovation implementation is rewarded, supported, and expected in the organization, which in turn promotes implementation effectiveness (Birken et al. 2012; Klein and Sorra 1996). Authors' research focuses on how middle manager commitment is demonstrated through behaviors. They define middle manager commitment as a behavioral manifestation of middle managers' effort and engagement in activities that promote implementation.

While Birken and colleagues' theory has garnered great interest, there remains a lack of strong quantitative evidence from the current health management literature in support of the

theorized relationship between middle manager commitment to a QI innovation and the effective implementation of that innovation. Moreover, the middle layers of an organization may extend beyond one particular level within the managerial hierarchy, which raises the question of whether there are different middle manager roles and whether their commitment to quality improvement implementation may relate differently to implementation success. The objective of our study is to better understand the ways in which middle manager commitment to a QI program influences the program's successful implementation and, if that relationship holds, how to foster manager commitment.

Our study makes several contributions to the literature on implementation effectiveness. First, our study provides empirical evidence of a relationship between manager commitment—at both the middle and senior manager levels—and successful QI program implementation. Second, we measure manager commitment at multiple levels: assistant middle manager, middle manager, and senior manager. To our knowledge, few studies have examined manager commitment across hierarchical levels. Third, we find that frontline worker support mediates the relationship between manager affective commitment and implementation success. Finally, we identify five key drivers associated with manager commitment: having a clear implementation plan, being held accountable for program results, having adequate financial resources for program implementation, having adequate personnel resources for program implementation, and having manager support to overcome implementation challenges.

4.2 Theory and conceptual framework

Figure 4.1 depicts our conceptual framework. First, we examine the relationship between manager commitment to a QI program and program implementation success. Despite its presumed importance, little attention has been paid to the definition and measurement of an

individual's commitment within an organizational change context. Herscovitch and Meyer (2002) made an important contribution to the measurement of employee commitment to change, finding that commitment to change is multidimensional. They define commitment to change as a mindset that binds an individual to a course of action deemed necessary for the successful implementation of a change initiative. They argue that this mindset that binds an individual to a course of action can reflect a) a desire to provide support for the change based on a belief in its inherent benefits ("affective" commitment to change), b) a sense of obligation to provide support for the change ("normative" commitment to change), or c) a recognition that there are costs associated with failure to provide support for the change ("continuance" commitment to change). Authors suggest that the three components of commitment to change are distinguishable and related to an employees' self-reported level of behavioral support for change (Herscovitch and Meyer 2002; Meyer et al. 2007).

Studies indicate that affective commitment to change has the strongest positive correlation with desirable work behaviors (Herscovitch and Meyer 2002; Meyer et al. 2007). Affective commitment may relate to engaging in activities that go beyond fulfilling job requirements, which may in turn promote implementation effectiveness. Consequently, we focus on the affective dimension of commitment to change among managers. (For additional analyses examining associations of continuance and normative commitment to implementation success please see Data Appendix E.) For brevity, we refer to affective commitment as commitment from this point forward.

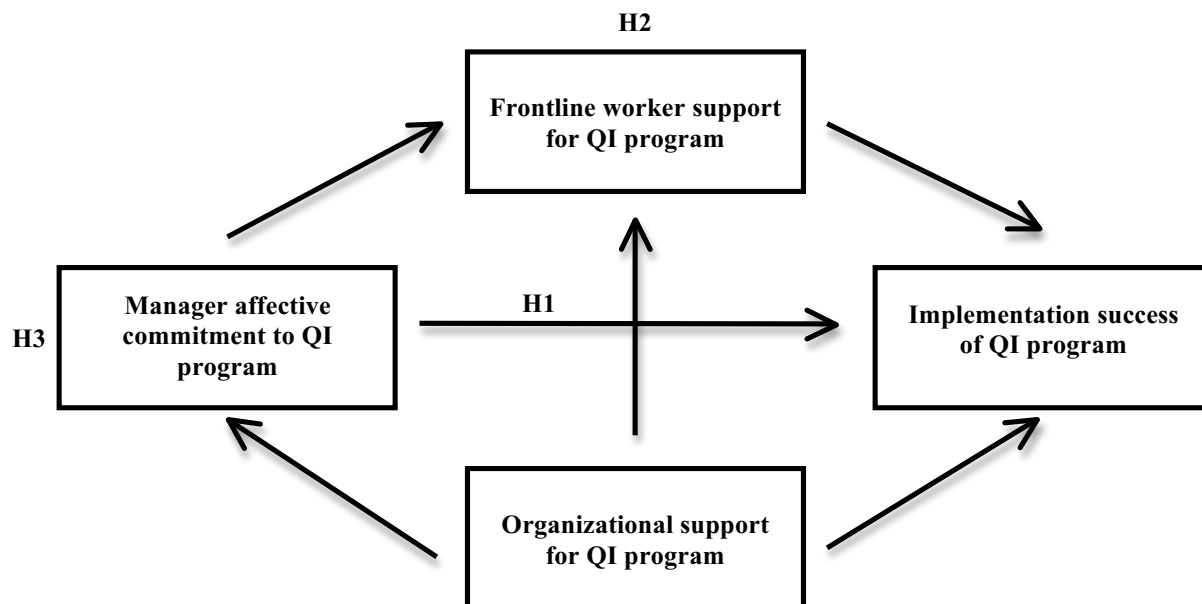


Figure 4.1. Conceptual Framework

Robust literatures from both health services research and manufacturing settings provide strong support for the central role that senior manager commitment plays in successful organizational change and quality improvement implementation. Studies of manufacturing firms show that senior leaders are the people in the organization who can establish quality as a top priority, create a corporate culture for quality, and mobilize the financial and human resources necessary to support organizational change. When they have high levels of commitment, they are more likely to engage in these actions. This, in turn, overcomes skepticism and reluctance of middle managers that otherwise would impede the implementation effort (Deming 1986; Juran 1988). Studies of healthcare organizations find similar results. Senior leadership’s commitment to quality improvement efforts is essential for QI implementation success (Berwick 1996; Lukas et al. 2007; Weiner and Shortell 1993). For example, Bradley and colleagues (2003) find in a

qualitative study of eight hospitals that higher performing hospitals have senior managers who are personally engaged in QI efforts, support norms of interdepartmental collaboration, and ensure the availability of resources for QI efforts. Other studies provide evidence that senior manager support influences middle manager commitment to innovation implementation (Birken et al. 2015; Chuang, Jason, and Morgan 2011).

While the key role of senior management commitment has been explored, a more nascent body of evidence is emerging in health services research on the important role middle manager commitment has in the organizational change process. While this area of research is relatively new to the health care setting, strategy and management literature has documented over the last few decades how organizational performance is heavily influenced by what happens in the middle of organizations rather than at the top (Burgess and Currie 2013; Dopson and Fitzgerald 2006; Floyd and Wooldridge 1994). Such research suggests that middle managers may play a pivotal role in helping (or hurting) organizations bring about successful change. For example, strategy literature shows that middle managers may impede implementation efforts. According to Floyd and Wooldridge (1992), unsuccessful execution of strategy can be caused by middle-level managers who are either ill informed or unsupportive of the chosen strategy. Others have similarly found that middle managers have a critical role in the success or failure of major change programs in organizations (Balogun 2003; Floyd and Wooldridge 1992, 1994; Huy 2001; Kanter 1981). For these reasons, we hypothesize that stronger middle manager commitment is associated with greater implementation success. More formally, we state:

Hypothesis 1 (H1): Higher levels of middle manager affective commitment to a falls prevention QI program is associated with higher levels of program implementation success.

Middle manager commitment to change has been theorized as a key mechanism linking organizational efforts to implement planned change to behaviors of employees (Armenakis and Bedeian 1999; Herscovitch and Meyer 2002; Meyer et al. 2007; Parish, Cadwallader, and Busch 2008). This may be because middle managers have the ability to enable the successful involvement of frontline workers in improvement efforts. Many researchers emphasize that implementation success depends on the ability and willingness of frontline employees to implement the new processes in their daily work routines (Blumenthal and Kilo 1998; Shortell, Bennett, and Byck 2014; Tucker et al. 2007). Tucker and colleagues, for example, empirically assess the roles of frontline employees and project teams in implementing new practices in hospital intensive care units. The authors find empirical support for the significant role frontline employees play in new-practice implementation and acknowledge the importance of middle managers in supervising frontline workers and project teams in their implementation efforts (Tucker et al. 2007). It is likely that middle manager commitment to an improvement program has a positive affect on implementation success via its ability to increase frontline worker support for the program. Thus, we hypothesize:

Hypothesis 2 (H2): The positive relationship between middle manager affective commitment to a falls prevention QI program and the program's implementation success is mediated by frontline worker support for the QI program.

Implementation research has theorized that it is important to create organizational structures, plans, and policies that facilitate the successful implementation of quality improvement innovations (Helfrich et al. 2007; Klein and Sorra 1996; Weiner et al. 2009). Studies indicate that certain organizational factors are necessary to ensure full implementation of QI efforts, including financial support, training and education, integrated data systems, clinical

integration, and information system capability (Alexander et al. 2006; Damschroder et al. 2009; Greenhalgh et al. 2004).

While prior research demonstrates the important link between organizational factors in support of a change initiative and the successful implementation of the change initiative, little has been done in health services literature to explore the mechanisms by which organizational support for a change influence successful implementation. Klein and Sorra (2001) empirically assess such implementation pathways in the manufacturing setting and hypothesize that manager support for a technology implementation fosters high-quality implementation policies and practices, which in turn influence implementation success. Contrary to their theorized model, however, authors find that management support is not significantly related to implementation policies and practices. One reason authors may have found no significant relationship is that implementation policies and practices may influence manager support, rather than the other way around. If an organization provides structures, plans, and policies in support of their employees implementing the planned change it is likely that such support will influence employee commitment to that change. We theorize that an organization's support for implementation (e.g. financial resources, incentives, implementation plans) will foster manager commitment to the change being implemented. More formally, we hypothesize:

Hypothesis 3 (H3): The positive relationship between an organization's support for a falls prevention QI program and the program's implementation success is mediated by manager affective commitment to the QI program.

4.3 Methods

4.3.1 Study design and context

We conduct an exploratory cross-sectional survey of senior and middle nurse managers from 30 U.S. hospitals. Nursing is an ideal context to study the middle manager role in health

care QI implementation because of the clearly delineated hierarchy of managerial roles within the profession. At the top of the hospital nursing hierarchy is a chief nursing officer, the highest-ranking nurse executive, who is responsible for overseeing and coordinating a hospital's nursing department and its daily operations. The chief nursing officer directly oversees associate chief nurses (also sometimes called nursing directors), who are senior managers in the nursing department that are in charge of a hospital service line. Each associate chief nurse, in turn, supervises nurse managers, who typically oversee one-to-two hospital units and the frontline nurses who work on those units. An assistant nurse manager, clinical nurse leader/specialist, or nurse educator may also support the work of the nurse manager on hospital units and oversee the day-to-day activities of frontline nurses and quality improvement implementation. In this study, we consider nurse managers and assistant managers as two levels of middle management as they oversee the work of frontline staff and report to senior managers. We consider the associate chief nurses and nursing directors as senior managers.

Data from nurse leaders were collected via online survey between September 2014 and January 2015. Fourteen hospitals belonged to a large hospital system in Texas, 13 hospitals belonged to a large hospital system in New York, and the remaining three hospitals were medium-to-large medical centers located in Florida, North Carolina, and Connecticut. Sample hospitals were larger than the U.S. average (15 hospitals had 250+ beds).

The survey was administered as a module in a larger multipurpose leadership survey of all nurse leaders (1,569) across hospital sites. Invitations to participate in the study were sent out via email by each hospital's chief nursing officer and included a link to the electronic survey. Three email reminders were sent to nurse leaders requesting survey participation. We received a total of 569 responses to the larger leadership survey (36% response rate). Of those who accessed

the larger survey, 53% (304) received the module with additional questions related to the implementation of their hospital's falls prevention QI program. Our final analytic sample included 246 nurse leaders (81% response rate) of which 85 were senior managers, 73 were middle managers, and 88 were assistant middle managers.

4.3.2 Variables and measures

We operationalize the domains outlined in our conceptual framework (see Figure 1) using established measures of correlates to organizational change that we adapt to a quality improvement program implementation context. All items are validated by the existing literature with exception of the items comprising the domain representing organizational support for the QI program, which we identified in consultation with the literature and qualitative interviews with nurse managers (N=12) as part of our survey development. A more detailed explanation of survey development can be found in Chapter One (section 1.2.5) and a complete version of the survey can be found in Appendix A.3.

All survey questions pertain specifically to the implementation of a falls prevention quality improvement program currently underway in the hospital. We focus on a falls prevention quality improvement program because such programs are widely implemented across hospitals in the United States. The American Nursing Association, the Joint Commission, and the Institute for Healthcare Improvement, for example, recommend common protocols and strategies to reduce patient fall rates in the hospital setting. Common protocols include: risk assessments for patients, patient and staff education, bedside signs and wristband alerts, footwear advice, scheduled and supervised toileting, and a medication review (Miake-Lye et al. 2013; Oliver, Hopper, and Seed 2000; Spoelstra, Given, and Given 2011). For all items, respondents use a

seven-point Likert scale to indicate their level of agreement (1=strongly disagree, 7=strongly agree).

Dependent Variable. Falls program implementation success, our dependent variable, is measured using a three-item survey scale developed by Noble and Mokwa (1999). They define implementation success as “the extent to which an implementation effort is considered successful by the organization” (Noble and Mokwa 1999). We adapt their three-item scale to the context of the implementation of a falls prevention quality improvement program. Survey scale items include: “Our implementation effort on this program was effective”; “The implementation of this program was effective”; and “I personally think the implementation of this program was a success” (standardized Cronbach’s alpha 0.93).

Independent Variables. Our analyses focus on three measures and how they relate to the falls prevention program implementation success. The first main independent variable of interest is manager affective commitment to the falls prevention program. These scale items include: “I believe in the value of this program”; “This program is a good strategy for this organization”; “This program serves an important purpose”; and “Things could be better without this program” (reverse scored) (standardized Cronbach’s alpha 0.93).

To measure frontline worker support for the quality improvement program, we draw on Klein and colleague’s six-item validated measure of management support for implementation, adapting survey items to assess managers’ views of frontline worker support rather than manager support (Klein et al. 2001). These scale items include: “Frontline workers have actively pushed to make this program a success”; “Frontline workers are strongly committed to the successful implementation of this program”; “Frontline workers have expressed doubts about whether this program will really help patients” (reverse scored); “Frontline workers show little interest in this

program” (reverse scored); “Frontline workers stress the importance of this program for this hospital”; “Frontline workers take an active interest in this program’s related problems and successes” (standardized Cronbach’s alpha 0.91).

Finally, we use five survey items to measure organizational support for the falls prevention program. These items include whether the manager feels he/she has adequate resources (both personnel and financial) to successfully implement the program, whether there is a clear falls program implementation plan, whether the manager is held accountable for program results, and whether the manager feels he/she could get senior manager support when implementation challenges are encountered (standardized Cronbach’s alpha 0.79).

Control Variables. Our control variables include age, gender, education, race, years of direct patient care experience, years of administrative experience, manager level, whether the respondent belongs to one of the two large hospital systems surveyed, and the length of time the falls prevention program implementation has been underway.

4.3.3 Data analysis

We provide sample characteristics in Table 4.1 and descriptive statistics in Table 4.2. We also assess survey properties including item nonresponse, means, and variance. To evaluate internal consistency and scale reliability, we use the common threshold of Cronbach’s alpha greater than or equal to 0.70 (Nunnally, Bernstein, and Berge 1967). All scale items exceed the 0.70 threshold for internal consistency (Table 4.2) thus we average all items within a scale to create a composite variable for each respondent.

To examine the relationships between our independent variables of interest (manager affective commitment to falls prevention QI program, frontline worker support for falls prevention QI program, and organizational support for falls prevention QI program) and our

dependent variable, falls prevention program implementation success, we fit two-level hierarchical linear models with hospital random effects, which accounts for the nesting of nursing managers within hospitals. A likelihood-ratio test comparing linear regressions to two-level models finds significant differences, confirming the appropriateness of using a multi-level model.

To identify the potential mediation effect of frontline worker support for the QI program on the relationship between manager affective commitment and program implementation success (H2), as well as the potential mediation effect of manager affective commitment on the relationship between organizational support for the QI program and the program's implementation success (H3), we implement a mediation analysis. We follow the procedure described by Krull and MacKinnon (2001) to identify the total effect of the independent variable on the outcome variable, which equals the sum of their direct and indirect effects, using multilevel modeling. The indirect effect equals the product of the effect of the independent variable on the mediator and the effect of the mediator on the outcome variable, while controlling for the independent variable. We apply a bootstrap extension to our analyses generating 5,000 random samples in order to estimate standard errors and obtain a confidence interval for our point estimates.

For each of the analyses described above, we first examine these relationships for the full sample of nurse managers and then separately for senior managers, middle managers, and assistant middle managers. We control for all available demographic characteristics of survey respondents to account for potential differences in survey responses that may be driven by a respondent's gender, age, race, education, years of patient care experience, years of administrative experience, manager level, whether the respondent belongs to one of the two large

hospital systems surveyed, as well as the length of time the falls prevention program has been underway in the hospital. We perform all quantitative analyses using STATA/MP 13.1.

4.3.4 Sensitivity analyses

We carry out a series of sensitivity analyses using alternative model specifications and variable construction to assess the robustness of our findings. First, we fit a hospital fixed effects model to examine the relationship of our dependent variable and main independent variables of interest. Findings are comparable to the mixed effects model.

Using manager responses for both our dependent and independent variables may introduce unmeasured variance in regression models. To address the concern for common method bias in our analysis we carry out a sensitivity analysis whereby we aggregate our individual response-level dependent variable to the hospital level. We assure aggregation is statistically appropriate by demonstrating that nurse leaders of each hospital report similar falls program implementation success scores and that hospitals have significant between hospital variance for falls program implementation success. We then use ordinary least squares regression with robust standard errors to test our hypothesized relationships. We assess the significance of the mediators (frontline worker support of QI program and organizational support of QI program) using a bootstrapped extension (5,000 random samples) of the Sobel test of mediation (1982) developed by Preacher and Hayes (2004, 2008). For detailed regression and mediation analyses using the aggregated hospital-level implementation success outcome, please see Appendix Tables D7-D15.

4.4 Findings

4.4.1 Survey response

Of the 304 nurse leaders who received the survey module about falls prevention program implementation, we have responses from 246 (81% response). Response rates by hospital do not correlate significantly with respondents' perceptions of falls prevention program implementation success.

4.4.2 Characteristics of respondents

The majority of respondents are female (89%), which is not surprising for the nursing profession (Table 4.1). Nearly half (46%) are over 50 years of age, with age progressing in line with managerial level (i.e. senior managers are typically older than middle managers who are typically older than assistant middle managers). The majority of respondents are also white (86%). Two-thirds of all respondents (66%) have at least a nursing masters or doctoral degree. A higher percentage of advanced degrees are seen among senior managers (80%) followed by middle managers (62%) and assistant middle managers (57%). Years of direct patient care average 15 years among all respondents, with assistant middle managers having a slightly higher number of years of direct patient care (15.6 years) compared to middle managers (15.3 years) and senior managers (15.0 years). Conversely, senior managers have more years of administrative experience (15.7 years) compared to middle managers (9 years) and assistant middle managers (6 years).

Table 4.1
Nurse manager respondent characteristics*

| Characteristic | All Nurse Managers (N = 246) | Senior manager (N = 85) | Middle manager (N = 73) | Assistant middle manager (N = 88) |
|--|------------------------------------|-------------------------------|-------------------------------|--|
| Gender | | | | |
| Female | 89.0 | 89.4 | 87.7 | 89.8 |
| Male | 11.0 | 10.6 | 12.3 | 10.2 |
| Age | | | | |
| <30 | 4.9 | 1.2 | 1.4 | 11.4 |
| 30-35 | 9.4 | 2.4 | 9.6 | 15.9 |
| 36-50 | 40.2 | 29.4 | 54.8 | 38.6 |
| >50 | 45.5 | 67.1 | 34.3 | 34.1 |
| Race | | | | |
| White | 86.2 | 84.7 | 86.3 | 87.5 |
| Non-White | 13.4 | 15.3 | 13.7 | 12.5 |
| Nursing education | | | | |
| Bachelor or Associates | 33.7 | 20.0 | 38.4 | 43.2 |
| Masters or Doctoral | 66.3 | 80.0 | 61.6 | 56.8 |
| Years of direct patient care experience (mean) | 15.3 | 15.0 | 15.3 | 15.6 |
| Years of administrative experience (mean) | 10.2 | 15.7 | 9.0 | 6.0 |

Notes:

* Values reported are percentages. Percentages may not sum to 100 due to rounding.

4.4.3 Descriptive Findings

Table 4.2 shows survey item and composite averages for the entire sample of nurse managers as well as averages stratified by manager role. Between group differences across manager levels were assessed using a one-way analysis of variance with manager level as the independent variable and each survey item as the dependent variable. Individual survey item means show general agreement across items within a composite and across manager levels for implementation success, affective commitment, and frontline worker support. The average levels of organizational support for the QI program are significantly different across manager levels ($p < 0.05$).

Table 4.2
Descriptive statistics of survey responses

| Variables | All Nurse Managers (N = 246) | Senior manager (N = 85) | Middle manager (N = 73) | Assistant middle manager (N = 88) | Differences Across Manager levels P-value |
|---|---------------------------------|----------------------------|----------------------------|--------------------------------------|--|
| | Mean (SD) | Mean (SD) | Mean (SD) | Mean (SD) | |
| Implementation Success Scale (standardized alpha = 0.93) | 5.68 (1.15) | 5.65 (1.20) | 5.76 (1.05) | 5.65 (1.20) | 0.09 |
| Our implementation effort on this program was effective | 5.58 (1.26) | 5.71 (1.25) | 5.64 (1.06) | 5.41 (1.41) | 0.34 |
| The implementation of this program was effective. | 5.77 (1.22) | 5.66 (1.27) | 5.89 (1.14) | 5.77 (1.25) | 0.49 |
| I personally think the implementation of this program was a success. | 5.73(1.25) | 5.66 (1.27) | 5.78 (1.18) | 5.75 (1.30) | 0.80 |
| Affective Commitment to Change Scale (standardized alpha = 0.93) | 6.36 (0.84) | 6.33 (0.91) | 6.29 (0.94) | 6.44 (0.67) | 0.59 |
| I believe in the value of this program. | 6.37 (0.91) | 6.36 (0.96) | 6.28 (1.01) | 6.43 (0.75) | 0.62 |
| This program is a good strategy for this organization. | 6.24 (0.98) | 6.22 (1.04) | 6.21 (1.02) | 6.30 (0.87) | 0.86 |
| This program serves an important purpose. | 6.46 (0.83) | 6.47 0.87) | 6.34 (0.96) | 6.56 (0.66) | 0.32 |
| Things could be better without this program (RS). | 6.36 (1.08) | 6.27 (1.34) | 6.33 (1.03) | 6.48 (0.82) | 0.58 |
| Frontline Worker Support for QI Program Scale (standardized alpha =0.91) | 5.56 (1.16) | 5.53 (1.12) | 5.66 (1.07) | 5.51 (1.28) | 0.80 |
| Frontline workers have actively pushed to make this program a success. | 5.62 (1.31) | 5.64 (1.31) | 5.67 (1.26) | 5.55 (1.36) | 0.95 |
| Frontline workers are strongly committed to the successful implementation of this program. | 5.64 (1.27) | 5.61 (1.27) | 5.78 (1.15) | 5.55 (1.38) | 0.70 |
| Frontline workers have expressed doubts about whether this program will really help patients (RS). | 5.47 (1.46) | 5.16 (1.64) | 5.79 (1.20) | 5.12 (1.42) | 0.04 |
| Frontline workers show little interest in this program (RS). | 5.60 (1.30) | 5.59 (1.24) | 5.63 (1.28) | 5.58 (1.39) | 0.98 |
| Frontline workers stress the importance of this program for this hospital. | 5.39 (1.36) | 5.42 (1.36) | 5.43 (1.24) | 5.33 (1.46) | 0.93 |
| Frontline workers take an active interest in this program's related problems and successes. | 5.64 (1.20) | 5.73 (1.17) | 5.66 (1.09) | 5.44 (1.30) | 0.65 |
| Organizational Support for QI Program Scale (standardized alpha 0.79) | 5.66 (1.03) | 6.01 (0.92) | 5.64 (0.86) | 5.31 (1.16) | 0.00 |
| I have adequate financial resources to successfully carry out this program. | 5.50 (1.41) | 5.71 (1.43) | 5.62 (1.15) | 5.20 (1.54) | 0.07 |
| I have adequate personnel resources to successfully carry out this program. | 5.42 (1.32) | 5.71 (1.30) | 5.42 (1.09) | 5.14 (1.46) | 0.03 |
| There is a clear action plan for implementing this program. | 5.86 (1.21) | 6.06 (1.16) | 5.66 (1.27) | 5.81 (1.18) | 0.09 |
| The person I directly report to holds me accountable for the results of this program. | 5.67 (1.55) | 6.27 (0.92) | 5.86 (1.35) | 4.89 (1.87) | 0.00 |
| When I experience challenges implementing this program I get the support from management I need to overcome them. | 5.76 (1.18) | 6.20 (1.00) | 5.49 (1.11) | 5.52 (1.29) | 0.00 |

Notes: Items used a 7-point Likert response scale (1 =strongly disagree to 7=strongly agree). Differences across manager levels assessed using one-way ANOVA.

4.4.4 Relationship of program implementation success and manager affective commitment, frontline worker support, and organizational support

We present the results of our hierarchical linear models testing the independent effects of manager's affective commitment to the falls program, frontline worker support for the falls program, and organizational support for the falls program, to implementation success of the program in Table 4.3. Additional regression models are included in Appendix tables D1-D6. As shown in Model 1, for all nurse manager levels combined, regression results suggest that all three independent variables of interest are independently, significantly, and positively associated with program implementation success ($p < 0.001$) after controlling for respondent demographics and program length. Overall, for all managers combined, a one-point higher score for manager affective commitment is associated with a 0.46 point higher score for implementation success ($p < 0.001$).

In addition, the results are also significant when we analyze each manager level separately (Models 2-4). A one-point higher score of manager affective commitment is associated with a 0.34 point higher implementation success score for senior managers ($p < 0.01$), a 0.43 point higher implementation success score for middle managers ($p < 0.001$), and a 0.60 point higher implementation success score for assistant middle managers ($p < 0.001$), independent of frontline worker support or organizational support. The latter two results offer support for H1.

In addition, frontline worker support is significantly and positively associated with implementation success holding all other variables constant, among middle managers and assistant middle managers ($p < 0.001$), but is not significant among senior managers ($p = 0.10$). Lastly, organizational support for the falls program is positively and significantly related to increased implementation success scores among all manager levels. A one point increase in

organizational support is associated with increasing implementation success rates by 0.59 points among senior managers ($p < 0.001$), 0.32 points among middle managers ($p < 0.01$), and 0.31 points among assistant middle managers ($p < 0.001$).

Table 4.3
Multivariate Hierarchical Linear Regression Models

| Variables | (1) All nurse managers | (2) Senior manager | (3) Middle manager | (4) Assistant middle manager |
|--|------------------------------|--------------------------|--------------------------|---------------------------------------|
| Affective Commitment to Falls Initiative (Hypothesis 1) | 0.46*** [0.07] | 0.34** [0.12] | 0.43*** [0.10] | 0.60*** [0.12] |
| Frontline Worker Support for Falls Initiative | 0.28*** [0.05] | 0.16^ [0.10] | 0.32*** [0.08] | 0.34*** [0.07] |
| Organizational Support for Falls Initiative | 0.40*** [0.06] | 0.59*** [0.14] | 0.32** [0.11] | 0.31*** [0.08] |
| Age | 0.01** [0.00] | 0.01 [0.01] | 0.00 [0.01] | 0.01^ [0.01] |
| Female (male) | 0.24 [0.15] | 0.02 [0.28] | 0.45^ [0.23] | 0.08 [0.27] |
| Education (Less than Masters level) | -0.06 [0.99] | -0.24 [0.22] | -0.18 [0.17] | -0.12 0.14] |
| Race (non-white) | 0.14 [0.13] | 0.16 [0.25] | 0.01 [0.23] | 0.12 [0.20] |
| Years of direct patient care | -0.00 [0.01] | -0.03** [0.01] | 0.00 [0.01] | 0.02* [0.01] |
| Years of administrative experience | -0.01^ [0.01] | -0.00 [0.01] | -0.03* [0.01] | -0.01 [0.01] |
| Manager level | | | | |
| Middle manager | 0.33** [0.13] | | | |
| Assistant middle manager | 0.30* [0.14] | | | |
| Falls program length | 0.07* [0.03] | 0.04 [0.07] | 0.04 [0.06] | 0.14*** [0.05] |
| System A | 0.09 [0.16] | 0.39 [0.24] | -0.08 [0.19] | -0.06 [0.22] |
| System B | 0.06 [0.17] | 0.35 [0.30] | -0.05 [0.20] | -0.07 [0.20] |
| Constant | -2.33*** [0.53] | -1.29 [1.02] | -0.70 [0.95] | -2.84*** [0.75] |
| N | 227 | 81 | 67 | 79 |
| Number of Groups | 29 | 27 | 19 | 25 |
| Chi2, overall model | 429.94 | 141.60 | 144.73 | 283.06 |
| Log likelihood | -233.19 | -88.34 | -58.02 | -68.98 |

Notes: Results derived from two-level random effects hierarchical linear regressions. Dependent variable is falls program implementation success. Robust standard errors reported in parentheses.

^ $p < 0.01$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

4.4.5 Frontline worker support as a mediator of manager affective commitment and program implementation success

Across all nurse manager levels, the total effect of manager affective commitment on implementation success is positive and statistically significant ($p < 0.001$), as are each of the two component effects comprising the indirect effect (the effect of affective commitment on frontline worker support ($p < 0.001$) and the effect of frontline worker support on implementation success ($p < 0.001$)) (Table 4.4). Analyses suggest that the indirect effect is also positive and statistically significant ($p = 0.001$), which suggests that frontline worker support is a mediator of the relationship between manager affective commitment and program implementation success. Because the direct effect of affective commitment on implementation success when controlling for frontline worker support is still positive and significant ($p < 0.001$), we conclude that frontline worker support only partly explains the effect of manager affective commitment on implementation success.

In mediation analyses stratified by manager level, the direct and total effect of manager affective commitment on implementation success is positive and significant ($p < 0.001$) but the indirect effect is only significant for middle managers and assistant middle managers. Therefore, results suggest that frontline worker support mediates the relationship of affective commitment on implementation success only for middle and assistant middle managers. These results offer support for H2.

Table 4.4
Results of Mediation Analyses: Frontline worker support as a mediator of association between manager affective commitment and implementation success

| Mode I | Observed coefficient | Bias | Bootstrapped standard error | Lower | Upper |
|-------------------------------|-------------------------|-------|-----------------------------------|-------|-------|
| (1) All managers | | | | | |
| Indirect effect | 0.22 | -0.02 | 0.07 | 0.12 | 0.39 |
| Direct effect | 0.62 | -0.01 | 0.09 | 0.45 | 0.80 |
| Total effect | 0.85 | -0.02 | 0.08 | 0.74 | 1.05 |
| (2) Senior managers | | | | | |
| Indirect effect | 0.21 | -0.00 | 0.13 | -0.03 | 0.54 |
| Direct effect | 0.57 | 0.04 | 0.13 | 0.22 | 0.71 |
| Total effect | 0.78 | 0.04 | 0.17 | 0.43 | 1.02 |
| (3) Middle managers | | | | | |
| Indirect effect | 0.11 | -0.05 | 0.09 | 0.02 | 0.46 |
| Direct effect | 0.55 | -0.02 | 0.14 | 0.27 | 0.89 |
| Total effect | 0.67 | -0.07 | 0.11 | 0.54 | 1.10 |
| (4) Assistant middle managers | | | | | |
| Indirect effect | 0.40 | -0.04 | 0.12 | 0.21 | 0.65 |
| Direct effect | 0.73 | -0.07 | 0.17 | 0.48 | 1.23 |
| Total effect | 1.14 | -0.11 | 0.14 | 1.02 | 1.53 |

Notes: Mediation analysis derived from two-level random effects hierarchical linear regressions. All results adjusted for age, gender, education, race, years of direct patient care experience, years of administrative experience, falls program length, and hospital system.

4.4.6 Manager affective commitment as a mediator of organizational support and falls prevention program implementation success

For all nurse manager levels combined, the total effect of organizational support on implementation success is positive and statistically significant ($p < 0.001$), as are each of the two component effects comprising the indirect effect (the effect of organizational support on manager affective commitment ($p < 0.001$) and the effect of organizational support on implementation success ($p < 0.001$) (Table 4.5). The test of mediation indicates that the indirect effect is also positive and statistically significant ($p < 0.001$), which suggests that manager affective commitment is a mediator of the relationship between organizational support for the falls program and program implementation success. This offers support for H3. Because the direct

effect of organizational support for the falls program on implementation success when controlling for manager affective commitment is still positive and significant ($p < 0.001$), we conclude that manager affective commitment only partly explains the effect of organizational support on implementation success.

In mediation analyses stratified by manager level, the indirect effect of organizational support for the falls program on implementation success is positive and significant ($p < 0.001$) for all manager levels. This result further underscores the central role senior and middle manager affective commitment has in mediating the relationship between organizational support for the falls program and implementation success.

Table 4.5
Results of Mediation Analyses: Manager affective commitment as a mediator of association between organization support and implementation success

| Model | Observed coefficient | Bias | Bootstrapped standard error | Bootstrapping bias-corrected 95% confidence interval | |
|-------------------------------|----------------------|-------|-----------------------------|--|-------|
| | | | | Lower | Upper |
| (1) All managers | | | | | |
| Indirect effect | 0.22 | -0.01 | 0.05 | 0.14 | 0.34 |
| Direct effect | 0.49 | 0.00 | 0.05 | 0.39 | 0.60 |
| Total effect | 0.71 | -0.01 | 0.07 | 0.60 | 0.85 |
| (2) Senior managers | | | | | |
| Indirect effect | 0.18 | -0.03 | 0.08 | 0.05 | 0.35 |
| Direct effect | 0.71 | 0.02 | 0.16 | 0.35 | 1.00 |
| Total effect | 0.88 | -0.02 | 0.14 | 0.53 | 1.10 |
| (3) Middle managers | | | | | |
| Indirect effect | 0.30 | 0.00 | 0.13 | 0.07 | 0.57 |
| Direct effect | 0.37 | -0.02 | 0.20 | 0.00 | 0.80 |
| Total effect | 0.63 | -0.01 | 0.16 | 0.33 | 0.95 |
| (4) Assistant middle managers | | | | | |
| Indirect effect | 0.27 | -0.02 | 0.06 | 0.19 | 0.43 |
| Direct effect | 0.41 | -0.01 | 0.07 | 0.30 | 0.58 |
| Total effect | 0.68 | -0.04 | 0.09 | 0.55 | 0.99 |

Notes: Mediation analysis derived from two-level random effects hierarchical linear regressions. All results adjusted for age, gender, education, race, years of direct patient care experience, years of administrative experience, falls program length, and hospital system.

4.4.7 Results of sensitivity analyses

Results from our sensitivity analyses, whereby we aggregate our individual response-level dependent variable to the hospital level, were robust to our findings using individually-perceived implementation success (Appendix Tables D7-D15). Four complementary measures of within-group agreement are used to determine the degree of congruence between individual nurse managers' survey responses and the appropriateness of aggregating these measures to the hospital level. The mean interrater agreement score (r_{wg}) is 0.76, which is above the established threshold of 0.60 (Zellmer-Bruhn 2003), allowing aggregation of responses to the hospital level. Statistically significant intraclass correlations ($ICC[1]=0.15$ and $ICC[2]=0.56$) also supports aggregation of the dependent variable to the hospital level (Bliese 2000). Finally, a significant F-statistic resulting from a one-way ANOVA with hospital membership as the independent variable and program implementation success as the dependent variable indicates that responses differ between nursing leaders in different hospitals ($F=2.27$, $p<0.005$).

Ordinary least square models testing the independent effects of manager's affective commitment to the falls program, frontline worker support for the falls program, and organizational support for the falls program, to hospital-perceived implementation success suggest that affective commitment to the falls program and frontline worker support for the program are independently and significantly associated with higher rates of implementation success across all nurse leaders (Appendix Table D13). The sobel test of mediation also indicates that frontline worker support is a mediator of the relationship of manager affective commitment on hospital-perceived implementation success (Appendix Table D14) and that affective commitment is a mediator of the relationship of organizational support on hospital-perceived implementation success (Appendix Table D15). While some regression coefficients in analyses

stratified by manager role become marginally significant in sensitivity analyses compared to analyses using the individual level implementation outcome, general results are supportive of hypothesized relationships.

4.5 Discussion

In this study of nurse senior managers, middle managers, and assistant middle managers, we find positive and independently significant associations between a manager's affective commitment to a QI program and program implementation success and between organizational support for the QI program and the program's implementation success, across all manager levels. We also find positive associations between frontline worker support for the QI program and implementation success among middle managers and assistant middle managers.

Increased frontline worker support for the falls program partially mediates the relationship between manager affective commitment and falls program implementation success for middle managers and assistant middle managers, but not for senior managers. One possible explanation for finding no mediation among senior managers may be because they do not directly supervise the frontline and therefore hold less direct influence over frontline workers. We also find that increased levels of manager affective commitment for the falls program mediates the relationship between organizational support for the falls program and program implementation success across all manager levels.

Sensitivity analyses suggest that these findings also cohere at the organizational level. This may not be surprising given that culture for organizational change, infrastructure in support of change, and commitment to change often come from the senior leadership of an organization and likely influence the shared perceptions of employees within an organization.

4.5.1 Contributions to theory

This study makes a number of important contributions to the theory of organizational change and implementation. First, we know of no other quantitative, multilevel assessment of the correlates of organizational implementation success in the health care setting. Survey findings empirically support the significant role of senior manager commitment to implementation success, a relationship established in the literature (Bradley et al. 2003; Deming 1986; Helfrich et al. 2007; Juran 1988; Klein et al. 2001; Weiner and Shortell 1993). However, to our knowledge, this is the first study to provide strong quantitative support of the significant role middle manager and assistant middle manager affective commitment may have in bringing about successful QI program implementation. The only prior quantitative study that attempts to explore the role of middle manager commitment and implementation success is that of Birken and colleagues (2013), whose empirical analyses found weak evidence (not significant at the 5% level) for a relationship between behavioral manifestations of middle manager commitment and QI implementation effectiveness. One reason for their weak finding may be that their study considered implementation leaders for teams involved in a healthcare collaborative as middle managers. The context in which we empirically assess middle manager commitment and additional correlates to QI implementation success is within an enduring managerial hierarchy, in which middle managers have direct and continuous oversight of frontline workers.

Another important theoretical contribution is that our research findings highlight the role frontline workers and organizational support each have in influencing quality improvement program implementation success. Mediation analyses suggest that an important way in which middle manager and assistant middle manager affective commitment influences quality improvement program implementation success is in facilitating increased frontline worker

support for the quality improvement program. Mediation analyses also suggest a key pathway in which organizational factors in support of a quality improvement program influence implementation success is through fostering increased levels of affective commitment, particularly among middle managers.

While results presented in this paper focus on analysis of variables at the individual level, sensitivity analyses conducted on the dependent variable aggregated to the hospital level lend further support for the positive and significant relationships between the successful implementation of a QI program at an organizational level and manager affective commitment to a QI program, frontline worker support for a QI program, and organizational support for a QI program.

4.5.2 Practice implications

Study findings also have important implications for health care practice. Results lend strong support for the positive association between manager affective commitment and implementation success, suggesting a practical strategy for QI implementation effectiveness may be to foster affective commitment among senior and middle managers. Findings point to key organizational variables associated with increasing levels of manager affective commitment, which include: holding managers accountable for implementation program results, assuring managers have adequate financial and personnel resources to successfully carry out program implementation, ensuring there is a clear action plan for implementing the program, and giving managers support from executive management when they experience implementation challenges.

Results also highlight the important role middle managers have in fostering quality improvement program implementation support among frontline workers. Mediation analyses suggest that middle manager affective commitment influences implementation success, in part,

by increasing levels of frontline worker support for the quality improvement program. Strategies to enhance implementation success among health care organizations should include focused efforts on fostering manager's affective commitment to the program being implemented, as increased levels should, in turn, facilitate increased frontline worker support for the program and program implementation success.

4.5.3 Study limitations and future research

Our results should be considered in light of study limitations. First, this study examined only associations and not causal relationships between variables of interest due to the cross-sectional nature of the study design. Moreover, we cannot rule out the possibility that the associations we see are due to reverse causality (i.e. middle managers are more committed to the falls program because the implementation of the program is successful). Future research should leverage longitudinal or other study designs that would allow for examinations of causal relationships and sustainability of effects. Future work should also focus on objective measures of implementation success such as program outcomes and tracking of manager implementation activities. Second, the analyses of the cross-sectional survey data are subject to concerns about common method bias. Results of sensitivity analyses in which the dependent variable was aggregated to an organizational level mitigates these concerns. Third, there is also concern for selection bias. Due to the administration of our survey via the hospital chief nursing officer, it was not possible to track non-respondents. Consequently, we are unable to conduct a non-response analysis. It is possible that nurse leaders who were more actively engaged in quality improvement efforts in their hospital were more likely to respond to our survey. This may have resulted in more positive responses, which may lead to overestimation of our results. However, this bias may also have resulted in less variance in our measures, which could have reduced our

ability to detect significant relationships, suggesting our findings may be conservative. Finally, our sample was homogeneously white and limited to particular geographic regions. Results thus may not be generalizable to nurse managers with other racial backgrounds and from other geographic areas.

Despite study limitations, this research offers an important contribution in providing empirical support of factors that influence the successful implementation of quality improvement implementation: manager affective commitment, frontline worker support, and organizational support for a QI program. Our results raise several important questions that should be addressed in future research. First, given that findings underscore the importance of manager affective commitment in influencing quality improvement implementation success, further research should be conducted to explore what additional ways organizations can increase levels of affective commitment among senior managers, middle managers, and frontline workers. Second, research should explore the extent to which middle manager commitment may influence implementation success in the absence of senior manager commitment. Can a committed middle manager overcome lack of senior manager commitment and influence implementation success? Future research should further investigate the dynamic interactions between senior manager, middle manager, and frontline worker affective commitment and how employee commitment, in turn, may foster improved implementation success.

Chapter 5

Conclusions

The aim of this dissertation is to advance empirical research on how patient-perceived integrated care and manager commitment influence the improvement and integration of health care delivery. Despite concerted efforts towards improving health care delivery over the last 15 years, the United States continues to fall short in providing high quality health care. As evidence-based practices and delivery reform models continue to emerge we need to better understand how to effectively implement quality improvement interventions. This research provides additional insight into how we might better achieve integrated care delivery and successful QI implementation. This concluding chapter summarizes the findings of this dissertation and discusses their implications for health care delivery improvement and future research.

5.1 Summary of Findings

In Chapter One of this dissertation I explore, in two parts, existing literature and theory around integrated patient care and quality improvement implementation. In the first part of Chapter One I draw attention to the conceptual ambiguity that surrounds the definition and study of integrated patient care. I also make the important theoretical argument that the integration of organizations and organizational activities may or may not result in integration of care delivered to patients, which underscores the value in measuring integrated care as perceived by patients. While this distinction may seem trivial, in practice integration of organizations and organizational activities is assumed to result in integrated patient care. The lack of empirical support around this commonly held assumption is especially relevant as delivery system reform

models, such as Accountable Care Organizations, Patient-Centered Medical Homes, and care management programs, are currently being implemented across the country and are being touted as ways to improve the integration and quality of health care delivery while lowering costs of care. Yet, recent evaluations of the effectiveness of such programs remain mixed (Friedberg et al. 2014; Reid et al. 2010; Rosenthal et al. 2013). Moreover, such evaluations are not considering the patient's perspective on the extent of care integration. Addressing these current limitations and research gaps motivate my first study, which assesses the relationship between patient perceptions of care integration and their utilization of health services (Chapter Two), and second study, which compares perceptions of integrated care among patients in a specialized care management program to those receiving regular care (Chapter Three).

In the second part of Chapter One I draw attention to the poor rates (less than 50%) of successful quality improvement implementation. By reviewing the literature and theories around organizational change and implementation I highlight the incredible complexity of quality improvement implementation and the numerous challenges health care organizations may face during the implementation process. I argue that focusing research efforts on factors that influence individuals involved in the implementation process warrants further attention. I focus my research on individual commitment to change, which has been postulated as a key psychological mechanism linking organizational efforts to implement planned change to behaviors of employees. An understudied, though growing, area of research on this topic has been on the role of middle manager commitment to an organizational change. While a robust literature on the influential role of senior managers during the implementation process exists, there is no strong quantitative evidence in support of the relationship between middle manager commitment to a quality improvement program and the effective implementation of that program. In order to

address this significant research gap I assess, in my third study, whether and how senior and middle manager commitment to a QI program is related to the program's implementation success (Chapter Four).

In Chapter Two, I examine how patient-perceived integrated care relates to utilization of health services. I use a novel and recently validated survey instrument, the Patient Perceptions of Integrated Care (PPIC) survey, among a random sample of 3,000 elderly patients with multiple chronic conditions belonging to the Massachusetts General Hospital Physician Organization. I assess relationships between provider performance on 11 domains of patient-reported integrated care and rates of emergency department (ED) visits, hospital admissions, and outpatient visits. I find better performance on two of the surveyed dimensions of integrated care is significantly associated with lower ED visit rates: information flow to other providers in doctor's office and responsiveness independent of visits. Better performance on three dimensions of integrated care is associated with lower outpatient visit rates: information flow to specialist, post-visit information flow to the patient, and continuous familiarity with patient over time. No dimension of integration is associated with hospital admission rates.

In Chapter Three, I use the same patient sample to evaluate the achievement of integrated care by a care management demonstration program from the perspective of older patients with multiple chronic conditions. I compare patient perceptions across 11 domains of patient-reported integrated care between patients assigned to the care management program (CMP) and those receiving standard care. Survey results suggest that patient perceptions of integrated care vary substantially among survey items and domains. CMP enrollment is significantly associated with greater patient perceptions of care integration in two domains: connecting patients to home services and being responsive independent of visits, domains that were targeted for improvement

by the CMP. Enrollment in the CMP is not significantly associated with other domains of integration.

In Chapter Four, I empirically assess whether and how senior and middle manager commitment to a falls reduction quality improvement program is associated with the successful implementation of that program. Using a cross-sectional online survey I collected data from 246 nurse leaders (senior managers, middle managers, and assistant middle managers) from 30 U.S. hospitals. I find that increased levels of managers' affective commitment to a falls prevention quality improvement program is positively and significantly associated with program implementation success across all manager levels surveyed. Stronger levels of frontline worker support for the falls program partially mediates the relationship between manager affective commitment to falls program implementation success for middle managers and assistant middle managers, but not for senior managers. Increased levels of manager affective commitment for the falls program partially mediates the relationship between organizational support for the falls program and program implementation success across all manager levels.

5.2 Dissertation Implications

The research included in this dissertation, together, advance our understanding of how patient-perceived integrated care, care management programs, and manager commitment to quality improvement programs influence the integration and improvement of health care delivery. The first two studies described in this dissertation, focused on patient-perceived integrated care, offer both theoretical and practical implications for understanding how and under what conditions delivery reform efforts may better integrate patient care, reduce unnecessary utilization, and lower costs. Findings from Chapter Two suggest that patient perceptions of different aspects of care integration may relate differently to utilization of health services,

underscoring the importance of having a multidimensional conceptualization of patient care integration.

Findings from Chapter Three highlight the important value the PPIC instrument may serve in program evaluation efforts. Findings suggest that targeted programmatic integration efforts can positively impact the integration of care as perceived by patients. However, results also indicate that patient perceptions of integrated care vary substantially among survey items and domains and that there is great room for improvement.

In combination, findings from Chapter Two and Three help build an evidence base for the value of patients' perspectives in assessing how well health care organizations integrate care. Results illustrate how the PPIC survey instrument may be especially helpful to policymakers and health organizations seeking to evaluate programs intended to improve patient care integration. The survey's operational domains of integration speak directly to various components of integrated care (coordination across providers, facilities, and support systems; continuous over time and between visits; patient-centered; and based on shared responsibility between a patient and caregivers) and provide more detailed guidance to providers and policymakers seeking to improve integration of patient care. Each domain represents an actionable area for which an organization can focus improvement efforts. Evaluating the patient's perspective on the extent of care integration may help providers understand the mechanisms through which patient outcomes improve and, importantly, the reasons why some interventions do not yield expected improvements. Study results illustrate how patient reports of integration can be useful guides to improving health system efficiency and illustrate how the PPIC survey instrument may serve as a useful tool for measuring multiple dimensions of integrated care in order to obtain information at a level of specificity that informs improvement efforts and program evaluations.

Chapter Four of this dissertation makes a significant contribution in being the first study, to my knowledge, that is a quantitative and multilevel assessment of the correlates of implementation success in health care organizations, and that provides strong empirical evidence of the significant relationship between middle manager commitment and successful QI program implementation. While literature to date has suggested middle managers theoretically are important in facilitating effective QI implementation, quantitative evidence is scarce. Findings also highlight the significant role frontline workers and organizational support have in influencing quality improvement program implementation success. Mediation analyses suggest that middle manager and assistant middle manager affective commitment is significantly associated with implementation success, in part, because it facilitates improved frontline worker support for the quality improvement program.

Study results also suggest a practical strategy for quality improvement implementation success may be to foster affective commitment among senior and middle managers. Mediation results show that a key pathway in which organizational factors in support of a quality improvement program influence implementation success is through fostering increased levels of affective commitment. Key organizational variables associated with increasing levels of manager affective commitment include: holding managers accountable for implementation program results, assuring managers have adequate financial and personnel resources to successfully carry out program implementation, ensuring there is a clear action plan for implementing the program, and giving managers support from executive management when they experience implementation challenges. Strategies to enhance implementation success among health care organizations should include focused efforts on fostering senior and middle manager's affective commitment to the program being implemented.

Dissertation findings offer important theoretical and practical contributions to the literature on health care quality improvement, health care management, and implementation research. In addition, this dissertation provides practical implications for physicians and hospital middle managers seeking ways to improve the quality and integration of care delivery

5.3 Future Research Directions

The studies explored in this dissertation highlight the need for future work that continues to explore how patient-perceived integrated care and manager commitment influence the improvement and integration of health care delivery.

The first study in this dissertation, which assesses the relationship between patient-perceived integrated care and utilization of services, raises a number of additional research questions. An important limitation of this study is being unable to distinguish between appropriate and inappropriate utilization of emergency department, inpatient, and outpatient services. While there are existing algorithms that can help identify appropriate utilization (Billings et al. 2000), I did not have access to sufficient information to apply them. Future research should focus on understanding how patient perceptions of integrated care relate to reductions in *inappropriate* utilization, such as readmission rates or inpatient admissions for ambulatory sensitive conditions. Also, further research is warranted to understand how and why patient perceptions of integrated care domains relate differently to utilization across care settings. The first study should be considered exploratory and is helpful in offering preliminary evidence of a significant association between increased levels of patient perceived integration and a reduction of emergency department visits and outpatient stays, but further research is necessary to understand the underlying mechanisms that may explain these relationships as well as the lack of findings in the inpatient setting.

The second study of this dissertation, which compares patient perceptions of care integration between patients belonging to a care management program and patients receiving regular care is helpful in highlighting how the Patient Perceptions of Integrated Care (PPIC) survey instrument may be a useful tool for evaluating care integration improvement efforts. Future research efforts should focus on more comparative and robust evaluations of care management programs, Accountable Care Organizations, Patient-Centered Medical Homes, and other delivery organizations to better understand how interventions, organizational structures, and underlying mechanisms may be associated with increased patient perceptions of integrated care. Finally, future research efforts should also explore how patient perceptions of integrated care relate to patient outcomes.

The third study of this dissertation, which assesses how senior and middle manager commitment to a falls reduction quality improvement program is associated with the successful implementation of that program, is useful in establishing empirical evidence in support of the significant relationship between middle manager commitment and implementation success. Given this finding, future research should explore additional organizational structures, strategies, and policies that may increase levels of affective commitment among senior managers, middle managers, and frontline workers, outside of the organizational support variables used in the study. Additional research should also explore the dynamic interactions between senior manager, middle manager, and frontline worker affective commitment and how employee commitment facilitates implementation success. Future research efforts should also try to address some of the study limitations discussed in Chapter Four. For example, it would be useful to replicate results in a larger and more diverse sample, longitudinally, with objective implementation outcome

measures. It would also be worthwhile to address these research questions in a variety of settings and across varying managerial roles within an organization.

5.4 Conclusion

I begin this dissertation by drawing attention to the fact that it has been 15 years since the Institute of Medicine released its groundbreaking report, *Crossing the Quality Chasm: A New Health System for the 21st Century*, in which authors documented numerous quality failings on the part of our health care system. The fact that over the last 15 years we have failed to make the substantial transformations necessary to achieve the IOM's aims of delivering safe, timely, efficient, equitable, and patient-centered care, remains troubling. It is my hope that the research presented in this dissertation offers insights and strategies for ways in which we can think about improving the integration and delivery of health care in the United States. My findings suggest that surveying patients to better understand how they perceive care to be integrated and focusing on ways to increase manager commitment to a quality improvement program may be useful strategies in improving health care delivery.

REFERENCES

- Aiken, Linda H. et al. 2011. "The Effects of Nurse Staffing and Nurse Education on Patient Deaths in Hospitals with Different Nurse Work Environments." *Medical care* 49(12):1047.
- Alexander, Jeffrey A. and Larry R. Hearld. 2011. "The Science of Quality Improvement Implementation: Developing Capacity to Make a Difference." *Medical care* 49 Suppl(12):S6–20.
- Alexander, Jeffrey A., Bryan J. Weiner, Stephen M. Shortell, Laurence C. Baker, and Mark P. Becker. 2006. "The Role of Organizational Infrastructure in Implementation of Hospitals' Quality Improvement." *Hospital topics* 84(1):11–20.
- Anderson, Gerard. 2004. *Chronic Conditions: Making the Case for Ongoing Care*. Johns Hopkins University.
- Anderson, Gerard and Jane Horvath. 2004. "The Growing Burden of Chronic Disease in America." *Public health reports* 119(3):263.
- Anthony, Mary K. et al. 2005. "Leadership and Nurse Retention: The Pivotal Role of Nurse Managers." *Journal of Nursing Administration* 35(3):146–55.
- Armenakis, Achilles A. and Arthur G. Bedeian. 1999. "Organizational Change: A Review of Theory and Research in the 1990s." *Journal of management* 25(3):293–315.
- Ashley, J. Stephen. 2000. "People behind the Health Care Delivery System: The Key to Quality Improvement and Expense Reduction." *Nursing Administration Quarterly* 24(4):1–10.
- Axelsson, Runo and Susanna Bihari Axelsson. 2006. "Integration and Collaboration in Public Health—a Conceptual Framework." *The International Journal of Health Planning and Management* 21(1):75–88. Retrieved November 4, 2014.
- Baggs, Judith Gedney et al. 1999. "Association between Nurse-Physician Collaboration and Patient Outcomes in Three Intensive Care Units." *Critical care medicine* 27(9):1991–98.
- Balogun, J. 2003. "From Blaming the Middle to Harnessing Its Potential: Creating Change Intermediaries." *British Journal of Management* 14(1):69–83.
- Bammer, Gabriele. 2003. "Integration and Implementation Sciences: Building a New Specialization." *Ecol. Soc* 10(2):95–107.
- Batalden, Paul B. and Patricia K. Stoltz. 1993. "A Framework for the Continual Improvement of Health Care: Building and Applying Professional and Improvement Knowledge to Test Changes in Daily Work." *The Joint Commission Journal on Quality Improvement* 19(10).

- Bergeson, Steven C., Janiece Gray, Lynn A. Ehrmantraut, Tracy Laibson, and Ron D. Hays. 2013. "Comparing Web-Based with Mail Survey Administration of the Consumer Assessment of Healthcare Providers and Systems (CAHPS®) Clinician and Group Survey." *Primary health care: open access* 3.
- Berwick, Donald M. 1996. "A Primer on Leading the Improvement of Systems." *BMJ* 312(March):619–22.
- Berwick, Donald M. 2008. "The Science of Improvement." *Jama* 299(10):1182–84.
- Billings, J., N. Parikh, and T. Mijanovich. 2000. "Emergency Room Use: The New York Story." *The Commonwealth Fund. Issue Brief* (November):1–11.
- Birken, Sarah a, Shoou-Yih Daniel Lee, and Bryan J. Weiner. 2012. "Uncovering Middle Managers' Role in Healthcare Innovation Implementation." *Implementation science*: 7(1):28.
- Birken, Sarah A. et al. 2015. "From Strategy to Action: How Top Managers' Support Increases Middle Managers' Commitment to Innovation Implementation in Healthcare Organizations." *Health care management review* 40(2):159.
- Birken, Sarah A., Shoou-Yih Daniel Lee, Bryan J. Weiner, Marshall H. Chin, and Cynthia T. Schaefer. 2013. "Improving the Effectiveness of Health Care Innovation Implementation Middle Managers as Change Agents." *Medical Care Research and Review* 70(1):29–45.
- Bliese, Paul D. 2000. "Within-Group Agreement, Non-Independence, and Reliability: Implications for Data Aggregation and Analysis," in *Multilevel theory, research, and methods in organizations: Foundations, extentions, and new directions*. Jossey-Bass Publishers.
- Blumenthal, David and Charles M. Kilo. 1998. "A Report Card on Continuous Quality Improvement." *The Milbank Quarterly* 76(4):625–48.
- Bodenheimer, Thomas. 2008. "Coordinating Care--a Perilous Journey through the Health Care System." *The New England journal of medicine* 358(10):1064–71.
- Bradley, Elizabeth H. et al. 2003. "The Roles of Senior Management in Quality Improvement Efforts: What Are the Key Components?" *Journal of healthcare management* 1(48):15–28.
- Brownlee, Shannon. 2007. *Overtreated: Why Too Much Medicine Is Making Us Sicker and Poorer*. Bloomsbury New York.
- Burgess, Nicola and Graeme Currie. 2013. "The Knowledge Brokering Role of the Hybrid Middle Level Manager: The Case of Healthcare." *British Journal of Management* 24(S1):S132–42.

- Burnes, Bernard. 2004. "Emergent Change and Planned Change-Competitors or Allies? The Case of XYZ Construction." *International Journal of Operations & Production Management* 24(9):886–902.
- Burns, L. R. and M. V. Pauly. 2002. "Integrated Delivery Networks: A Detour On The Road To Integrated Health Care?" *Health Affairs* 21(4):128–43.
- Carman, James M. et al. 2010. "Keys for Successful Implementation of Total Quality Management in Hospitals." *Health care management review* 35(4):283–93.
- Chuang, Emmeline, Kendra Jason, and Jennifer Craft Morgan. 2011. "Implementing Complex Innovations: Factors Influencing Middle Manager Support." *Health care management review* 36(4):369–79.
- Conley, Dante M., Sara J. Singer, Lizabeth Edmondson, William R. Berry, and Atul a Gawande. 2011. "Effective Surgical Safety Checklist Implementation." *Journal of the American College of Surgeons* 212(5):873–79.
- Conner, Daryl R. and Robert W. Patterson. 1982. "Building Commitment to Organizational Change." *Training & Development Journal*.
- Currie, Graeme and Stephen J. Procter. 2005. "The Antecedents of Middle Managers' Strategic Contribution: The Case of a Professional Bureaucracy." *Journal of management studies* 42(7):1325–56.
- Dalrymple, Michelle L., Irene Lena Hudson, and R. P. K. Ford. 2003. "Finite Mixture, Zero-Inflated Poisson and Hurdle Models with Application to SIDS." *Computational Statistics & Data Analysis* 41(3):491–504.
- Damschroder, Laura J. et al. 2009. "Fostering Implementation of Health Services Research Findings into Practice: A Consolidated Framework for Advancing Implementation Science." *Implementation science*: 4:50.
- Deming, W. Edwards. 1986. "Out of the Crisis. Cambridge, MA: Massachusetts Institute of Technology." *Center for Advanced Engineering Study* 6.
- Diehr, Paula, D. Yanez, A. Ash, M. Hornbrook, and D. Y. Lin. 1999. "Methods for Analyzing Health Care Utilization and Costs." *Annual review of public health* 20(1):125–44.
- Dopson, Sue and Louise Fitzgerald. 2006. "The Role of the Middle Manager in the Implementation of Evidence-Based Health Care." *Journal of nursing management* 14(1):43–51.
- Douglas, Thomas J. and W. Judge. 2001. "Total Quality Management Implementation and Competitive Advantage: The Role of Structural Control and Exploration." *Academy of Management* 44(1):158–69.

- Duan, Naihua, Willard G. Manning, Carl N. Morris, and Joseph P. Newhouse. 1983. "A Comparison of Alternative Models for the Demand for Medical Care." *Journal of business & economic statistics* 1(2):115–26.
- Dutton, Jane E., Susan J. Ashford, Regina M. O’Neill, and Katherine A. Lawrence. 2001. "Moves That Matter: Issue Selling and Organizational Change." *Academy of Management Journal* 44(4):716–36.
- Dyer, Naomi, Joann S. Sorra, Scott A. Smith, Paul Cleary, and Ron Hays. 2012. "Psychometric Properties of the Consumer Assessment of Healthcare Providers and Systems (CAHPS®) Clinician and Group Adult Visit Survey." *Medical care* 50(Suppl):S28.
- Eccles, Martin P. and Brian S. Mittman. 2006. "Welcome to Implementation Science." *Implementation Science* 1(1):1–3.
- Edmondson, Amy C., Richard M. Bohmer, and Gary P. Pisano. 2001. "Disrupted Routines: Team Learning and New Technology Implementation in Hospitals." *Administrative Science Quarterly* 46(4):685–716.
- Edmondson, Amy C., Ashley-Kay Fryer, and Morten T. Hansen. 2015. "Transforming Care at UnityPoint Health - Fort Dodge." *Harvard Business School Case 615-052* March.
- Eisenhardt, Kathleen M. 1989. "Building Theories from Case Study Research." *Academy of management review* 14(4):532–50.
- Elliott, Marc N. et al. 2009. "Effects of Survey Mode, Patient Mix, and Nonresponse on CAHPS® Hospital Survey Scores." *Health services research* 44(2p1):501–18.
- Ferlie, Ewan B. and Stephen M. Shortell. 2001. "Improving the Quality of Health Care in the United Kingdom and the United States: A Framework for Change." *Milbank Quarterly* 79(2):281–315.
- Ferris, Timothy G. et al. 2010. "Cost Savings from Managing High-Risk Patients." in *The Healthcare Imperative: Lowering Costs and Improving Outcomes: Workshop Series Summary*. National Academies Press.
- Fisher, Elliott S. et al. 2003. "The Implications of Regional Variations in Medicare Spending. Part 2: Health Outcomes and Satisfaction with Care." *Annals of internal medicine* 138(4):288–98.
- Floyd, Steven W. and Bill Wooldridge. 1992. "Managing Strategic Consensus: The Foundation of Effective Implementation." *The Executive*. 6(4):27–39.
- Floyd, Steven W. and Bill Wooldridge. 1994. "Dinosaurs or Dynamos ? Recognizing Middle Management's Strategic Role." *The Academy of Management Executive*: 8(4):47–57.

- Friedberg, Mark W., Eric C. Schneider, Meredith B. Rosenthal, Kevin G. Volpp, and Rachel M. Werner. 2014. "Association between Participation in a Multipayer Medical Home Intervention and Changes in Quality, Utilization, and Costs of Care." *Jama* 311(8):815–25.
- Gantz, Nancy Rollins, Lisa Sorenson, and Randy L. Howard. 2003. "A Collaborative Perspective on Nursing Leadership in Quality Improvement: The Foundation for Outcomes Management and Patient/staff Safety in Health Care Environments." *Nursing administration quarterly* 27(4):324–29.
- Goldstein, Elizabeth, Marybeth Farquhar, Christine Crofton, Charles Darby, and Steven Garfinkel. 2005. "Measuring Hospital Care from the Patients' Perspective: An Overview of the CAHPS® Hospital Survey Development Process." *Health services research* 40(6p2):1977–95.
- Goldstone, Jerry. 1998. "The role of quality assurance versus continuous quality improvement." *Journal of Vascular Surgery* 28(2): 378-380.
- Greenhalgh, Trisha, Glenn Robert, Fraser Macfarlane, Paul Bate, and Olivia Kyriakidou. 2004. "Diffusion of Innovations in Service Organizations: Systematic Review and Recommendations." *Milbank Quarterly* 82(4):581–629.
- Grol, Richard and Jeremy Grimshaw. 2003. "Research into Practice I From Best Evidence to Best Practice : Effective Implementation of Change in Patients ' Care." 362:1225–30.
- Grone, Oliver. 2001. "Integrated Care A Position Paper of the WHO European Office for Integrated Health Care Services The Position of WHO on Integrated Care." 1(June).
- Haggerty, Jeannie L. et al. 2003. "Continuity of Care: A Multidisciplinary Review." *Bmj* 327(7425):1219–21.
- Helfrich, Christian D., Bryan J. Weiner, Martha M. McKinney, and Lori Minasian. 2007. "Determinants of Implementation Effectiveness: Adapting a Framework for Complex Innovations." *Medical care research and review : MCRR* 64(3):279–303. Retrieved November 5, 2014 (<http://www.ncbi.nlm.nih.gov/pubmed/17507459>).
- Herscovitch, Lynne and John P. Meyer. 2002. "Commitment to Organizational Change: Extension of a Three-Component Model." *Journal of Applied Psychology* 87(3):474–87. Retrieved September 30, 2014.
- Huy, Quy Nguyen. 2001. "In Praise of Middle Managers." *Harvard Business Review* 79(8):72–81.
- Institute of Medicine. 2001. *Crossing the Quality Chasm: A New Health System for the 21st Century*. Washington D.C.: National Academy of Press.
- Jackson, George L. et al. 2013. "The Patient-Centered Medical Home: A Systematic Review."

Annals of internal medicine 158(3):169–78.

- James, Brent C. and Lucy a Savitz. 2011. “How Intermountain Trimmed Health Care Costs through Robust Quality Improvement Efforts.” *Health affairs (Project Hope)* 30(6):1185–91.
- Juran, Joseph M. 1988. *Juran on Planning for Quality*. Free Press New York.
- Kanter, Rosabeth Moss. 1981. “The Middle Manager as Innovator.” *Harvard business review* 60(4):95–105.
- Kim, Michelle M., Amber E. Barnato, Derek C. Angus, Lee F. Fleisher, and Jeremy M. Kahn. 2010. “The Effect of Multidisciplinary Care Teams on Intensive Care Unit Mortality.” *Archives of Internal Medicine* 170(4):369–76.
- Kirkman-Liff, Brad. 2002. “Keeping an Eye on a Moving Target: Quality Changes and Challenges for Nurses.” *Nursing Economics* 20(6):258.
- Klein, Katherine J., Amy Buhl Conn, and Joann Speer Sorra. 2001. “Implementing Computerized Technology: An Organizational Analysis.” *Journal of Applied Psychology* 86(5):811.
- Klein, Katherine J. and Andrew P. Knight. 2005. “Innovation Implementation. Overcoming the Challenge.” *Current Directions in Psychological Science* 14(5):243–46.
- Klein, Katherine J. and Joann Speer Sorra. 1996. “The Challenge of Innovation Implementation.” *The Academy of Management Review* 21(4):1055.
- Kodner, D. and C. Spreeuwenberg. 2002. “Integrated Care: Meaning, Logic, Applications, and Implications – a Discussion Paper.” *International Journal of Integrated Care* 2.
- Krull, Jennifer L. and David P. MacKinnon. 2001. “Multilevel Modeling of Individual and Group Level Mediated Effects.” *Multivariate behavioral research* 36(2):249–77.
- Krumholz, Harlan M., Sharon-Lise T. Normand, John A. Spertus, David M. Shahian, and Elizabeth H. Bradley. 2007. “Measuring Performance for Treating Heart Attacks and Heart Failure: The Case for Outcomes Measurement.” *Health Affairs* 26(1):75–85.
- Laffel, Glenn and David Blumenthal. 1989. “The Case for Using Industrial Quality Management Science in Health Care Organizations.” *Jama* 262(20):2869–73.
- Lahiri, Kajal and Guibo Xing. 2004. “An Econometric Analysis of Veterans’ Health Care Utilization Using Two-Part Models.” *Empirical Economics* 29(2):431–49.
- Larson, Bridget K. et al. 2012. “Insights from Transformations under Way at Four Brookings-Dartmouth Accountable Care Organization Pilot Sites.” *Health Affairs* 31(11):2395–2406.

- Lawrence, Paul R. and Jay W. Lorsch. 1986. "Organization and Environment: Managing Differentiation and Integration (Harvard Business School Classics)."
- Lee, Todd A. et al. 2007. "Mortality Rate in Veterans with Multiple Chronic Conditions." *Journal of general internal medicine* 22(3):403–7.
- Lehnert, Thomas et al. 2011. "Review: Health Care Utilization and Costs of Elderly Persons with Multiple Chronic Conditions." *Medical Care Research and Review* 68(4):387–420.
- Lukas, Carol Vandeuken, Sally K. Holmes, Alan B. Cohen, Irene E. Cramer, and Martin P. Charms. 2007. "Transformational Change in Health Care Systems : An Organizational Model." 32(December):309–20.
- McCall, Nancy, Jerry Cromwell, and Carol Urato. 2010. "Evaluation of Medicare Care Management for High Cost Beneficiaries (CMHCB) Demonstration: Massachusetts General Hospital and Massachusetts General Physicians Organization (MGH)." *Research Triangle Park, NC: RTI International*.
- McGlynn, Elizabeth A. et al. 2003. "The Quality of Health Care Delivered to Adults in the United States." *New England journal of medicine* 348(26):2635–45.
- Meyer, John P., E. S. Srinivas, Jaydeep B. Lal, and Laryssa Topolnytsky. 2007. "Employee Commitment and Support for an Organizational Change: Test of the Three-Component Model in Two Cultures." *Journal of Occupational and Organizational Psychology* 80(2):185–211.
- Miake-Lye, Isomi M., Susanne Hempel, David A. Ganz, and Paul G. Shekelle. 2013. "Inpatient Fall Prevention Programs as a Patient Safety Strategy: A Systematic Review." *Annals of internal medicine* 158(5_Part_2):390–96.
- Niefeld, Marlene R. et al. 2003. "Preventable Hospitalization among Elderly Medicare Beneficiaries with Type 2 Diabetes." *Diabetes Care* 26(5):1344–49.
- Noble, Charles H. and Michael P. Mokwa. 1999. "Implementing Marketing Strategies: Developing and Testing a Managerial Theory." *The Journal of Marketing* 57–73.
- Nunnally, Jum C., Ira H. Bernstein, and Jos M. F. ten Berge. 1967. *Psychometric Theory*. JSTOR.
- Nutting, Paul A. et al. 2009. "Initial Lessons from the First National Demonstration Project on Practice Transformation to a Patient-Centered Medical Home." *The Annals of Family Medicine* 7(3):254–60.
- Oliver, David, Adrian Hopper, and Paul Seed. 2000. "Do Hospital Fall Prevention Programs Work? A Systematic Review." *Journal of the American Geriatrics Society* 48(12):1679–89.

- Ouwens, Marielle, H. U. B. Wollersheim, Rosella Hermens, Marlies Hulscher, and Richard Grol. 2005. "Integrated Care Programmes for Chronically Ill Patients : A Review of Systematic Reviews." *International Journal of Integrated Care* 17(2):141–46.
- Parekh, Anand K. and Mary B. Barton. 2010. "The Challenge of Multiple Comorbidity for the US Health Care System." *Jama* 303(13):1303–4.
- Parish, Janet Turner, Susan Cadwallader, and Paul Busch. 2008. "Want To, Need To, Ought to: Employee Commitment to Organizational Change." *Journal of Organizational Change Management* 21(1):32–52. Retrieved July 12, 2014.
- Pear, R. 2014. "Medicare to Start Paying Doctors Who Coordinate Needs of Chronically Ill Patients." *The New York Times*. August 16.
- Pham, Hoangmai H., Ann S. O'Malley, Peter B. Bach, Cynthia Saiontz-Martinez, and Deborah Schrag. 2009. "Primary Care Physicians' Links to Other Physicians through Medicare Patients: The Scope of Care Coordination." *Annals of internal medicine* 150(4):236–42.
- Pronovost, P. et al. 2006. "An Intervention to Decrease Catheter-Related Bloodstream Infections in the ICU." *New England Journal of Medicine* 2725–32.
- Reid, Robert J. et al. 2010. "The Group Health Medical Home at Year Two: Cost Savings, Higher Patient Satisfaction, and Less Burnout for Providers." *Health affairs (Project Hope)* 29(5):835–43. Retrieved October 21, 2014.
- Riley, Gerald F. 2007. "Long-Term Trends in the Concentration of Medicare Spending." *Health Affairs* 26(3):808–16.
- Rosenthal, Meredith B. et al. 2013. "Effect of a Multipayer Patient-Centered Medical Home on Health Care Utilization and Quality: The Rhode Island Chronic Care Sustainability Initiative Pilot Program." *JAMA internal medicine* 173(20):1907–13.
- Shortell, S., R. Gillies, D. Anderson, Erickson K, and J. Mitchell. 2000. *Remaking Health Care in America, Second Edition*. 2nd ed. San Francisco: Jossey-Bass.
- Shortell, Stephen M. et al. 1998. "Assessing the Impact of Continuous Quality Improvement / Total Quality Management : Concept versus Implementation." *The Milbank Quarterly* 76(4):593–624.
- Shortell, Stephen M., Charles L. Bennett, and Gayle R. Byck. 2014. "Assessing the Impact of Continuous Quality Improvement on Clinical Practice : What It Will Take to Accelerate Progress." 76(4):593–624.
- Shortell, Stephen M. and Lawrence P. Casalino. 2008. "Health Care Reform Requires Accountable Care Systems." *Jama* 300(1):95–97.

- Shortell, Stephen M., Robin R. Gillies, and David A. Anderson. 1994. "The New World of Managed Care: Creating Organized Delivery Systems." *Health affairs* 13(5):46–64.
- Simoens, Steven and Anthony Scott. 2005. "Integrated Primary Care Organizations: To What Extent Is Integration Occurring and Why?" *Health services management research : an official journal of the Association of University Programs in Health Administration / HSMC, AUPHA* 18(1):25–40.
- Singer, Sara J. et al. 2011. "Defining and Measuring Integrated Patient Care: Promoting the next Frontier in Health Care Delivery." *Medical care research and review : MCRR* 68(1):112–27.
- Singer, Sara J., Mark W. Friedberg, Mathew V Kiang, Toby Dunn, and Diane M. Kuhn. 2013. "Development and Preliminary Validation of the Patient Perceptions of Integrated Care Survey." *Medical care research and review : MCRR* 70(2):143–64.
- Snijders, Tom and Roel Bosker. 1999. *Multilevel Modeling: An Introduction to Basic and Advanced Multilevel Modeling*. Sage Publishing.
- Solomon, Loel S., Ron D. Hays, Alan M. Zaslavsky, Lin Ding, and Paul D. Cleary. 2005. "Psychometric Properties of a Group-Level Consumer Assessment of Health Plans Study (CAHPS) Instrument." *Medical care* 43(1):53–60.
- Spoelstra, Sandra L., Barbara A. Given, and Charles W. Given. 2011. "Fall Prevention in Hospitals: An Integrative Review." *Clinical nursing research: 21(1)*:92-112.
- Tollen, Laura. 2008. "Physician Organization in Relation to Quality and Efficiency of Care: A Synthesis of Recent Literature." *The Commonwealth Fund* (1121):1–12.
- Tom, Jeffrey O., Rita Mangione-Smith, Cam Solomon, and David C. Grossman. 2012. "Integrated Personal Health Record Use: Association with Parent-Reported Care Experiences." *Pediatrics* 130(1):e183–90.
- Tucker, Anita L., Ingrid M. Nembhard, Amy C. Edmondson, and L. Tucker. 2007. "Implementing New Practices: An Empirical Study of Organizational Learning in Hospital Intensive Care Units." 53(6):894–907.
- Valentijn, Pim P., Sanneke Schepman, W. Opheij, and M. Bruijnzeels. 2013. "Understanding Integrated Care : A Comprehensive Conceptual Framework Based on the Integrative Functions of Primary Care." *Interional Journal of Integrated Care* 13(March).
- Vogeli, Christine et al. 2007. "Multiple Chronic Conditions: Prevalence, Health Consequences, and Implications for Quality, Care Management, and Costs." *Journal of general internal medicine* 22(3):391–95.

- Ward, Brian W., Jeannine S. Schiller, and Richard A. Goodman. 2014. "Peer Reviewed: Multiple Chronic Conditions Among US Adults: A 2012 Update." *Preventing chronic disease* 11.
- Warshaw, Gregg. 2006. "Introduction: Advances and Challenges in Care of Older People with Chronic Illness." *Generations* 30(3):5–10.
- Weeks, William B. et al. 2010. "Higher Health Care Quality and Bigger Savings Found at Large Multispecialty Medical Groups." *Health Affairs* 29(5):991–97.
- Weiner, Bryan J., Megan a Lewis, and Laura a Linnan. 2009. "Using Organization Theory to Understand the Determinants of Effective Implementation of Worksite Health Promotion Programs." *Health education research* 24(2):292–305. Retrieved November 5, 2014.
- Weiner, Bryanj and Stephen M. Shortell. 1993. "Promoting Clinical Involvement in Hospital Quality Improvement Efforts : The Effects of Top Management , Board , and Physician Leadership." 491–510.
- Wolff, Jennifer L., Barbara Starfield, and Gerard Anderson. 2002. "Prevalence, Expenditures, and Complications of Multiple Chronic Conditions in the Elderly." *Archives of internal medicine* 162(20):2269–76.
- Wong, Carol A. and Greta G. Cummings. 2007. "The Relationship between Nursing Leadership and Patient Outcomes: A Systematic Review." *Journal of nursing management* 15(5):508–21.
- Zellmer-Bruhn, Mary E. 2003. "Interruptive Events and Team Knowledge Acquisition." *Management Science* 49(4):514–28.

APPENDIX A
Supplementary Materials for Chapter One

Appendix A1. Patient Perceptions of Integrated Care Survey 2.0

Survey Instructions

Answer each question by marking the box to the left of your answer. You are sometimes told to skip over some questions in this survey. When this happens you will see an arrow with a note that tells you what question to answer next, like this:

¹ Yes **If Yes, go to #1**
² No

If you are answering the questions for another person, please answer according to your understanding of that person's experiences with medical providers.

Your Provider

1. Our records show that you got care from the provider named below in the last 6 months.

[Name of provider label goes here]

1a. Is that right?

¹ Yes
² No

1b. Is this the provider you usually see if you need a check-up, want advice about a health problem, or get sick or hurt?

¹ Yes
² No **If No, who is the provider you usually see? (Please print):**

Some questions in this survey will refer to your answer to Question 1 as "this provider." Please think of this person as you answer this survey.

2. How long have you been going to this provider?

¹ Less than 6 months
² At least 6 months but less than 1 year
³ At least 1 year but less than 3 years
⁴ At least 3 years but less than 5 years
⁵ 5 years or more

3. Our records indicate that you saw this provider at the office or clinic named below.

[Name of Clinic label goes here]

Is that right?

¹ Yes
² No **If No, where did you see this provider? (Please print):**

Some questions in this survey will refer to your answer to Question 3 as "this provider's office." Please think of this office or clinic as you answer this survey.

**Care from This Provider
and Provider's Office**

4. These questions ask about the care you received from the provider named in Question 1. Some offices remind patients about appointments. Before your most recent visit with this provider, did you get a reminder from this provider's office about the appointment?

- ¹ Yes
² No

5. Before your most recent visit with this provider, did you get instructions telling you what to expect or how to prepare?

- ¹ Yes
² No

6. How often has this provider canceled or changed the date of an appointment?

- ¹ Never **If Never, go to #8**
² Once or twice
³ 3 to 5 times
⁴ More than 5 times

7. When this provider cancels or changes the date of an appointment, how often is this a big problem for you?

- ¹ Never
² Sometimes
³ Usually
⁴ Always

8. People have busy lives and miss appointments for many reasons. How often have you missed an appointment with this provider?

- ¹ Never **If Never, go to #10**
² Once or twice
³ 3 to 5 times
⁴ More than 5 times

9. When you miss an appointment with your provider, how often does someone from this provider's office contact you to make a new appointment?

- ¹ Never
² Sometimes
³ Usually
⁴ Always

10. When you see this provider, how often do you have to repeat information you have already given to someone in your provider's office?

- ¹ Never
² Sometimes
³ Usually
⁴ Always

11. In the last 6 months, how often did this provider seem to know the important information about your medical history?

- ¹ Never
² Sometimes
³ Usually
⁴ Always

12. In the last 6 months, how often did this provider seem to know the important information about your work or life at home that you have discussed in the past?

- ¹ Never
² Sometimes
³ Usually
⁴ Always

13. In the last 6 months, how often did this provider explain things in a way that was easy to understand?

- ¹ Never
- ² Sometimes
- ³ Usually
- ⁴ Always

14. In the last 6 months, how often did this provider listen carefully to you?

- ¹ Never
- ² Sometimes
- ³ Usually
- ⁴ Always

15. In the last 6 months, how often did this provider show respect for what you had to say?

- ¹ Never
- ² Sometimes
- ³ Usually
- ⁴ Always

16. In the last 6 months, how often did this provider spend enough time with you?

- ¹ Never
- ² Sometimes
- ³ Usually
- ⁴ Always

17. In the last 6 months, did this provider order a blood test, x-ray, or other test for you?

- ¹ Yes
- ² No **If No, go to #22**

18. In the last 6 months, when this provider ordered a blood test, x-ray, or other test for you, how often did anyone from this provider's office follow up to give you those results?

- ¹ Never
- ² Sometimes
- ³ Usually
- ⁴ Always

19. In the last 6 months, how often did you get these test results in a timely manner?

- ¹ Never
- ² Sometimes
- ³ Usually
- ⁴ Always

20. In the last 6 months, how often did you have to request your test results before you got them?

- ¹ Never
- ² Sometimes
- ³ Usually
- ⁴ Always

21. In the last 6 months, how often were these test results presented in a way that was easy to understand?

- ¹ Never
- ² Sometimes
- ³ Usually
- ⁴ Always

22. In the last 6 months, how often do you think this provider understood what you wanted from your health care?

- ¹ Never
- ² Sometimes
- ³ Usually
- ⁴ Always

23. In the last 6 months, how often did this provider ask you for your ideas about managing your health?

- ¹ Never
- ² Sometimes
- ³ Usually
- ⁴ Always

24. In the last 6 months, how often did this provider discuss whether you were getting the health care you wanted?

- ¹ Never
- ² Sometimes
- ³ Usually
- ⁴ Always

**Care from Other Staff
at This Provider's Office**

25. People often receive care from several people in the same office. These questions ask about the care you received from other staff in the office of the provider named in Question 1. In the last 6 months, did you receive care from any other staff in the office of the provider named in Question 1?

- ¹ Yes
- ² No **□ If No, go to #29**

26. In the last 6 months, how often did these other staff seem up-to-date about the care you were receiving from the provider named in Question 1?

- ¹ Never
- ² Sometimes
- ³ Usually
- ⁴ Always

27. In the last 6 months, how often did these other staff talk with you about care you received from the provider named in Question 1?

- ¹ Never
- ² Sometimes
- ³ Usually
- ⁴ Always

28. In the last 6 months, how often did these other staff seem to know the important information about your medical history?

- ¹ Never
- ² Sometimes
- ³ Usually
- ⁴ Always

**Care from Anyone in This Provider's
Office**

29. These questions ask about the care you received from the provider named in Question 1 and other staff in this provider's office. In the last 6 months, did anyone from this provider's office give you instructions about how to manage your health conditions?

- ¹ Yes
- ² No **□ If No, go to #31**

30. When anyone from the office of the provider named in Question 1 gave you instructions about how to manage your health conditions, how often were you able to follow these instructions?

- ¹ Never
- ² Sometimes
- ³ Usually
- ⁴ Always

31. In the last 6 months, did you take any prescription medicine?

- ¹ Yes
- ² No **□ If No, go to #35**

32. In the last 6 months, how often have you and anyone from the office of the provider named in Question 1 talked about how you were supposed to take your medicine?

- 1 Never
- 2 Sometimes
- 3 Usually
- 4 Always

33. In the last 6 months, how often have you taken your medicine as prescribed?

- 1 Never
- 2 Sometimes
- 3 Usually
- 4 Always

34. In the last 6 months, how often have you and anyone from the office of the provider named in Question 1 talked about what to do if you have a bad reaction to your medicine?

- 1 Never
- 2 Sometimes
- 3 Usually
- 4 Always

35. In the last 6 months, how often has anyone from the office of the provider named in Question 1 contacted you between visits to see how you were doing?

- 1 Never
- 2 Sometimes
- 3 Usually
- 4 Always

36. In the last 6 months, did you try to contact the office of the provider named in Question 1 with a medical question **after** regular office hours?

- 1 Yes
- 2 No **If No, go to #38**

37. In the last 6 months, when you tried to contact the office of the provider named in Question 1 **after** regular office hours, how often did you get an answer to your medical question in a timely manner?

- 1 Never
- 2 Sometimes
- 3 Usually
- 4 Always

38. In the last 6 months, how often did anyone from the office of the provider named in Question 1 **ask** if you needed more services at home to manage your health conditions?

- 1 Never **If Never, go to #40**
- 2 Sometimes
- 3 Usually
- 4 Always

39. In the last 6 months, how often did anyone from the office of the provider named in Question 1 **help you get** more services at home to manage your health conditions?

- 1 Never
- 2 Sometimes
- 3 Usually
- 4 Always

**Care from Specialists Outside
This Provider's Office**

40. Specialists are doctors like surgeons, heart doctors, psychiatrists, allergy doctors, skin doctors, and other doctors who specialize in one area of health care. In the last 6 months, did you receive care from any specialists outside the office of the provider named in Question 1?

- 1 Yes
- 2 No **If No, go to #48**

41. In the last 6 months, how often did the provider named in Question 1 seem informed and up-to-date about the care you got from specialists?

- ¹ Never
- ² Sometimes
- ³ Usually
- ⁴ Always

42. In the last 6 months, how often did you have to remind the provider named in Question 1 about care you received from specialists?

- ¹ Never
- ² Sometimes
- ³ Usually
- ⁴ Always

43. In the last 6 months, did any specialists prescribe medicine for you?

- ¹ Yes
- ² No **If No, go to #45**

44. In the last 6 months, how often did the provider named in Question 1 talk with you about the medicines prescribed by specialists?

- ¹ Never
- ² Sometimes
- ³ Usually
- ⁴ Always

**The Specialist You Saw Most Often
in the Last 6 Months**

45. These questions ask about care you received from the specialist you saw most often in the last 6 months. In the last 6 months, how often did this specialist seem to know the important information about your medical history?

- ¹ Never
- ² Sometimes
- ³ Usually
- ⁴ Always

46. When you see this specialist, how often do you have to repeat information that you have already given to the provider named in Question 1?

- ¹ Never
- ² Sometimes
- ³ Usually
- ⁴ Always

47. When you see this specialist, how often does he or she repeat tests that you have already had?

- ¹ Never
- ² Sometimes
- ³ Usually
- ⁴ Always

Your Most Recent Hospital Stay

48. In the last 6 months, were you admitted to a hospital overnight or longer?

- ¹ Yes
- ² No **If No, go to #53**

49. After your most recent hospital stay, did anyone from the office of the provider named in Question 1 contact you to ask about the condition you were in the hospital for?

- ¹ Yes
- ² No **If No, go to #52**

50. After your most recent hospital stay, did anyone from the office of the provider named in Question 1 give you advice to help you manage the condition you were in the hospital for?

- ¹ Yes
- ² No **If No, go to #52**

51. How often did you follow this advice?

- 1 Never
- 2 Sometimes
- 3 Usually
- 4 Always

52. After your most recent hospital stay, did the provider named in Question 1 seem to know the important information about this hospital stay?

- 1 Yes
- 2 No

About You

53. In general, how would you rate your overall health?

- 1 Excellent
- 2 Very good
- 3 Good
- 4 Fair
- 5 Poor

54. What is your age?

- 1 18 to 24
- 2 25 to 34
- 3 35 to 44
- 4 45 to 54
- 5 55 to 64
- 6 65 to 74
- 7 75 or older

55. Are you male or female?

- 1 Male
- 2 Female

56. What is the highest grade or level of school that you have completed?

- 1 8th grade or less
- 2 Some high school, but did not graduate
- 3 High school graduate or GED
- 4 Some college or 2-year degree
- 5 4-year college graduate
- 6 More than 4-year college degree

57. Are you of Hispanic or Latino origin or descent?

- 1 Yes, Hispanic or Latino / Latina
- 2 No, not Hispanic or Latino / Latina

58. What is your race? Please mark one or more.

- 1 White
- 2 Black or African-American
- 3 Asian
- 4 Native Hawaiian or Other Pacific Islander
- 5 American Indian or Alaska Native
- 6 Other

59. Did someone help you complete this survey?

- 1 Yes
- 2 No **If No, go to #61**

60. How did that person help you? Please mark one or more.

- Read the questions to me
- Wrote down the answers I gave
- Answered the questions for me
- Translated the questions into my language
- Helped in some other way

How did they help? *(Please print):*

61. Did you complete this survey for someone else?

- Yes If Yes, go to #62

No **Thank you. Please return the completed survey in the postage-paid envelope.**

62. What is your relationship to the person for whom you completed the survey? Please mark all that apply.

- Your child
- Your parent
- Another family member
- Other (specify)

Other relationship *(Please print):*

Thank You

Please return the completed survey in the postage-paid envelope to:

**Center for the Study of Services
PO Box 10820
Herndon, VA 20172-9904**

Please do not include any other correspondence.

**Appendix A.2 Nurse middle manager interview guide
July and August, 2013**

Introduction to Participant and Research Project

- Thank interviewer for participation.
- Introduce self and provide brief background.
- Describe research interests and goal of call: to understand the role of nurse managers/directors in quality improvement implementation on the medical unit so as to inform the design of survey research questions.
- Discuss confidentiality of conversation (information discussed during this call will not be shared with anyone outside of our research team and will be de-identified)
- Ask permission to record interview. Explain recording for transcription purposes and recordings will be deleted after transcription.

Interview Questions

Can you please provide a little bit of background information about yourself and your current role and responsibilities at your hospital?

Can you please provide a little bit of background information about the medical unit you manage? (e.g. how many nurses are on staff?)

Can you describe for me your role in the implementation of quality improvement projects on your unit?

- What are your specific responsibilities?
- How do you oversee/manage the implementation process?
- We are trying to create survey questions to better understand the role of the nurse manager in quality improvement implementation on the unit. What do you think are the key activities nurse managers carry out during the implementation of a quality improvement initiative on their unit?
- Can you think of a few ongoing initiatives at the moment and describe for me your involvement with their implementation?
 - What types of activities do you do on a daily basis to oversee the implementation?
 - Were you involved in the planning of the implementation process of the QI initiative? If so, how?
 - How and what do you communicate with your frontline staff about these initiatives?
 - Do you personally feel committed to these initiatives? Do you think they will “stick”/last? Do you think they are a worthwhile endeavor?
 - Do you feel responsible for these initiatives?
 - Do you feel accountable for the outcome of these initiatives?

- Do you communicate at all with your supervisor about these initiatives? If so, what do you communicate?
- Do you ever modify or redesign the initiative? If so, under what circumstances and how?
- How do you maintain the momentum of the initiative?
- Do you track the initiative's implementation progress at all? If so, how? If so, who do you communicate those results to?

In your experience, what activities/characteristics do you think are important for a nurse middle manager to carry out to lead to the successful implementation of a quality improvement initiative?

In your experience, are there activities/characteristics of nurse middle managers that hinder the successful implementation of a quality improvement initiative?

Why do you think the same quality improvement initiative may be successful on one unit and not on another?

Thank you for your time. Would you like to add anything else on the topic of the nurse manager's role in quality improvement implementation?

Appendix A.3 Manager Influence Over Quality Improvement Program Implementation Survey

Demographic Variables

Your Age
_____ Years

Your Gender

- Male
- Female

Employment status

- Full time (40 or more hours per week)
- Part time (20-40 hours per week)
- Temporary/ Per diem (< 20 per week)

Your primary title is best described as

- Chief Nursing Officer
- Executive Nurse Director
- Nurse Director
- Nurse Manager
- Clinical Coordinator
- Advanced Practice Nurse (APN/Educator)
- Clinical Practice Specialist
- Other _____

Are you certified as a nurse manager/ leader/ executive? If so which certifications have you completed?

- Nurse Executive (through ANCC)
- Nurse Executive, Advanced (Through ANCC)
- Certified in Executive Nursing Practice (CENP) (through AONE)
- Certified Nurse Manager and Leader (CNML) (through AONE/AACN collaboration)
- Other _____
- No certification training

Are you Hispanic or Latino

- Yes
- No

Your Race (check all that apply)

- American Indian/ Alaskan Native
- Asian
- Black or African American
- Native Hawaiian or Other Pacific Islander
- White
- Other(please specify): _____

Do you consider yourself to be disabled?

- Yes
- No

Indicate the highest level of nursing education (if you are currently enrolled and have started in a degree granting program, please list that as the highest degree)

- LPN/ LVN
- Diploma
- Associates Degree
- Baccalaureate Degree
- Master's Degree
- Doctoral Degree

Indicate the highest level of any education (if you are currently enrolled and have started in a degree granting program, please list that as the highest degree).

- Diploma
- Associates Degree
- Baccalaureate Degree
- Master's Degree
- Doctoral Degree

How many beds are there total on the unit(s) in which you work / oversee (if applicable)?
_____ beds

How many people report directly to you?

How many people are under your span of control (the number of persons reporting to you directly or through another person)?

How many years have you worked for your current employer?
_____ Years

How many years experience do you have in your current role?
_____ Years

What was your professional title immediately prior to your current role?

Your number of years of direct patient care experience?

_____ Years

Your number of years of administrative experience?

_____ Years

How many health care employers have you had since graduating from nursing school?

_____ Employers

I am likely to retire in the next three years?

- Yes
- No
- Unsure

Magnet status?

- Not pursuing Magnet accreditation
- On the journey
- Application submitted
- Magnet accredited
- Unknown
- Not applicable

Management Influence Over Quality Improvement Program Implementation Survey Questions

The following series of questions are related to quality improvement programs or initiatives on your unit(s) and your role in their implementation. (By quality improvement programs or initiatives we mean both formal and informal programs, initiatives, or projects that consist of systematic and continuous actions intended to lead to measurable improvement in an intended healthcare services area.) At the HOSPITAL UNIT level, do you DIRECTLY manage, or help to directly manage, quality improvement programs or initiatives on the hospital unit?

- Yes
 No

Earlier in this survey, you selected multiple hospital units on which you work. If you work on or oversee multiple units please consider one particular unit when answering the following questions. Please write in below the unit for which you work that you will consider when answering the following questions:

UNIT: _____

Approximately how many quality improvement programs or initiatives are you currently working on in this unit?
 _____ projects

Please SELECT ALL THAT APPLY to indicate WHEN your unit has engaged in a quality improvement program or initiative related to:

| | Not Applicable to My Unit | Not During My Time on This Unit | More than One Year Ago | Within the Last Year | Plan to Engage in the Future |
|---|---------------------------|---------------------------------|--------------------------|--------------------------|------------------------------|
| FALLS | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| PRESSURE ULCERS | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| CATHETER ASSOCIATED UTI (CAUTI) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| C.DIFF INFECTIONS | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| MRSA INFECTIONS | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| CENTRAL LINE-ASSOCIATED BLOODSTREAM INFECTIONS (CLABSI) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

How long has your unit engaged in a quality improvement program or initiative related to:

| | Less than 1 year | 1 year | 2 years | 3 years | 4 or More Years |
|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| FALLS | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| PRESSURE ULCERS | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| CATHETER ASSOCIATED UTI (CAUTI) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| C.DIFF INFECTIONS | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| MRSA INFECTIONS | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| CENTRAL LINE-ASSOCIATED BLOODSTREAM INFECTIONS (CLABSI(s)) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

The following continuum represents a range of behavioral reactions that individuals might exhibit in response to an organizational change, such as a quality improvement program or initiative. Please move the slider to the point on the continuum that YOU feel best represents YOUR reaction to each of the following quality improvement programs. You may move the slider to any point on the continuum. (Please note that all responses are confidential. Your honest assessment is appreciated.)



[Note: Only quality improvement programs for which respondent indicated unit engaged in program for “more than one year ago” or “within the last year” shown]

- _____ FALLS
- _____ PRESSURE ULCERS
- _____ CATHETER ASSOCIATED UTI (CAUTI)
- _____ C.DIFF INFECTIONS
- _____ MRSA INFECTIONS
- _____ CENTRAL LINE-ASSOCIATED BLOODSTREAM INFECTIONS (CLABSI(s))

On a scale of 0 to 100% complete, how far along is your unit in the implementation of each of the following quality improvement programs?

- FALLS
- PRESSURE ULCERS
- CATHETER ASSOCIATED UTI (CAUTI)
- C.DIFF INFECTIONS
- MRSA INFECTIONS
- CENTRAL LINE-ASSOCIATED BLOODSTREAM INFECTIONS (CLABSIs)

On a scale of 0 to 100, how would you rate the overall level of ENGAGEMENT of your FRONTLINE NURSING STAFF in each of the following quality improvement programs on your unit? (By engagement we mean the degree to which individuals are attentive and put forth discretionary effort (e.g. energy, brainpower, extra time) towards the QI initiative.)

- FALLS
- PRESSURE ULCERS
- CATHETER ASSOCIATED UTI (CAUTI)
- C.DIFF INFECTIONS
- MRSA INFECTIONS
- CENTRAL LINE-ASSOCIATED BLOODSTREAM INFECTIONS (CLABSIs)

On a scale of 0 to 100, how would you rate the overall level of ENGAGEMENT of your PHYSICIAN COLLEAGUES in each of the following quality improvement programs on your unit? (By engagement we mean the degree to which individuals are attentive and put forth discretionary effort (e.g. energy, brain power, extra time) towards the QI initiative.)

- FALLS
- PRESSURE ULCERS
- CATHETER ASSOCIATED UTI (CAUTI)
- C.DIFF INFECTIONS
- MRSA INFECTIONS
- CENTRAL LINE-ASSOCIATED BLOODSTREAM INFECTIONS (CLABSIs)

On a scale of 0 to 100, how would you rate the overall level of ENGAGEMENT of your MANAGER in each of the following quality improvement programs on your unit? (By engagement we mean the degree to which individuals are attentive and put forth discretionary effort (e.g. energy, brain power, extra time) towards the QI initiative.)

- FALLS
- PRESSURE ULCERS
- CATHETER ASSOCIATED UTI (CAUTI)
- C.DIFF INFECTIONS
- MRSA INFECTIONS
- CENTRAL LINE-ASSOCIATED BLOODSTREAM INFECTIONS (CLABSIs)

On a scale of 0 to 100, how would you rate YOUR overall level of ENGAGEMENT in each of the following quality improvement programs on your unit? (By engagement we mean the degree to which individuals are attentive and put forth discretionary effort (e.g. energy, brain power, extra time) towards the QI initiative.)

- _____ FALLS
- _____ PRESSURE ULCERS
- _____ CATHETER ASSOCIATED UTI (CAUTI)
- _____ C.DIFF INFECTIONS
- _____ MRSA INFECTIONS
- _____ CENTRAL LINE-ASSOCIATED BLOODSTREAM INFECTIONS (CLABSIs)

The following series of 11 questions are related to the FALLS quality improvement program or initiative your unit engaged in during the last 12 months. Please answer the following questions with this program/initiative in mind. After these 11 questions the survey will conclude.

Please SELECT ALL THAT APPLY: From which part of your organization did the FALLS quality improvement program originate?

- From the person you report directly to or senior management
- From a quality improvement department
- From you
- From your staff
- Don't know
- Other (Please fill in) _____

We are interested in understanding what you do while implementing the FALLS quality improvement program. How often, if at all, do you:

| | Never | Less than quarterly | Quarterly | Monthly | Weekly | Daily |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Report to your supervisor about program progress | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Arrange education or training related to the program for your staff | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Discuss program during unit meetings | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Engage in one-on-one | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

| | | | | | | |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| conversations with staff about the program | | | | | | |
| Track staff adherence to the program | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Provide feedback to individual staff members on their personal performance related to the program | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Modify or re-design the program during or after program implementation | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Review data on your unit's performance related to the program | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Share data or feedback on your unit's performance related to the program to staff | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

To what extent were you involved in the planning of the FALLS quality improvement program?

- Never
- Rarely
- Occasionally
- A moderate amount
- A great deal

How often have you received any training in quality improvement methodology?

- Never
- Rarely
- Occasionally
- A moderate amount
- A great deal

How often do you use the following quality improvement methods and analytic tools in the implementation of the FALLS quality improvement program?

| | Never | Rarely | Occasionally | A moderate amount | A great deal |
|--|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| PDSA (Plan-Do-Study-Act) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| SPC (Statistical Process Control) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 90-day Improvement Cycles | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Six Sigma | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Lean Thinking (Toyota Production System) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Root Cause Analysis | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| High Reliability Methods | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Other (please specify): | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Please fill in the number of staff (e.g. nursing staff, quality program staff, CNS staff) who help you MANAGE implementing the FALLS quality improvement program.

_____ staff

On average, how many hours per week do YOU spend working on your hospital unit's quality improvement program on FALLS:

_____ hours per week

Please indicate the extent to which you agree or disagree with the following statements about the FALLS quality improvement program:

| | Strongly Disagree | Disagree | Somewhat Disagree | Neither Agree Nor Disagree | Somewhat Agree | Agree | Strongly Agree |
|--|-----------------------|-----------------------|-----------------------|----------------------------|-----------------------|-----------------------|-----------------------|
| I believe in the value of this program. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| This program is a good strategy for this organization. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| This program serves an important purpose. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Things would be better without this program. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I feel a sense of duty to work toward implementing this program. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I have too much at stake to resist this program. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| It would be too costly for me to resist this program. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| It would be risky to speak out against this program. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Resisting this | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

| | | | | | | | |
|--|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| program is not a viable option for me. | | | | | | | |
| I would not feel badly about opposing this program. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| The implementation of this program was effective. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I personally think the implementation of this program was a success. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Please indicate the extent to which you agree or disagree with the following statements about the FALLS quality improvement program:

| | Strongly Disagree | Disagree | Somewhat Disagree | Neither Agree Nor Disagree | Somewhat Agree | Agree | Strongly Agree |
|--|-----------------------|-----------------------|-----------------------|----------------------------|-----------------------|-----------------------|-----------------------|
| I do not think it would be right of me to oppose this program. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| It would be irresponsible of me to resist this program. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I would feel guilty about opposing this program. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I do not feel any obligation to support this program. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| I play a key role in setting priorities for | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

| | | | | | | | |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| <p>this program.</p> <p>The person I directly report to holds me accountable for the results of this program.</p> <p>I have adequate personnel resources to successfully carry out this program.</p> <p>I have adequate financial resources to successfully carry out this program.</p> <p>There is a clear action plan for implementing this program.</p> <p>I am rewarded and recognized (e.g., financially and/or otherwise) for this program's results on my unit.</p> <p>Our implementation effort on this program was effective.</p> <p>When I experience challenges implementing this program I get the support from</p> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|

| | | | | | | | |
|-------------------------------------|--|--|--|--|--|--|--|
| management I need to overcome them. | | | | | | | |
|-------------------------------------|--|--|--|--|--|--|--|

Please indicate the extent to which you agree or disagree with the following statements about the FALLS quality improvement program:

| | Strongly Disagree | Disagree | Somewhat Disagree | Neither Agree Nor Disagree | Somewhat Agree | Agree | Strongly Agree |
|--|-----------------------|-----------------------|-----------------------|----------------------------|-----------------------|-----------------------|-----------------------|
| Managers and supervisors have actively pushed to make this program a success. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Managers and supervisors are strongly committed to the successful implementation of this program. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Managers and supervisors have expressed doubts about whether this program will really help patients. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Managers and supervisors show little interest in this program. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Managers and supervisors stress the importance of this program for this | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

| | | | | | | | |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| hospital. Managers and supervisors take an active interest in this program's related problems and successes. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|

Please indicate the extent to which you agree or disagree with the following statements about the FALLS quality improvement program:

| | Strongly Disagree | Disagree | Somewhat Disagree | Neither Agree Nor Disagree | Somewhat Agree | Agree | Strongly Agree |
|---|-----------------------|-----------------------|-----------------------|----------------------------|-----------------------|-----------------------|-----------------------|
| Frontline workers have actively pushed to make this program a success. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Frontline workers are strongly committed to the successful implementation of this program. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Frontline workers have expressed doubts about whether this program will really help patients. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Frontline workers show little interest in this program. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Frontline workers stress | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| <p>the importance of this program for this hospital.</p> <p>Frontline workers take an active interest in this program's related problems and successes.</p> | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
|---|---|---|---|---|---|---|---|

Any other thoughts you'd like to share about your role in the implementation of quality improvement programs/initiatives on your unit or the units you oversee would be appreciated. Your comments will be used in continued development of this survey instrument.

- I give permission to share my de-identified qualitative responses to this question to highlight representative themes for manuscripts, presentations and/ or reports.

APPENDIX B
Supplementary Materials for Chapter Two

Appendix Table B.1
Patient Perceptions of Integrated Care Survey domains and items

| |
|--|
| Information Flow to Primary Care Provider |
| Captures patients' perceptions of how well the patient's primary provider is informed and up-to-date about care the patient receives from specialists. |
| In the last 6 months, how often did your primary care provider seem informed and up-to-date about the care you got from specialists? (% Always) |
| In the last 6 months, how often did you have to remind your primary care provider about care you received from specialists? (% Never) |
| In the last 6 months, how often did your primary care provider talk with you about the medicines prescribed by specialists? (% Always) |
| Information Flow to Specialist |
| Captures patients' perceptions of how well the specialist is informed and up-to-date about care the patient receives from the primary provider. |
| In the last 6 months, how often did the specialist seem to know the important information about your medical history? (% Always) |
| When you see the specialist, how often do you have to repeat information that you have already given to your primary care provider? (% Never) |
| When you see the specialist, how often does he or she repeat tests that you have already had? (% Never) |
| Information Flow to Other Providers in Primary Provider's Office |
| Captures patients' perceptions of whether other physicians, nurses, clinicians and support staff in the primary provider's office are informed and up-to-date about care the patient receives. |
| In the last 6 months, how often did other staff seem up-to-date about the care you were receiving from your primary care provider? (% Always) |
| In the last 6 months, how often did other staff talk with you about care you received from your primary care provider? (% Always) |
| In the last 6 months, how often did these other staff seem to know the important information about your medical history? (% Always) |
| Information Flow Post Hospitalization |
| Captures patients' perceptions of the extent to which care team members who interact with the patient deliver consistent care and seem informed about the recent hospitalization. |
| After your most recent hospital stay, did anyone from your primary care provider's office contact you to ask about the condition you were in the hospital for? (% Yes) |
| After your most recent hospital stay, did anyone from your primary care provider's office give you advice to help you manage the condition you were in the hospital for? (% Yes) |
| How often did you follow this advice?(% Always) |
| After your most recent hospital stay, did your primary care provider seem to know the important information about this hospital stay? (% Yes) |
| Proactive Action Before Visits |
| Captures patients' perceptions of how well care team members prepare patients for upcoming appointments. |
| Before your most recent visit with your primary care provider, did you get a reminder from this provider's office about the appointment? (% Yes) |
| Before your most recent visit with your primary care provider, did you get instructions telling you what to expect or how to prepare? (% Yes) |
| How often has your primary care provider cancelled or changed the date of an appointment? (% Never) |
| When your primary care provider cancels or changes the date of an appointment, how often is this a big problem for you? (% Never) |
| When you miss an appointment with your primary care provider, how often does someone from this provider's office contact you to make a new appointment? (% Always) |

Appendix Table B.1 (continued)

| |
|--|
| Post-visit Information Flow to the Patient |
| Captures patients' perceptions of how well care-team members follow-up with patients after an office visit. |
| In the last 6 months, when your primary care provider ordered a blood test, x-ray, or other test for you, how often did anyone from this provider's office follow up to give you those results? (% Always) |
| In the last 6 months, how often did you get these test results in a timely manner? (% Always) |
| In the last 6 months, how often did you have to request your test results before you got them? (% Never) |
| In the last 6 months, how often were these test results presented in a way that was easy to understand? (% Always) |
| Responsive Independent of Visits |
| Captures patients' perceptions of whether care-team members reach out, respond, and are available to patients between visits. |
| In the last 6 months, how often has anyone from your primary care provider's office contacted you between visits to see how you were doing? (% Always) |
| In the last 6 months, when you tried to contact your primary care provider's office after regular office hours, how often did you get an answer to your medical question in a timely manner? (% Always) |
| Continuous Familiarity with Patient Over Time |
| Captures patients' perceptions of the extent to which care-team members are familiar with the patient's past medical history and treatments. |
| When you see your primary care provider, how often do you have to repeat information you have already given to someone in your provider's office? (% Never) |
| In the last 6 months, how often did your primary care provider seem to know the important information about your medical history? (% Always) |
| In the last 6 months, how often did your primary care provider seem to know the important information about your work or life at home that you have discussed in the past? (% Always) |
| Coordination with Home and Community Resources |
| Captures patients' perceptions of how well care teams engage caregivers and caregiving organizations in the community (e.g. Meals on Wheels). |
| In the last 6 months, how often did anyone from your primary care provider's office ask if you needed more services at home to manage your health conditions? (% Always) |
| In the last 6 months, how often did anyone from your primary care provider's office help you get more services at home to manage your health conditions? (% Always) |
| Patient-Centeredness |
| Captures patients' perceptions of the extent to which care delivered meets the patient and family members' needs and preferences. |
| In the last 6 months, how often do you think your primary care provider understood what you wanted from your health care? (% Always) |
| In the last 6 months, how often did your primary care provider ask you for your ideas about managing your own health? (% Always) |
| In the last 6 months, how often did your primary care provider discuss whether you were getting the health care you wanted? (% Always) |
| Shared Responsibility |
| Captures patients' perceptions of how well the patient and his or her family share responsibility and engage in the provision of care and maintenance of good health. |
| When anyone from your primary care provider's office gave you instructions about how to manage your health conditions, how often were you able to follow these instructions? (% Always) |
| In the last 6 months, how often have you and anyone from your primary care provider's office talked about how you were supposed to take your medicine? (% Always) |
| In the last 6 months, how often have you taken your medicine as prescribed? (% Always) |
| In the last 6 months, how often have you and anyone from your primary care provider's office talked about what to do if you have a bad reaction to your medicine? (% Always) |

Appendix Table B.2 Non-response analysis

| | Sample (N=1,059) | Non- Respondents (N=1,669) | P-Value |
|--------------------------------------|---------------------|----------------------------------|---------|
| Chronic Conditions | | | |
| Chronic Heart Failure (CHF) | 3.0% | 6.5% | 0.001 |
| Asthma | 1.0% | 1.5% | 0.978 |
| Diabetes | 5.1% | 6.5% | 0.086 |
| Depression | 17.4% | 23.1% | 0.001 |
| Ischemic heart disease (IHD) | 21.5% | 26.0% | 0.013 |
| Average number of chronic conditions | 4.3 | 4.7 | 0.000 |
| Age | | | |
| 65 to Less than 75 | 45.2% | 41.1% | 0.009 |
| 75 or older | 54.8% | 58.5% | 0.009 |
| Gender (% male) | 48.1% | 44.5% | 0.082 |
| Recent Inpatient Stay | 20.6% | 33.0% | 0.000 |
| Care Management Program Participant | 14.8% | 15.9% | 0.50 |

Note: P-values derived from two-tailed significance tests examining differences between respondents and non-respondents.

Appendix Table B.3 Sensitivity analyses: Two-part regression models (raw coefficients reported)

| | Hurdle Model | | | | | | Zero-Inflated Model | | | | | |
|--|----------------------|------------------|-------------------|----------------------------------|-----------------|--------------------|----------------------|-----------------|--------------------|------------------------|-----------------|-------------------|
| | Part 1 (Logit Model) | | | Part 2 (Negative Binomial Model) | | | Part 1 (Logit Model) | | | Part 2 (Poisson Model) | | |
| | ED Visits | Hospital Admits | Outpatient Visits | ED Visits | Hospital Admits | Outpatient Visits | ED Visits | Hospital Admits | Outpatient Visits | ED Visits | Hospital Admits | Outpatient Visits |
| Information Flow to Your Doctor | 0.25 [1.71] | -2.22 [1.59] | 1.38 [1.47] | -1.89** [0.68] | -1.02 [0.70] | -0.35 [0.71] | -1.71** [0.59] | -0.46 [0.48] | -0.42 [0.69] | -1.27 [1.65] | 2.69 [1.94] | -1.40 [1.45] |
| Information Flow to Your Specialist | 0.18 [2.02] | -2.23* [1.09] | 2.11 [2.05] | -1.10 [1.46] | -1.65 [1.22] | -1.12* [0.48] | -1.26 [1.38] | -1.31 [1.20] | -1.14** [0.44] | -0.79 [1.59] | 1.30 [2.61] | -2.15 [2.07] |
| Information Flow to Other Providers in Your Doctors Office | -1.17^ [0.63] | 2.07 [1.79] | 4.47* [1.82] | -1.32 [0.98] | 0.13 [0.49] | -0.56 [0.56] | -0.95 [0.78] | 0.14 [0.34] | -0.52 [0.54] | 0.87 [0.99] | -2.63 [2.02] | -4.51* [1.84] |
| Information Flow Post Hospitalization | 0.88 [1.35] | -1.20 [1.30] | 4.11** [1.56] | 0.78 [0.58] | -0.60 [0.44] | -0.14 [0.32] | -0.88 [0.54] | -0.58 [0.54] | -0.24 [0.25] | -1.67 [1.30] | -2.33 [1.31] | -4.11** [1.55] |
| Proactive Action Before Visits | -1.74 [2.11] | -1.02 [1.41] | 0.07 [2.80] | -1.03 [1.03] | -0.16 [1.26] | -1.50^ [0.89] | -0.78 [0.88] | -0.06 [0.74] | -1.46 [0.96] | 1.63 [2.26] | 1.33 [1.45] | 0.16 [2.80] |
| Post-visit information flow to the patient | -0.36 [1.74] | -1.73 [1.73] | -1.18 [2.14] | -0.95 [1.42] | -0.04 [1.13] | -1.34*** [0.32] | -0.62 [1.21] | -0.03 [0.72] | -1.48*** [0.25] | 0.08 [1.50] | 2.38 [1.73] | 1.14 [2.15] |
| Responsive independent of Visits | -1.70 [1.55] | -0.42 [1.58] | 1.47 [2.24] | -1.55*** [0.46] | -0.18 [0.60] | -0.43 [0.82] | 1.31** [0.42] | -0.08 [0.42] | -0.66 [0.80] | 1.19 [1.50] | 0.64 [1.63] | -1.49 [2.22] |
| Continuous familiarity with patient over time | -2.12 [1.49] | -2.55* [1.31] | -0.59 [2.21] | -1.35 [1.01] | -0.57 [0.94] | -1.97** [0.63] | -1.24 [1.01] | -0.34 [0.72] | -1.71*** [0.53] | 1.71 [1.19] | 2.94 [0.84] | 0.49 [2.22] |
| Coordination with Home and Community Resources | 1.57 [1.50] | 1.70 [1.70] | -0.48 [2.07] | -0.92 [0.64] | 0.19 [0.65] | -0.24 [0.70] | -0.87 [0.58] | 0.09 [0.43] | -0.41 [0.55] | -2.25 [1.79] | -2.10 [2.27] | 0.49 [2.06] |
| Patient-Centeredness | -0.97 [1.36] | -1.13 [1.70] | 2.16 [1.71] | -1.65^ [0.94] | -0.20 [0.92] | -0.53 [0.62] | -1.44 [0.96] | -0.08 [0.68] | -0.70 [0.57] | 0.31 [1.12] | 1.32 [1.47] | -2.19 [1.71] |
| Shared Responsibility | -1.72 [1.25] | -- -- | 2.86 [2.52] | -1.39 [1.22] | -- -- | -0.15 [0.66] | -1.07 [1.14] | -0.04 [0.94] | -0.05 [0.62] | 1.43 [1.05] | 2.44 [1.81] | -2.86 [2.54] |

Notes: Models control for number of chronic conditions, self-reported health, hospitalization within prior six months of being surveyed, enrollment in the MGPO care management program, and gender. Robust standard errors in parentheses. ^p<0.10; *p<0.05; **p<0.01; ***p<0.001; -- Model would not converge.

Appendix Table B.4. Negative binomial regression of patient perceptions of integrated care and number of emergency department visits (incident rate ratios reported)

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
|--|----------------|----------------|-----------------|----------------|----------------|----------------|-----------------|-----------------|----------------|-----------------|----------------|
| Information Flow to Your Doctor | 0.26 [0.30] | | | | | | | | | | |
| Information Flow to Your Specialist | | 0.56 [0.95] | | | | | | | | | |
| Information Flow to Other Providers in Your Doctors Office | | | 0.22* [0.16] | | | | | | | | |
| Information Flow Post Hospitalization | | | | 0.86 [0.42] | | | | | | | |
| Proactive Action Before Visits | | | | | 0.14 [0.22] | | | | | | |
| Post-visit information flow to the patient | | | | | | 0.32 [0.55] | | | | | |
| Responsive independent of Visits | | | | | | | 0.12* [0.10] | | | | |
| Continuous familiarity with patient over time | | | | | | | | 0.11^ [0.14] | | | |
| Coordination with Home and Community Resources | | | | | | | | | 0.94 [0.71] | | |
| Patient-Centeredness | | | | | | | | | | 0.15^ [0.18] | |
| Shared Responsibility | | | | | | | | | | | 0.14 [0.18] |
| In Care Management Program (receiving standard care) | 1.50 [0.37] | 1.51 [0.34] | 1.28 [0.25] | 1.19 [0.14] | 1.42 [0.26] | 1.34 [0.27] | 1.44* [0.24] | 1.46* [0.27] | 1.32 [0.26] | 1.42* [0.25] | 1.39 [0.23] |

Notes: Robust standard errors clustered by practice and reported in parentheses. ^p<0.10; *p<0.05; **p<0.01; ***p<0.001.

Appendix Table B.4. Negative binomial regression of patient perceptions of integrated care and number of emergency department visits (continued)

| | | | | | | | | | | | |
|---|-------------------|-------------------|-------------------|------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Self-reported Fair or Poor Health (excellent, very good or good self-reported health) | 1.56** [0.25] | 1.49** [0.23] | 1.68** [0.29] | 1.38 [0.27] | 1.84*** [0.28] | 1.88*** [0.27] | 1.85*** [0.28] | 1.83*** [0.27] | 1.98*** [0.31] | 1.77*** [0.30] | 1.84*** [0.29] |
| Number of Chronic Conditions (two chronic conditions) | | | | | | | | | | | |
| 3 chronic conditions | 1.82* [0.42] | 1.71* [0.46] | 1.78 [0.61] | 0.94 [0.44] | 1.68* [0.35] | 1.66* [0.38] | 1.63* [0.35] | 1.66* [0.35] | 1.69* [0.43] | 1.66* [0.36] | 1.70* [0.36] |
| 4 or more chronic conditions | 2.64*** [0.51] | 2.41*** [0.59] | 2.62*** [0.69] | 1.66 [0.46] | 2.73*** [0.43] | 2.56*** [0.43] | 2.65*** [0.42] | 2.78*** [0.42] | 2.65*** [0.52] | 2.77*** [0.44] | 2.72*** [0.46] |
| Was Hospitalized Within Last 6 Months | 2.87*** [0.34] | 2.91*** [0.37] | 2.95*** [0.49] | 1.43** [0.19] | 2.77*** [0.38] | 2.85*** [0.37] | 2.96*** [0.41] | 2.78*** [0.34] | 3.04*** [0.42] | 2.88*** [0.37] | 2.89*** [0.40] |
| Male (female) | 1.44* [0.21] | 1.44** [0.19] | 0.87 [0.13] | 1.39 [0.24] | 1.28 [0.19] | 1.26 [0.17] | 1.24 [0.18] | 1.27 [0.18] | 1.25 [0.23] | 1.28 [0.18] | 1.34* [0.17] |
| Constant | 0.22*** [0.06] | 0.24*** [0.07] | 0.31*** [0.11] | 0.86 [0.27] | 0.23*** [0.07] | 0.24*** [0.07] | 0.23*** [0.07] | 0.43*** [0.06] | 0.23*** [0.07] | 0.22*** [0.06] | 0.22*** [0.06] |
| Inalpha_cons | 0.38 [0.21] | 0.39 [0.21] | 0.23 [0.13] | -0.26 [-.12] | 0.44 [0.18] | 0.46 [0.188] | 0.42 [0.19] | 0.43 [0.17] | 0.44 [0.21] | 0.43 [0.17] | 0.42 [0.18] |
| N | 829 | 805 | 486 | 269 | 1044 | 962 | 994 | 1043 | 932 | 1026 | 992 |

Notes: Robust standard errors clustered by practice and reported in parentheses. Incident rate ratios reported. ^p<0.10; *p<0.05; **p<0.01; ***p<0.001.

Appendix Table B.5. Negative binomial regression of patient perceptions of integrated care and number of hospital admissions (incident rate ratios reported)

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
|--|-------------------|-------------------|----------------|----------------|-------------------|------------------|-------------------|-------------------|----------------|-------------------|-------------------|
| Information Flow to Your Doctor | 0.41 [0.29] | | | | | | | | | | |
| Information Flow to Your Specialist | | 0.24 [0.21] | | | | | | | | | |
| Information Flow to Other Providers in Your Doctors Office | | | 1.57 [0.83] | | | | | | | | |
| Information Flow Post Hospitalization | | | | 0.55 [0.20] | | | | | | | |
| Proactive Action Before Visits | | | | | 0.74 [0.63] | | | | | | |
| Post-visit information flow to the patient | | | | | | 0.68 [0.62] | | | | | |
| Responsive independent of Visits | | | | | | | 0.75 [0.52] | | | | |
| Continuous familiarity with patient over time | | | | | | | | 0.37 [0.33] | | | |
| Coordination with Home and Community Resources | | | | | | | | | 1.53 [0.79] | | |
| Patient-Centeredness | | | | | | | | | | 0.70 [0.65] | |
| Shared Responsibility | | | | | | | | | | | 0.62 [0.77] |
| In Care Management Program (receiving standard care) | 1.23*** [0.05] | 1.19*** [0.04] | 1.15 [0.12] | 1.15 [0.09] | 1.22*** [0.07] | 1.17** [0.07] | 1.24*** [0.07] | 1.24*** [0.07] | 1.15 [0.10] | 1.24*** [0.05] | 1.26*** [0.07] |

Notes: Robust standard errors clustered by practice and reported in parentheses. Incident rate ratios reported. ^p<0.10; *p<0.05; **p<0.01; ***p<0.001.

Appendix Table B.5. Negative binomial regression of patient perceptions of integrated care and number of hospital admissions (continued)

| | | | | | | | | | | | |
|---|-------------------|--------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Self-reported Fair or Poor Health (excellent, very good or good self-reported health) | 1.39*** [0.08] | 1.37*** [0.07] | 1.35*** [0.14] | 1.26 [0.15] | 1.47*** [0.13] | 1.47*** [0.14] | 1.45*** [0.12] | 1.46*** [0.11] | 1.60*** [0.15] | 1.41*** [0.09] | 1.40*** [0.09] |
| Number of Chronic Conditions (two chronic conditions) | | | | | | | | | | | |
| 3 chronic conditions | 1.42 [0.33] | 1.35 [0.31] | 1.34 [0.39] | 1.00 [0.21] | 1.42 [0.29] | 1.37 [0.29] | 1.43 [0.29] | 1.41 [0.29] | 1.57* [0.28] | 1.39 [0.27] | 1.42 [0.29] |
| 4 or more chronic conditions | 2.51*** [0.53] | 2.42*** [0.50] | 2.82*** [0.97] | 1.53* [0.27] | 2.63*** [0.45] | 2.50*** [0.46] | 2.57*** [0.43] | 2.66*** [0.45] | 2.64*** [0.42] | 2.60*** [0.45] | 2.50*** [0.43] |
| Was Hospitalized Within Last 6 Months | 5.25*** [0.54] | 5.18*** [0.55] | 4.83*** [0.75] | 2.53*** [0.16] | 5.78*** [0.76] | 5.90*** [0.75] | 5.90*** [0.79] | 5.70*** [0.71] | 6.00*** [0.76] | 5.89*** [0.75] | 5.95*** [0.82] |
| Male (female) | 0.96 [0.05] | 0.99 [0.06] | 0.87 [0.08] | 0.99 [0.06] | 0.94 [0.05] | 0.91 [0.05] | 0.94 [0.07] | 0.94 [0.05] | 0.95 [0.08] | 0.96 [0.05] | 0.98 [0.05] |
| Constant | 0.16*** [0.03] | 0.16*** [0.031] | 0.17*** [0.05] | 0.56*** [0.10] | 0.14*** [0.03] | 0.14*** [0.03] | 0.14*** [0.03] | 0.13*** [0.03] | 0.13*** [0.03] | 0.14*** [0.03] | 0.14*** [0.03] |
| Inalpha_cons | -2.72 [1.58] | -2.91 [1.54] | -2.71 [1.24] | -4.02 [3.36] | -2.40 [1.10] | -2.43 [1.12] | -2.36 [1.09] | -2.39 [1.09] | -2.48 [1.23] | -2.44 [1.12] | -2.52 [1.25] |
| N | 829 | 805 | 486 | 269 | 1044 | 962 | 994 | 1043 | 932 | 1026 | 992 |

Notes: Robust standard errors clustered by practice and reported in parentheses. Incident rate ratios reported. ^p<0.10; *p<0.05; **p<0.01; ***p<0.001.

Appendix Table B.6. Negative binomial regression of patient perceptions of integrated care and number of outpatient visits (incident rate ratios reported)

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
|--|-----------------|-----------------|----------------|----------------|----------------|-------------------|----------------|-----------------|----------------|----------------|----------------|
| Information Flow to Your Doctor | 0.78 [0.58] | | | | | | | | | | |
| Information Flow to Your Specialist | | 0.38* [0.17] | | | | | | | | | |
| Information Flow to Other Providers in Your Doctors Office | | | 0.77 [0.52] | | | | | | | | |
| Information Flow Post Hospitalization | | | | 1.07 [0.40] | | | | | | | |
| Proactive Action Before Visits | | | | | 0.25 [0.26] | | | | | | |
| Post-visit information flow to the patient | | | | | | 0.27*** [0.10] | | | | | |
| Responsive independent of Visits | | | | | | | 0.74 [0.67] | | | | |
| Continuous familiarity with patient over time | | | | | | | | 0.16* [0.11] | | | |
| Coordination with Home and Community Resources | | | | | | | | | 0.76 [0.56] | | |
| Patient-Centeredness | | | | | | | | | | 0.74 [0.54] | |
| Shared Responsibility | | | | | | | | | | | 1.08 [0.74] |
| In Care Management Program (receiving standard care) | 1.27* [0.15] | 1.24 [0.14] | 1.23 [0.19] | 1.12 [0.23] | 1.22 [0.13] | 1.27* [0.12] | 1.26 [0.18] | 1.25* [0.14] | 1.26 [0.17] | 1.25 [0.16] | 1.26 [0.19] |

Notes: Robust standard errors clustered by practice and reported in parentheses. ^p<0.10; *p<0.05; **p<0.01; ***p<0.001.

Appendix Table B.6. Negative binomial regression of patient perceptions of integrated care and number of outpatient visits (continued)

| | | | | | | | | | | | |
|---|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Self-reported Fair or Poor Health (excellent, very good or good self-reported health) | 1.25* [0.11] | 1.25* [0.13] | 1.24 [0.16] | 1.18 [0.18] | 1.27* [0.13] | 1.21 [0.13] | 1.24* [0.13] | 1.27** [0.11] | 1.31** [0.13] | 1.28* [0.12] | 1.28** [0.12] |
| Number of Chronic Conditions (two chronic conditions) | | | | | | | | | | | |
| 3 chronic conditions | 1.19 [0.10] | 1.18 [0.10] | 1.27 [0.19] | 1.21 [0.13] | 1.18 [0.11] | 1.17 [0.10] | 1.22** [0.09] | 1.19* [0.10] | 1.16 [0.10] | 1.19* [0.10] | 1.21* [0.10] |
| 4 or more chronic conditions | 1.37*** [0.08] | 1.37*** [0.08] | 1.53*** [0.19] | 1.48*** [0.09] | 1.48*** [0.09] | 1.44*** [0.07] | 1.45*** [0.08] | 1.52*** [0.08] | 1.40*** [0.08] | 1.47*** [0.09] | 1.48*** [0.09] |
| Was Hospitalized Within Last 6 Months | 1.42*** [0.13] | 1.41*** [0.13] | 1.39*** [0.14] | 1.34*** [0.11] | 1.48*** [0.10] | 1.50*** [0.08] | 1.53*** [0.10] | 1.47*** [0.07] | 1.51*** [0.11] | 1.49*** [0.10] | 1.53*** [0.10] |
| Male (female) | 0.92 [0.06] | 0.95 [0.07] | 0.82** [0.06] | 1.02 [0.05] | 0.91 [0.08] | 0.87 [0.07] | 0.90 [0.07] | 0.91 [0.08] | 0.90 [0.08] | 0.89 [0.07] | 0.88 [0.07] |
| Constant | 6.62*** [0.75] | 6.61*** [0.78] | 6.55*** [1.42] | 6.50*** [0.83] | 6.00*** [0.77] | 6.00*** [0.74] | 5.87*** [0.82] | 5.68*** [0.56] | 5.91*** [0.76] | 5.85*** [0.86] | 5.84*** [0.81] |
| Inalpha_cons | -0.58 [0.14] | -0.60 [0.14] | -0.46 [0.13] | -0.80 [0.12] | -0.44 [0.17] | -0.46 [0.16] | -0.44 [0.15] | -0.46 [0-17] | -0.40 [0.15] | -0.42 [0.15] | -0.43 [0.15] |
| N | 829 | 805 | 486 | 269 | 1044 | 962 | 994 | 1043 | 932 | 1026 | 992 |

Notes: Robust standard errors clustered by practice and reported in parentheses. ^p<0.10; *p<0.05; **p<0.01; ***p<0.001.

APPENDIX C
Supplementary Materials for Chapter Three

Appendix Table C.1 Non-response analysis

| | Sample (N=1,331) | Non- Respondents (N=1,669) | P-Value |
|--------------------------------------|---------------------|----------------------------------|---------|
| Chronic Conditions | | | |
| Chronic Heart Failure (CHF) | 4.1% | 6.5% | 0.005 |
| Asthma | 1.3% | 1.5% | 0.598 |
| Diabetes | 5.0% | 6.5% | 0.083 |
| Depression | 17.7% | 23.1% | 0.000 |
| Ischemic heart disease (IHD) | 22.3% | 26.0% | 0.019 |
| Average number of chronic conditions | 4.3 | 4.7 | 0.000 |
| Age | | | |
| 65 to Less than 75 | 46.4% | 41.1% | 0.004 |
| 75 or older | 53.5% | 58.5% | 0.004 |
| Gender (% male) | 47.8% | 44.5% | 0.075 |
| Recent Inpatient Stay | 23.1% | 33.0% | 0.000 |
| Care Management Program Participant | 14.4% | 15.9% | 0.229 |

Note: P-values derived from two-tailed significance tests examining differences between respondents and non-respondents.

APPENDIX D
Supplementary Materials for Chapter Four

APPENDIX D – PART ONE
Additional Regressions with Individual Perceived Implementation as Dependent Variable

Appendix Table D1. Relationship between manager affective commitment and implementation success
Hierarchical regression model with control variables

| Variables | (1) All nurse managers | (2) Senior manager | (3) Middle manager | (4) Assistant middle manager |
|---------------------------------------|------------------------------|--------------------------|--------------------------|---------------------------------------|
| Affective Commitment to Falls Program | 0.80*** [0.07] | 0.74*** [0.11] | 0.67*** [0.10] | 1.05*** [0.12] |
| Age | 0.01* [0.01] | 0.03* [0.01] | -0.01 [0.01] | 0.01 [0.01] |
| Female (male) | 0.05 [0.18] | -0.02 [0.33] | 0.51^ [0.28] | -0.41 [0.28] |
| Education (Less than Masters level) | -0.12 [0.12] | -0.21 [0.26] | -0.29 [0.20] | -0.21 [0.18] |
| Race (non-white) | 0.06 [0.17] | 0.09 [0.30] | -0.14 [0.28] | 0.11 [0.27] |
| Years of direct patient care | -0.01 [0.01] | -0.03* [0.01] | 0.00 [0.01] | 0.01 [0.01] |
| Years of administrative experience | -0.01 [0.01] | 0.00 [0.01] | -0.01 [0.02] | -0.00 [0.01] |
| Manager level | | | | |
| Mid-level manager | 0.28^ [0.15] | | | |
| Low-level manager | 0.04 [0.16] | | | |
| Falls program length | 0.14*** [0.04] | 0.06 [0.08] | 0.13* [0.07] | 0.18*** [0.05] |
| System A | 0.07 [0.22] | 0.65* [0.27] | -0.39 [0.25] | -0.25 [0.40] |
| System B | 0.23 [0.22] | 0.74* [0.33] | -0.35 [0.27] | -0.03 [0.39] |
| Constant | -0.57 [0.63] | -0.47 [1.19] | 1.83^ [1.04] | -1.64^ [0.95] |
| N | 246 | 85 | 73 | 88 |
| Number of Groups | 29 | 27 | 19 | 26 |
| Chi2, overall model | 184.86 | 70.92 | 73.69 | 102.07 |
| Log likelihood | -310.08 | -109.48 | -79.77 | -103.37 |

Notes: Results derived from two-level random effects hierarchical linear regressions. Dependent variable is falls program implementation success. Robust standard errors reported in parentheses.

^p<0.01; *p<0.05; **p<0.01; ***p<0.001

Appendix Table D2. Relationship between manager affective commitment and frontline worker support
Hierarchical regression model with control variables

| Variables | (1) All nurse managers | (2) Senior manager | (3) Middle manager | (4) Assistant middle manager |
|---------------------------------------|------------------------------|--------------------------|--------------------------|---------------------------------------|
| Affective Commitment to Falls Program | 0.57*** [0.08] | 0.52*** [0.14] | 0.40*** [0.12] | 0.98*** [0.17] |
| Age | 0.01 [0.01] | 0.01 [0.01] | 0.01 [0.02] | 0.00 [0.01] |
| Female (male) | -0.02 [0.22] | 0.26 [0.37] | -0.03 [0.34] | -0.11 [0.42] |
| Education (Less than Masters level) | -0.04 [0.14] | -0.08 [0.30] | -0.18 [0.26] | 0.07 [0.24] |
| Race (non-white) | -0.11 [0.19] | -0.13 [0.33] | -0.09 [0.34] | -0.17 [0.35] |
| Years of direct patient care | -0.00 [0.01] | -0.00 [0.01] | -0.00 [0.02] | -0.01 [0.01] |
| Years of administrative experience | 0.01 [0.01] | -0.00 [0.01] | 0.03^ [0.02] | 0.02 [0.02] |
| Manager level | | | | |
| Mid-level manager | 0.27 [0.18] | | | |
| Low-level manager | 0.06 [0.19] | | | |
| Falls program length | 0.11* [0.05] | 0.17^ [0.10] | 0.08 [0.08] | 0.09 [0.07] |
| System A | -0.18 [0.23] | 0.21 [0.31] | -0.50 [0.28] | -0.57 [0.44] |
| System B | 0.22 [0.24] | 0.66 [0.39] | -0.03 [0.30] | -0.05 [0.42] |
| Constant | 1.24 [0.76] | 0.61 [1.38] | 2.86* [1.33] | -0.70 [1.25] |
| N | 228 | 81 | 67 | 80 |
| Number of Groups | 29 | 27 | 19 | 25 |
| Chi2, overall model | 74.19 | 25.35 | 33.77 | 45.13 |
| Log likelihood | -320.80 | -112.90 | -85.10 | -113.49 |

Notes: Results derived from two-level random effects hierarchical linear regressions. Dependent variable is falls program implementation success. Robust standard errors reported in parentheses.

^p<0.01; *p<0.05; **p<0.01; ***p<0.001

Appendix Table D3. Relationship between frontline worker support and implementation success
Hierarchical regression model with control variables

| Variables | (1) All nurse managers | (2) Senior manager | (3) Middle manager | (4) Assistant middle manager |
|-------------------------------------|------------------------------|--------------------------|--------------------------|---------------------------------------|
| Frontline worker support | 0.60*** [0.05] | 0.56*** [0.09] | 0.51*** [0.10] | 0.66*** [0.07] |
| Age | 0.01^ [0.01] | 0.01 [0.01] | 0.02 [0.02] | 0.01 [0.01] |
| Female (male) | 0.11 [0.19] | -0.35 [0.34] | 0.69* [0.30] | -0.23 [0.32] |
| Education (Less than Masters level) | 0.09 [0.13] | -0.16 [0.27] | -0.27 [0.22] | -0.22 [0.18] |
| Race (non-white) | 0.04 [0.17] | -0.01 [0.30] | -0.24 [0.30] | 0.20 [0.26] |
| Years of direct patient care | -0.01 [0.01] | -0.04** [0.01] | -0.01 [0.01] | 0.02* [0.01] |
| Years of administrative experience | -0.01 [0.01] | 0.01 [0.01] | -0.04* [0.02] | -0.01 [0.01] |
| Manager level | | | | |
| Mid-level manager | 0.14 [0.16] | | | |
| Low-level manager | 0.07 [0.17] | | | |
| Falls program length | 0.09* [0.05] | -0.02 [0.09] | 0.08 [0.07] | 0.19*** [0.05] |
| System A | 0.17 [0.19] | 0.79* [0.29] | -0.30 [0.28] | 0.08 [0.29] |
| System B | 0.28 [0.20] | 0.61^ [0.37] | -0.15 [0.29] | 0.21 [0.26] |
| Constant | 1.39* [0.54] | 2.34* [0.99] | 2.46* [1.13] | 0.96 [0.65] |
| N | 228 | 81 | 67 | 80 |
| Number of Groups | 29 | 27 | 19 | 25 |
| Chi2, overall model | 168.09 | 62.70 | 49.21 | 133.51 |
| Log likelihood | -292.67 | -106.07 | -76.77 | -91.01 |

Notes: Results derived from two-level random effects hierarchical linear regressions. Dependent variable is falls program implementation success. Robust standard errors reported in parentheses.

^p<0.01; *p<0.05; **p<0.01; ***p<0.001

Appendix Table D4. Relationship between organizational support and implementation success
Hierarchical regression model with control variables

| Variables | (1) All nurse managers | (2) Senior manager | (3) Middle manager | (4) Assistant middle manager |
|-------------------------------------|------------------------------|--------------------------|--------------------------|---------------------------------------|
| Organizational support | 0.75*** [0.06] | 0.90*** [0.10] | 0.62*** [0.11] | 0.68*** [0.09] |
| Age | 0.02** [0.01] | 0.01 [0.01] | 0.02 [0.02] | 0.01 [0.01] |
| Female (male) | 0.24 [0.18] | 0.04 [0.29] | 0.23 [0.28] | 0.34 [0.35] |
| Education (Less than Masters level) | -0.05 [0.12] | -0.20 [0.23] | -0.35^ [0.20] | -0.06 [0.18] |
| Race (non-white) | -0.02 [0.16] | 0.03 [0.26] | -0.30 [0.28] | 0.07* [0.28] |
| Years of direct patient care | -0.00 [0.01] | -0.03** [0.01] | -0.01 [0.01] | 0.00 [0.02] |
| Years of administrative experience | -0.00 [0.01] | -0.01 [0.01] | -0.02 [0.02] | |
| Manager level | | | | |
| Mid-level manager | 0.50*** [0.15] | | | |
| Low-level manager | 0.63*** [0.16] | | | |
| Falls program length | 0.05 [0.04] | 0.06 [0.08] | -0.00 [0.07] | 0.08 [0.06] |
| System A | 0.00 [0.22] | 0.21 [0.24] | -0.22 [0.32] | -0.16 [0.40] |
| System B | 0.08 [0.23] | 0.33 [0.30] | -0.07 [0.33] | -0.08 [0.38] |
| Constant | 0.06 [0.06] | 0.18 [0.92] | 2.24* [1.09] | 0.66 [0.78] |
| N | 233 | 83 | 69 | 81 |
| Number of Groups | 29 | 27 | 19 | 25 |
| Chi2, overall model | 224.35 | 114.55 | 56.25 | 97.22 |
| Log likelihood | -281.96 | -95.63 | -76.41 | -96.67 |

Notes: Results derived from two-level random effects hierarchical linear regressions. Dependent variable is falls program implementation success. Robust standard errors reported in parentheses.
^p<0.01; *p<0.05; **p<0.01; ***p<0.001

**Appendix Table D.5 Relationship between organizational support and
manager affective commitment
Hierarchical regression model with control variables**

| Variables | (1) All nurse managers | (2) Senior manager | (3) Middle manager | (4) Assistant middle manager |
|-------------------------------------|------------------------------|--------------------------|--------------------------|---------------------------------------|
| Organizational Support | 0.42*** [0.05] | 0.49*** [0.08] | 0.56*** [0.12] | 0.33*** [0.06] |
| Age | 0.00 [0.01] | -0.02^ [0.01] | 0.04* [0.02] | 0.00 [0.01] |
| Female (male) | 0.05 [0.15] | -0.20 [0.24] | -0.24 [0.30] | 0.33 [0.26] |
| Education (Less than Masters level) | 0.02 [0.10] | 0.05 [0.19] | -0.08 [0.22] | 0.08 [0.14] |
| Race (non-white) | -0.21 [0.13] | -0.26 [0.22] | -0.29 [0.29] | -0.07 [0.20] |
| Years of direct patient care | -0.00 [0.01] | -0.01 [0.01] | -0.02 [0.01] | 0.01 [0.01] |
| Years of administrative experience | 0.01 [0.01] | 0.01 [0.01] | -0.00 [0.02] | 0.01 [0.01] |
| Manager level | | | | |
| Mid-level manager | 0.11 [0.13] | | | |
| Low-level manager | 0.38** [0.14] | | | |
| Falls program length | -0.05 [0.03] | -0.05 [0.06] | -0.08 [0.07] | -0.06 [0.04] |
| System A | -0.10 [0.12] | -0.23 [0.25] | -0.01 [0.25] | 0.02 [0.21] |
| System B | 0.02 [0.13] | -0.02 [0.29] | 0.20 [0.25] | 0.06 [0.19] |
| Constant | 3.96*** [0.46] | 5.00*** [0.82] | 2.56* [1.14] | 4.22*** [0.54] |
| N | 233 | 83 | 69 | 81 |
| Number of Groups | 29 | 27 | 19 | 25 |
| Chi2, overall model | 94.77 | 53.38 | 38.38 | 34.54 |
| Log likelihood | -245.78 | -81.61 | -78.18 | -69.34 |

Notes: Results derived from two-level random effects hierarchical linear regressions. Dependent variable is falls program implementation success. Robust standard errors reported in parentheses.

^p<0.01; *p<0.05; **p<0.01; ***p<0.001

**Appendix Table D.6 Relationship between organizational support and
frontline worker support
Hierarchical regression model with control variables**

| Variables | (1) All nurse managers | (2) Senior manager | (3) Middle manager | (4) Assistant middle manager |
|-------------------------------------|------------------------------|--------------------------|--------------------------|---------------------------------------|
| Organizational Support | 0.54*** [0.07] | 0.80*** [0.11] | 0.25^ [0.14] | 0.61*** [0.11] |
| Age | 0.01 [0.01] | 0.00 [0.01] | 0.02 [0.02] | 0.00 [0.01] |
| Female (male) | 0.04 [0.21] | 0.38 [0.31] | -0.19 [0.35] | 0.45 [0.43] |
| Education (Less than Masters level) | -0.01 [0.14] | -0.08 [0.25] | -0.23 [0.25] | 0.11 [0.23] |
| Race (non-white) | -0.22 [0.19] | -0.14 [0.28] | -0.28 [0.35] | -0.23 [0.36] |
| Years of direct patient care | 0.00 [0.01] | -0.00 [0.01] | -0.01 [0.02] | -0.00 [0.01] |
| Years of administrative experience | 0.01 [0.01] | -0.01 [0.01] | 0.02 [0.02] | 0.03 [0.02] |
| Manager level | | | | |
| Mid-level manager | 0.43* [0.17] | | | |
| Low-level manager | 0.49** [0.19] | | | |
| Falls program length | 0.03 [0.05] | 0.15^ [0.08] | 0.04 [0.09] | -0.02 [0.08] |
| System A | -0.22 [0.27] | -0.24 [0.27] | -0.43 [0.37] | -0.55 [0.59] |
| System B | 0.05 [0.28] | 0.24 [0.34] | -0.01 [0.39] | -0.23 [0.56] |
| Constant | 1.84 [0.66] | 0.28 [0.98] | 3.88** [1.36] | 1.92^ [1.01] |
| N | 227 | 81 | 67 | 79 |
| Number of Groups | 29 | 27 | 19 | 25 |
| Chi2, overall model | 93.41 | 70.85 | 19.76 | 41.73 |
| Log likelihood | -311.40 | -98.47 | -87.62 | -112.96 |

Notes: Results derived from two-level random effects hierarchical linear regressions. Dependent variable is falls program implementation success. Robust standard errors reported in parentheses.

^p<0.01; *p<0.05; **p<0.01; ***p<0.001

APPENDIX D – PART TWO
Additional Regression Models with Hospital-perceived Falls QI Program Implementation Success as Dependent Variable

Appendix Table D7. Relationship between manager affective commitment and hospital-perceived implementation success
Ordinary least squares regression model with control variables

| Variables | All Nurse Managers | Senior manager | Middle manager | Assistant middle manager |
|------------------------------------|--------------------|----------------|----------------|--------------------------|
| Affective Commitment | 0.17*** | 0.20** | 0.13^ | 0.26** |
| | [0.04] | [0.06] | [0.06] | [0.08] |
| Age | 0.00 | 0.01^ | -0.01 | 0.00 |
| | [0.00] | [0.01] | [0.01] | [0.01] |
| Female (male) | 0.20* | 0.37^ | 0.07 | 0.14 |
| | [0.08] | [0.21] | [0.01] | [0.15] |
| Education Masters Level or Above | 0.04 | -0.14 | 0.18^ | -0.22^ |
| | [0.05] | [0.12] | [0.10] | 0[.12] |
| Race (non-white) | 0.06 | 0.07 | 0.23 | -0.13 |
| | [0.13] | [0.24] | [0.18] | [0.16] |
| Years of direct patient care | -0.01 | -0.02* | 0.01 | 0.00 |
| | [0.01] | [0.01] | [0.01] | [0.01] |
| Years of administrative experience | -0.00 | -0.00 | 0.01 | -0.01 |
| | [0.00] | [0.01] | [0.01] | [0.01] |
| Manager level | | | | |
| Mid-level manager | -0.08 | | | |
| | [0.10] | | | |
| Low-level manager | -0.01 | | | |
| | [0.09] | | | |
| Falls program length | 0.06^ | 0.02 | 0.04 | 0.11* |
| | [0.03] | [0.05] | [0.05] | [0.04] |
| System A | -0.07 | 0.07 | -0.08 | -0.05 |
| | [0.23] | [0.19] | [0.27] | [0.28] |
| System B | 0.17 | 0.29^ | 0.21 | 0.15 |
| | [0.18] | [0.16] | [0.18] | [0.24] |
| Constant | 4.31*** | 3.97*** | 4.49*** | 3.98*** |
| | [0.47] | [0.75] | [0.52] | [0.58] |
| Observations | 246 | 85 | 73 | 88 |
| R-squared | 0.164 | 0.267 | 0.157 | 0.274 |

Notes: Results derived from ordinary least squares regressions. Dependent variable is hospital-perceived falls program implementation success. Robust standard errors reported in parentheses.

^p<0.01; *p<0.05; **p<0.01; ***p<0.001

**Appendix Table D.8 Relationship between manager affective commitment
and frontline worker support
Ordinary least squares regression model with control variables**

| Variables | All Nurse Managers (N = 246) | Senior manager (N = 85) | Middle manager (N = 73) | Assistant middle manager |
|------------------------------------|------------------------------------|-------------------------------|-------------------------------|--------------------------------|
| Affective Commitment | 0.60*** | 0.53* | 0.41^ | 1.01*** |
| Age | [0.15] 0.01 | [0.22] 0.01 | [0.23] 0.01 | [0.19] 0.00 |
| Female (male) | [0.01] 0.05 | [0.02] 0.26 | [0.02] -0.02 | [0.01] 0.07 |
| Education Masters Level or Above | [0.20] -0.03) | [0.44] -0.08) | [0.36] -0.17 | [0.28] 0.10 |
| Race (non-white) | [0.18] -0.07 | [0.43] -0.13 | [0.28] -0.09 | [0.31] -0.09 |
| Years of direct patient care | [0.22] -0.00 | [0.38] -0.00 | [0.34] -0.00 | [0.51] -0.01 |
| Years of administrative experience | [0.01] 0.01 | [0.01] -0.00 | [0.01] 0.04 | [0.01] 0.01 |
| Manager level | | | | |
| Mid-level manager | [0.16] 0.24 | | | |
| Low-level manager | [0.15] 0.03 | | | |
| Falls program length | [0.06] 0.11^ | [0.15] 0.17 | [0.09] 0.08 | [0.09] 0.08 |
| System A | [0.22] -0.21 | [0.24] 0.21 | [0.28] -0.50^ | [0.31] -0.56^ |
| System B | [0.16] 0.20 | [0.31] 0.66* | [0.25] -0.03 | [0.21] -0.05] |
| Constant | [1.24] 0.92 | [0.17] 0.61 | [0.16] 2.82^ | [1.89] -1.16 |
| Observations | 228 | 81 | 67 | 80 |
| R-squared | 0.268 | 0.238 | 0.343 | 0.376 |

Notes: Results derived from ordinary least squares regressions. Dependent variable is hospital-perceived falls program implementation success. Robust standard errors reported in parentheses.

^p<0.01; *p<0.05; **p<0.01; ***p<0.001

Appendix Table D.9 Relationship between frontline worker support and hospital-perceived implementation success
Ordinary least squares regression model with control variables

| Variables | (1) All nurse managers | (2) Senior manager | (3) Middle manager | (4) Assistant middle manager |
|-------------------------------------|------------------------------|--------------------------|--------------------------|---------------------------------------|
| Frontline worker support | 0.15*** [0.03] | 0.12* [0.05] | 0.18*** [0.05] | 0.18*** [0.04] |
| Age | -0.00 [0.00] | 0.00 [0.01] | -0.01 [0.01] | 0.00 [0.01] |
| Female (male) | 0.23* [0.10] | 0.30 [0.22] | 0.07 [0.11] | 0.24 [0.17] |
| Education (Less than Masters level) | -0.02 [0.07] | -0.10 [0.16] | 0.22 [0.14] | -0.23* [0.11] |
| Race (non-white) | 0.04 [0.10] | 0.06 [0.21] | 0.22 [0.18] | -0.16 [0.14] |
| Years of direct patient care | -0.00 [0.00] | -0.02 [0.01] | 0.01 p0.01] | 0.01 [0.01] |
| Years of administrative experience | -0.00 [0.00] | -0.00 [0.01] | 0.01 [0.01] | -0.01 [0.01] |
| Manager level | | | | |
| Mid-level manager | -0.14 [0.09] | | | |
| Low-level manager | -0.05 [0.10] | | | |
| Falls program length | 0.05* [0.02] | 0.01 [0.05] | 0.02 [0.04] | 0.11** [0.04] |
| System A | -0.07 [0.08] | 0.07 [0.13] | 0.01 [0.14] | -0.02 [0.16] |
| System B | 0.18* [0.07] | 0.25 [0.17] | 0.23* [0.11] | 0.19 [0.15] |
| Constant | 4.63*** [0.29] | 4.94*** [0.60] | 4.31*** [0.61] | 4.52*** [0.38] |
| Observations | 228 | 81 | 67 | 80 |
| R-squared | 0.51 | 0.23 | 0.48 | 0.38 |

Notes: Results derived from ordinary least squares regressions. Dependent variable is hospital-perceived falls program implementation success. Robust standard errors reported in parentheses.

^p<0.01; *p<0.05; **p<0.01; ***p<0.001

Appendix Table D.10 Relationship between organizational support and hospital-perceived implementation success
Ordinary least squares regression model with control variables

| Variables | (1) All nurse managers | (2) Senior manager | (3) Middle manager | (4) Assistant middle manager |
|-------------------------------------|------------------------------|--------------------------|--------------------------|---------------------------------------|
| Organizational support | 0.11*** [0.03] | 0.16* [0.06] | 0.00 [0.09] | 0.15** [0.05] |
| Age | 0.00 [0.00] | 0.00 [0.01] | -0.01 [0.01] | 0.00 [0.01] |
| Female (male) | 0.24* [0.10] | 0.37 [0.24] | 0.07 [0.12] | 0.36^ [0.20] |
| Education (Less than Masters level) | -0.03 [0.07] | -0.12 [0.15] | 0.18 [0.14] | -0.20 [0.12] |
| Race (non-white) | 0.03 [0.10] | 0.06 [0.20] | 0.18 [0.21] | -0.18 [0.13] |
| Years of direct patient care | -0.00 [0.00] | -0.02* [0.01] | 0.01 [0.01] | 0.01 [0.01] |
| Years of administrative experience | -0.00 [0.01] | -0.01 [0.01] | 0.01 [0.01] | -0.00 [0.01] |
| Manager level | | | | |
| Mid-level manager | -0.07 [0.10] | | | |
| Low-level manager | 0.05 [0.10] | | | |
| Falls program length | 0.05* [0.02] | 0.03 [0.05] | 0.04 [0.04] | -/-8* [0.04] |
| System A | -0.10 [0.08] | 0.01 [0.14] | -0.11 [0.15] | -0.07 [0.18] |
| System B | 0.18** [0.07] | 0.24 [0.16] | 0.24 [0.11] | -.14 [0.14] |
| Constant | 4.76*** [0.32]] | 4.59*** [0.63] | 5.19*** [0.76] | 4.66*** [0.44] |
| Observations | 233 | 83 | 69 | 81 |
| R-squared | 0.52 | 0.53 | 0.50 | 0.50 |

Notes: Results derived from ordinary least squares regressions. Dependent variable is hospital-perceived falls program implementation success. Robust standard errors reported in parentheses.

^p<0.01; *p<0.05; **p<0.01; ***p<0.001

**Appendix Table D.11 Relationship between organizational support and
manager affective commitment
Ordinary least squares regression model with control variables**

| Variables | (1) All nurse managers | (2) Senior manager | (3) Middle manager | (4) Assistant middle manager |
|-------------------------------------|------------------------------|--------------------------|--------------------------|---------------------------------------|
| Organizational support | 0.42*** [0.07] | 0.52*** [0.12] | 0.56** [0.18] | 0.33*** [0.09] |
| Age | 0.00 [0.01] | -0.01 [0.01] | 0.04 [0.02] | 0.00 [0.00] |
| Female (male) | 0.05 [0.12] | -0.15 [0.17] | -0.24 [0.28] | 0.33* [0.17] |
| Education (Less than Masters level) | 0.02 [0.10] | 0.09 [0.21] | -0.08 [0.21] | 0.08 [0.13] |
| Race (non-white) | -0.21* [0.10] | -0.30 [0.18] | -0.29 [0.29] | -0.07 [0.16] |
| Years of direct patient care | -0.00 [0.01] | -0.01 [0.01] | -0.02 [0.01] | 0.01 [0.01] |
| Years of administrative experience | 0.01 [0.01] | 0.01 [0.01] | -0.00 [0.02] | 0.01 [0.01] |
| Manager level | | | | |
| Mid-level manager | 0.11 [0.14] | | | |
| Low-level manager | 0.38** [0.14] | | | |
| Falls program length | -0.05^ [0.03] | -0.02 [0.05] | -0.08 [0.07] | -0.06 [0.04] |
| System A | -0.10 [0.13] | -0.28 [0.20] | -0.01 [0.27] | 0.02 [0.21] |
| System B | 0.02 [0.12] | -0.05 [0.22] | 0.20 [0.27] | 0.06 [0.17] |
| Constant | 3.96*** [0.55] | 4.41*** [1.11] | 2.56 [1.67] | 4.22*** [0.49] |
| N | 233 | 83 | 69 | 81 |
| R-squared | 0.72 | 0.40 | 0.83 | 0.61 |

Notes: Results derived from ordinary least squares regressions. Dependent variable is hospital-perceived falls program implementation success. Robust standard errors reported in parentheses.

^p<0.01; *p<0.05; **p<0.01; ***p<0.001

**Appendix Table D.12 Relationship between organizational support and
frontline worker support
Ordinary least squares regression model with control variables**

| Variables | (1) All nurse managers | (2) Senior manager | (3) Middle manager | (4) Assistant middle manager |
|-------------------------------------|------------------------------|--------------------------|--------------------------|---------------------------------------|
| Organizational support | 0.56*** [0.09] | 0.80*** [0.09] | 0.29 [0.19] | 0.61*** [0.15] |
| Age | 0.01 [0.01] | 0.00 [0.01] | 0.02 [0.02] | 0.00 [0.01] |
| Female (male) | 0.17 [0.19] | 0.38 [0.43] | -0.14 [0.30] | 0.79** [0.25] |
| Education (Less than Masters level) | 0.00 [0.18] | -0.08 [0.30] | -0.21 [0.29] | 0.23 [0.38] |
| Race (non-white) | -0.17 [0.23] | -0.14 [0.33] | -0.19 [0.37] | -0.23 [0.40] |
| Years of direct patient care | -0.00 [0.01] | -0.00 [0.01] | -0.01 [0.01] | -0.01 [0.01] |
| Years of administrative experience | 0.01 [0.01] | -0.01 [0.01] | 0.04 [0.02] | 0.02 [0.02] |
| Manager level | | | | |
| Mid-level manager | 0.40* [0.19] | | | |
| Low-level manager | 0.46* [0.17] | | | |
| Falls program length | 0.04 [0.06] | 0.15 [0.13] | 0.03 [0.09] | -0.03 [0.08] |
| System A | -0.27 [0.25] | -0.24 [0.15] | -0.47 [0.31] | -0.55 [0.44] |
| System B | 0.06 [0.18] | 0.24 [0.21] | 0.06 [0.30] | -0.21 [0.28] |
| Constant | 1.56^ [0.81] | 0.28 [0.90] | 3.69** [1.10] | 1.52 [1.41] |
| N | | 81 | 67 | 79 |
| R-squared | | 0.47 | 0.27 | 0.33 |

Notes: Results derived from ordinary least squares regressions. Dependent variable is hospital-perceived falls program implementation success. Robust standard errors reported in parentheses.

^p<0.01; *p<0.05; **p<0.01; ***p<0.001

**Appendix Table D.13 Relationship between manager affective commitment, frontline worker support, organizational support and hospital-perceived implementation success
Ordinary least squares regression model with control variables**

| Variables | (1) All nurse managers | (2) Senior manager | (3) Middle manager | (4) Assistant middle manager |
|--|------------------------------|--------------------------|--------------------------|---------------------------------------|
| Affective Commitment to Falls Program | 0.10* [0.05] | 0.16^ [0.09] | 0.09 [0.05] | 0.09 [0.07] |
| Frontline worker support for Falls Program | 0.12** [0.04] | 0.05 [0.06] | 0.16** [0.06] | 0.13* [0.05] |
| Organizational Support for Falls Program | 0.01 [0.04] | 0.04 [0.11] | -0.09 [0.06] | 0.04 [0.06] |
| Age | -0.00 [0.00] | 0.01 [0.01] | -0.02^ [0.01] | 0.00 [0.01] |
| Female (male) | 0.22* [0.09] | 0.37^ [0.21] | 0.11 [0.09] | 0.22 [0.15] |
| Education (Less than Masters level) | -0.03 [0.05] | -0.12 [0.13] | 0.22* [0.10] | -0.22 [0.11] |
| Race (non-white) | 0.06 [0.12] | 0.12 [0.25] | 0.01 [0.01] | -0.15 [0.15] |
| Years of direct patient care | -0.00 [0.00] | -0.02* [0.01] | 0.00 [0.01] | 0.01 [0.01] |
| Years of administrative experience | -0.00 [0.00] | -0.01 [0.01] | | -0.01 [0.01] |
| Manager level | | | | |
| Mid-level manager | -0.14 [0.10] | | | |
| Low-level manager | -0.05 [0.10] | | | |
| Falls program length | 0.05 [0.03] | 0.03 [0.06] | 0.04 [0.05] | 0.10* [0.04] |
| System A | -0.07 [0.22] | 0.05 [0.20] | -0.03 [0.24] | -0.03 [0.31] |
| System B | 0.16 [0.17] | 0.21 [0.18] | 0.21 [0.16] | 0.17 [0.28] |
| Constant | 4.17*** [0.49] | 3.91*** [0.87] | 4.35*** [0.65] | 4.06 [0.59] |
| N | 227 | 81 | 67 | 79 |
| Adjusted R-squared | 0.22 | 0.28 | 0.48 | 0.48 |

Notes: Results derived from ordinary least squares regressions. Dependent variable is hospital-perceived falls program implementation success. Robust standard errors reported in parentheses.
^p<0.01; *p<0.05; **p<0.01; ***p<0.001

**Appendix Table D.14 Results of mediation analyses:
Frontline worker support as a mediator of association between manager affective
commitment and hospital-perceived implementation success**

| Model | Observed coefficient | Proportion of total effect mediated | Bias | Bootstrapped standard error | Bootstrapping bias- corrected 95% confidence interval | |
|-------------------------------|---------------------------------|--|-------------|--|--|--------------|
| | | | | | Lower | Upper |
| (1) All managers | | | | | | |
| Indirect effect | 0.072 | 41.8% | 0.002 | 0.028 | 0.028 | 0.137 |
| Direct effect | 0.101 | | -0.000 | 0.047 | 0.002 | 0.191 |
| Total effect | 0.173 | | 0.002 | 0.041 | 0.091 | 0.251 |
| (2) Senior managers | | | | | | |
| Indirect effect | 0.034 | 16.5% | 0.007 | 0.047 | -0.021 | 0.174 |
| Direct effect | 0.174 | | -0.006 | 0.083 | -0.030 | 0.307 |
| Total effect | 0.208 | | 0.001 | 0.064 | 0.081 | 0.337 |
| (3) Middle managers | | | | | | |
| Indirect effect | 0.065 | 56.7% | 0.005 | 0.048 | 0.008 | 0.206 |
| Direct effect | 0.050 | | -0.006 | 0.077 | -0.116 | 0.193 |
| Total effect | 0.115 | | -0.001 | 0.078 | 0.041 | 0.267 |
| (4) Assistant middle managers | | | | | | |
| Indirect effect | 0.143 | 55.7% | 0.002 | 0.062 | 0.037 | 0.279 |
| Direct effect | 0.113 | | -0.002 | 0.099 | -0.082 | 0.312 |
| Total effect | 0.256 | | 0.000 | 0.084 | 0.082 | 0.418 |

Notes: Mediation analysis derived from ordinary least squares regression models. All results adjusted for age, gender, education, race, years of direct patient care experience, years of administrative experience, falls program length, and hospital system.

**Appendix Table D.15 Results of mediation analyses:
 Manager affective commitment as a mediator of association between organization support
 and hospital-perceived implementation success**

| Model | Observed coefficient | Proportion of total effect mediated | Bias | Bootstrapped standard error | Bootstrapping bias- corrected 95% confidence interval | |
|-------------------------------|---------------------------------|--|-------------|--|--|--------------|
| | | | | | Lower | Upper |
| (1) All managers | | | | | | |
| Indirect effect | 0.057 | 51.4% | 0.000 | 0.022 | 0.019 | 0.104 |
| Direct effect | 0.053 | | -0.000 | 0.039 | -0.024 | 0.132 |
| Total effect | 0.111 | | -0.000 | 0.033 | 0.043 | 0.173 |
| (2) Senior managers | | | | | | |
| Indirect effect | 0.086 | 55.1% | -0.011 | 0.059 | -0.025 | 0.221 |
| Direct effect | 0.070 | | 0.013 | 0.096 | -0.110 | 0.264 |
| Total effect | 0.156 | | 0.002 | 0.067 | 0.031 | 0.298 |
| (3) Middle managers | | | | | | |
| Indirect effect | 0.084 | 39.4% | 0.005 | 0.055 | -0.010 | 0.203 |
| Direct effect | -0.082 | | -0.008 | 0.089 | -0.249 | 0.109 |
| Total effect | 0.002 | | -0.003 | 0.090 | -0.172 | 0.187 |
| (4) Assistant middle managers | | | | | | |
| Indirect effect | 0.062 | 41.2% | 0.002 | 0.041 | -0.005 | 0.160 |
| Direct effect | 0.088 | | -0.006 | 0.064 | -0.038 | 0.215 |
| Total effect | 0.150 | | -0.004 | 0.050 | 0.055 | 0.252 |

Notes: Mediation analysis derived from ordinary least squares regression models. All results adjusted for age, gender, education, race, years of direct patient care experience, years of administrative experience, falls program length, and hospital system.

APPENDIX E
Supplementary Data Appendix for Chapter Four

**Analyses Exploring Manager Affective Commitment, Normative Commitment and
Continuance Commitment to Falls QI Program Implementation Success**

Appendix Table E.1 Correlations of key variables

| Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|-------|-------|-------|-------|-------|-------|--------|--------|--------|----|
| Perceived Implementation Success | 1 | | | | | | | | | |
| Hospital-perceived Implementation Success | 0.47* | 1 | | | | | | | | |
| Affective Commitment | 0.62* | 0.30* | 1 | | | | | | | |
| Normative Commitment | 0.41* | 0.18* | 0.40* | 1 | | | | | | |
| Continuance Commitment | 0.18* | -0.02 | 0.14* | 0.50* | 1 | | | | | |
| Frontline Worker Support | 0.63* | 0.36* | 0.46* | 0.35* | 0.15* | 1 | | | | |
| Organizational Support | 0.65* | 0.25* | 0.48* | 0.50* | 0.29* | 0.50* | 1 | | | |
| Senior Manager | -0.02 | -0.03 | -0.02 | 0.06 | 0.03 | -0.02 | 0.25* | 1 | | |
| Middle Manager | 0.04 | -0.10 | -0.05 | -0.01 | 0.06 | 0.04 | -0.01 | -0.39* | 1 | |
| Assistant Middle Manager | -0.02 | 0.12* | 0.06 | -0.05 | -0.09 | -0.02 | -0.24* | -0.56* | -0.54* | 1 |

*p<0.05

Appendix Table E.2 Descriptive statistics of manager affective, normative, continuance commitment to change

| Variables | All Nurse Managers (N = 252) | Senior manager (N = 86) | Middle manager (N = 74) | Assistant middle manager (N = 92) | |
|--|---------------------------------|----------------------------|----------------------------|--------------------------------------|-------------|
| | Mean (SD) | Mean (SD) | Mean (SD) | Mean (SD) | |
| Affective Commitment to Change Scale (standardized alpha = 0.93) | | | | | |
| I believe in the value of this program. | | 6.37 (0.91) | 6.36 (0.96) | 6.28 (1.01) | 6.43 (0.75) |
| This program is a good strategy for this organization. | | 6.24 (0.98) | 6.22 (1.04) | 6.21 (1.02) | 6.30 (0.87) |
| This program serves an important purpose. | | 6.46 (0.83) | 6.47 (0.87) | 6.34 (0.96) | 6.56 (0.66) |
| Things could be better without this program (RS). | | 6.36 (1.08) | 6.27 (1.34) | 6.33 (1.03) | 6.48 (0.82) |
| Normative Commitment to Change Scale (standardized alpha =0.81) | | | | | |
| I feel a sense of duty to work toward this program. | | 6.30 (0.96) | 6.38 (1.09) | 6.26 (0.86) | 6.25 (0.92) |
| I do not think it would be right of me to oppose this program. | | 5.76 (1.58) | 6.01 (1.49) | 5.77 (1.51) | 5.49 (1.70) |
| It would be irresponsible of me to resist this program. | | 5.98 (1.39) | 6.11 (1.38) | 5.99 (1.32) | 5.84 (1.47) |
| I would feel guilty about opposing this program. | | 5.24 (1.93) | 5.19 (2.14) | 5.27 (1.82) | 5.26 (1.81) |
| Continuance Commitment to Change Scale (standardized alpha=0.80) | | | | | |
| I have too much at stake to resist this program. | | 5.51 (1.71) | 5.79 (1.53) | 5.61 (1.59) | 5.16 (1.91) |
| It would be too costly for me to resist this program. | | 5.22 (1.89) | 5.27 (1.88) | 5.43 (1.74) | 5.00 (2.01) |
| It would be risky to speak out against this program. | | 3.73 (2.17) | 3.65 (2.19) | 3.69 (2.19) | 3.85 (2.16) |
| Resisting this program is not a viable option for me. | | 5.25 (1.88) | 5.34 (1.89) | 5.51 (1.73) | 4.97 (1.97) |

**Appendix Table E.3 Relationship between manager affective commitment, normative commitment, continuance commitment and implementation success
Hierarchical regression with no controls**

| Variables | (1) All nurse managers | (2) Senior manager | (3) Middle manager | (4) Assistant middle manager |
|---|------------------------------|--------------------------|--------------------------|---------------------------------------|
| Affective Commitment to Falls Program | 0.73*** [0.07] | 0.75*** [0.13] | 0.56*** [0.10] | 1.02*** [0.16] |
| Normative Commitment to Falls Program | 0.17** [0.06] | 0.16 [0.11] | 0.29** [0.10] | 0.09 [0.09] |
| Continuance Commitment to Falls Program | 0.03 [0.04] | 0.07 [0.08] | 0.02 [0.08] | -0.02 [0.06] |
| Constant | -0.05 [0.46] | -0.43 [0.86] | 0.45 [0.60] | -1.30 [0.91] |
| N | 250 | 84 | 74 | 92 |
| Chi2, overall model | 166.29 | 53.50 | 80.26 | 63.61 |
| Log likelihood | -319.94 | -111.99 | -80.49 | -118.94 |

Notes: Results derived from two-level random effects hierarchical linear regressions. Dependent variable is falls program implementation success. Robust standard errors reported in parentheses.

^p<0.01; *p<0.05; **p<0.01; ***p<0.001

**Appendix Table E.4 Relationship between manager affective commitment, normative commitment, continuance commitment and implementation success
Hierarchical regression with controls**

| Variables | (1) All nurse managers | (2) Senior manager | (3) Middle manager | (4) Assistant middle manager |
|---|------------------------------|--------------------------|--------------------------|---------------------------------------|
| Affective Commitment to Falls Program | 0.73*** [0.07] | 0.72*** [0.13] | 0.50*** [0.11] | 1.04*** [0.14] |
| Normative Commitment to Falls Program | 0.14* [0.06] | 0.14 [0.10] | 0.29** [0.10] | 0.03 [0.09] |
| Continuance Commitment to Falls Program | 0.02 [0.04] | 0.05 [0.08] | 0.01 [0.07] | -0.04 [0.06] |
| Age | 0.01* [0.01] | 0.02^ [0.01] | 0.01 [0.01] | 0.01 [0.01] |
| Female (male) | 0.05 [0.18] | -0.06 [0.33] | 0.42 [0.26] | -0.36 [0.29] |
| Education (Less than Masters level) | 0.09 [0.12] | -0.20 [0.26] | -0.25 [0.19] | -0.20 [0.18] |
| Race (non-white) | 0.06 [0.16] | 0.13 [0.30] | -0.27 [0.27] | 0.08 [0.28] |
| Years of direct patient care | -0.01 [0.01] | -0.03* [0.01] | -0.00 [0.01] | 0.01 [0.01] |
| Years of administrative experience | -0.00 [0.01] | 0.00 [0.01] | -0.01 [0.01] | -0.00 [0.01] |
| Manager level | | | | |
| Mid-level manager | 0.29* [0.15] | | | |
| Low-level manager | 0.10 [0.16] | | | |
| Falls program length | 0.13 [0.04] | 0.09 [0.08] | 0.09 [0.06] | 0.19*** [0.05] |
| System A | 0.04 [0.21] | 0.64* [0.26] | -0.37^ [0.21] | -0.26 [0.40] |
| System B | 0.13 [0.22] | 0.60^ [0.33] | -0.30 [0.22] | -0.03 [0.39] |
| Constant | -1.03 [0.63] | -1.26 [1.22] | 0.86 [0.99] | -1.55 [0.96] |
| N | 244 | 83 | 73 | 88 |
| Chi2, overall model | 199.06 | 75.96 | 101.97 | 103.15 |
| Log likelihood | -302.88 | -104.65 | -74.66 | -103.13 |

Notes: Results derived from two-level random effects hierarchical linear regressions. Dependent variable is falls program implementation success. Robust standard errors reported in parentheses.

^p<0.01; *p<0.05; **p<0.01; ***p<0.001

**Appendix Table E.5 Relationship between manager affective commitment, normative commitment, continuance commitment, frontline worker support and organizational support to implementation success
Hierarchical regression with controls**

| Variables | (1) All nurse managers | (2) Senior manager | (3) Middle manager | (4) Assistant middle manager |
|--|------------------------------|--------------------------|--------------------------|---------------------------------------|
| Affective Commitment to Falls Program | 0.47*** [0.07] | 0.33** [0.13] | 0.40*** [0.11] | 0.67*** [0.13] |
| Normative Commitment to Falls Program | -0.03 [0.05] | 0.04 [0.09] | 0.04 [0.10] | -0.12 [0.08] |
| Continuance Commitment to Falls Program | 0.01 [0.04] | -0.01 [0.08] | 0.07 [0.07] | -0.02 [0.04] |
| Frontline worker support for Falls Program | 0.28*** [0.05] | 0.17^ [0.10] | 0.32*** [0.08] | 0.33*** [0.07] |
| Organizational support for Falls Program | 0.41*** [0.06] | 0.57*** [0.14] | 0.26* [0.11] | 0.36*** [0.08] |
| Age | 0.01** [0.00] | 0.01 [0.01] | 0.00 [0.01] | 0.01^ [0.01] |
| Female (male) | 0.23 [0.15] | 0.02 [0.28] | 0.44^ [0.23] | 0.12 [0.27] |
| Education (Less than Masters level) | -0.07 [0.10] | -0.23 [0.22] | -0.21 [0.17] | -0.14 [0.14] |
| Race (non-white) | 0.15 [0.13] | 0.14 [0.25] | -0.05 [0.24] | 0.06 [0.20] |
| Years of direct patient care | -0.00 [0.01] | -0.03** [0.01] | 0.00 [0.01] | 0.02* [0.01] |
| Years of administrative experience | -0.01^ [0.01] | -0.00 [0.01] | -0.02^ [0.01] | -0.01 [0.01] |
| Manager level | | | | |
| Mid-level manager | 0.33** [0.13] | | | |
| Low-level manager | 0.30* [0.14] | | | |
| Falls program length | 0.07* [0.03] | 0.04 [0.07] | 0.03 [0.06] | 0.15*** [0.04] |
| System A | 0.10 [0.16] | 0.39 [0.24] | -0.10 [0.19] | 0.01 [0.22] |
| System B | 0.07 [0.17] | 0.35 [0.30] | -0.07 [0.19] | 0.03 [0.21] |
| Constant | -2.33*** [0.53] | -1.32 [1.03] | -0.62 [0.94] | -2.79*** [0.74] |
| N | 227 | 81 | 67 | 79 |
| Chi2, overall model | 430.48 | 142.11 | 150.84 | 301.01 |
| Log likelihood | -233.06 | -88.25 | -57.07 | -67.07 |

Notes: Results derived from two-level random effects hierarchical linear regressions. Dependent variable is falls program implementation success. Robust standard errors reported in parentheses.

^p<0.01; *p<0.05; **p<0.01; ***p<0.001

**Appendix Table E.6 Relationship between manager affective commitment, normative commitment, continuance commitment and hospital-perceived implementation success
Ordinary least squares regression with no controls**

| Variables | (1) All nurse managers | (2) Senior manager | (3) Middle manager | (4) Assistant middle manager |
|---|------------------------------|--------------------------|--------------------------|---------------------------------------|
| Affective Commitment to Falls Program | 0.16*** [0.04] | 0.76*** [0.13] | 0.56*** [0.11] | 1.11*** [0.20] |
| Normative Commitment to Falls Program | 0.07* [0.03] | 0.16 [0.13] | 0.29* [0.12] | 0.05 [0.09] |
| Continuance Commitment to Falls Program | -0.05^ [0.03] | 0.07 [0.09] | 0.02 [0.09] | -0.02 [0.06] |
| Constant | 4.48*** [0.25] | -0.43 [0.74] | 0.45 [0.60] | -1.73^ [1.03] |
| N | 250 | 84 | 74 | 92 |
| R-squared | 0.51 | 0.40 | 0.52 | 0.43 |

Notes: Results derived from ordinary least squares regressions. Dependent variable is hospital-perceived falls program implementation success. Robust standard errors reported in parentheses.

^p<0.01; *p<0.05; **p<0.01; ***p<0.001

**Appendix Table E.7 Relationship between manager affective commitment, normative commitment, continuance commitment and implementation success
Ordinary least squares regression**

| Variables | (1) All nurse managers | (2) Senior manager | (3) Middle manager | (4) Assistant middle manager |
|---|------------------------------|--------------------------|--------------------------|---------------------------------------|
| Affective Commitment to Falls Program | 0.15*** [0.04] | 0.19** [0.07] | 0.08 [0.06] | 0.26** [0.09] |
| Normative Commitment to Falls Program | 0.06^ [0.03] | 0.03 [0.07] | 0.15** [0.05] | 0.00 [0.05] |
| Continuance Commitment to Falls Program | -0.05* [0.03] | -0.04 [0.05] | -0.13* [0.05] | -0.03 [0.04] |
| Age | 0.00 [0.00] | 0.01 [0.00] | -0.01 [0.01] | -0.00 [0.01] |
| Female (male) | 0.24* [0.09] | 0.40^ [0.22] | 0.06 [0.11] | 0.17 [0.18] |
| Education (Less than Masters level) | -0.01 [0.07] | -0.11 [0.16] | 0.19 [0.13] | -0.21^ [0.12] |
| Race (non-white) | 0.04 [0.10] | 0.08 [0.20] | 0.18 [0.22] | -0.16 [0.14] |
| Years of direct patient care | -0.00 [0.00] | -0.02* [0.01] | 0.00 [0.01] | 0.00 [0.01] |
| Years of administrative experience | -0.00 [0.00] | -0.01 [0.01] | 0.00 [0.01] | -0.01 [0.01] |
| Manager level | | | | |
| Mid-level manager | -0.09 [0.09] | | | |
| Low-level manager | -0.03 [0.10] | | | |
| Falls program length | 0.06** [0.02] | 0.04 [0.05] | 0.03 [0.04] | 0.11** [0.04] |
| System A | -0.08 [0.08] | 0.09 [0.11] | -0.09 [0.14] | -0.05 [0.16] |
| System B | 0.16 [0.07] | 0.30^ [0.16] | 0.21* [0.10] | 0.16 [0.14] |
| Constant | 4.32*** [0.35] | 4.03*** [0.63] | 4.35*** [0.71] | 4.06*** [0.55] |
| N | 244 | 83 | 73 | 88 |
| R-squared | 0.50 | 0.27 | 0.25 | 0.28 |

Notes: Results derived from ordinary least squares regressions. Dependent variable is hospital-perceived falls program implementation success. Robust standard errors reported in parentheses.

^p<0.01; *p<0.05; **p<0.01; ***p<0.001

**Appendix Table E.8 Relationship between manager affective commitment, normative commitment, continuance commitment, frontline worker support, and organizational support to implementation success
Ordinary least squares regression**

| Variables | (1) All nurse managers | (2) Senior manager | (3) Middle manager | (4) Assistant middle manager |
|--|------------------------------|--------------------------|--------------------------|---------------------------------------|
| Affective Commitment to Falls Program | 0.08 [0.05] | 0.14 [0.10] | 0.06 [0.07] | 0.09 [0.10] |
| Normative Commitment to Falls Program | 0.03 [0.03] | 0.01 [0.07] | 0.12^ [0.07] | -0.01 [0.06] |
| Continuance Commitment to Falls Program | -0.05^ [0.03] | -0.05 [0.06] | -0.12* [0.06] | -0.02 [0.04] |
| Frontline worker support for Falls Program | 0.12*** [0.03] | 0.06 [0.07] | 0.13* [0.05] | 0.13* [0.05] |
| Organizational support for Falls Program | 0.01 [0.04] | 0.05 [0.11] | -0.06 [0.08] | 0.05 [0.06] |
| Age | 0.00 [0.00] | 0.01 [0.00] | -0.01 [0.01] | -0.00 [0.01] |
| Female (male) | 0.24* [0.10] | 0.40^ [0.23] | 0.07 [0.13] | 0.24 [0.21] |
| Education (Less than Masters level) | -0.01 [0.07] | -0.11 [0.16] | 0.24^ [0.14] | -0.22^ [0.12] |
| Race (non-white) | 0.04 [0.10] | 0.09 [0.21] | 0.18 [0.21] | -0.18 [0.14] |
| Years of direct patient care | -0.00 [0.00] | -0.02* [0.01] | 0.01 [0.01] | 0.01 [0.01] |
| Years of administrative experience | -0.00 [0.00] | -0.01 [0.01] | 0.00 [0.01] | -0.01 [0.01] |
| Manager level | | | | |
| Mid-level manager | -0.13 [0.10] | | | |
| Low-level manager | -0.05 [0.10] | | | |
| Falls program length | 0.05* [0.02] | 0.02 [0.05] | 0.04 [0.04] | 0.10* [0.03] |
| System A | -0.07 [0.08] | 0.05 [0.14] | -0.05 [0.15] | -0.03 [0.17] |
| System B | 0.16* [0.07] | 0.24 [0.17] | 0.20^ [0.11] | 0.17 [0.15] |
| Constant | 4.24*** [0.36] | 4.03*** [0.67] | 4.25*** [0.78] | 4.13*** [0.56] |
| N | 227 | 81 | 67 | 79 |
| R-squared | 0.23 | 0.29 | 0.32 | 0.39 |

Notes: Results derived from ordinary least squares regressions. Dependent variable is hospital-perceived falls program implementation success. Robust standard errors reported in parentheses.

^p<0.01; *p<0.05; **p<0.01; ***p<0.001

Page intentionally left blank