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MOBILITY BOOST: A QUALITY IMPROVEMENT PROJECT TO BRIDGE A GAP IN CARE
FOR HOSPITALIZED ADULTS

DISSERTATION

A dissertation submitted in partial fulfillment of
the requirements for the Degree of Doctor of Philosophy in the
College of Health Sciences
at the University of Kentucky

By

Audrey M. Johnson

Lexington, Kentucky

Co-Directors: Dr. Esther Dupont-Versteegden, Professor of Physical Therapy

And Dr. Dana Howell, Professor of Occupational Therapy

Lexington, Kentucky

2017

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ABSTRACT

MOBILITY BOOST: A QUALITY IMPROVEMENT PROJECT TO BRIDGE A GAP IN CARE FOR HOSPITALIZED ADULTS

Early mobility quality improvement (QI) projects are leading the charge to shift the prevailing culture in acute care from a culture of immobility to a culture of mobility. Low mobility and hospital acquired functional decline is a persistent problem, especially for older adults, often leading to increased post acute care costs, increased risk of hospital readmission and increased mortality. Transition of care programs designed to improve care transitions and prevent hospital readmission exist but fail to include rehabilitation professionals or to adequately consider patient functional status during hospitalization. The goal of this research was to implement and evaluate an early mobility quality improvement (QI) project that added a physical therapist and mobility technician to an existing transition of care program (Project BOOST) to increase adult patients mobility and level of physical activity during hospitalization, using both quantitative and qualitative methods. The project was implemented from August 2, 2016 to February 4, 2017. A physical therapist rounded with one of two Project BOOST teams to promote increased patient mobility performed with a mobility technician daily. The physical therapist also recommended rehabilitation consultations (physical and occupational therapy) for appropriate patients. The AM-PAC "6 Clicks" Basic Mobility Short Form was used to set mobility tier levels for intervention group patients. Quantitative evaluation used observed hospital length of stay, 30 day same hospital all-cause readmission, and change in AM-PAC score from admission to discharge as outcome measures. Results showed that observed hospital length of stay decreased 0.9 days in the intervention group and 30 day same hospital all-cause readmission decreased 4.8%. Bivariate analysis of patient observed hospital length of stay was statistically significant for intervention group patients ($p=0.07$) but failed to reach statistical significance for same hospital readmission in intervention group patients ($p=0.18$). Qualitative evaluation used a phenomenological lens to explore the context of the early mobility quality improvement project and shared experience of patients and staff members exposed to more mobility and higher levels of activity during hospitalization. Twelve participants were interviewed during implementation of the project including four patients and eight staff members (physicians, nurses and a mobility technician). One overarching theme and four supporting themes were found from the data. The essential meaning was that mobility bridged a gap in care. Staff understood the benefits of early mobility for patients. Patients expressed how

important mobility was for their discharge and quality of life. Patients with greater functional independence and higher mobility level reduced nursing burden of care. When patients were consistently presented with opportunities to be mobile and active during acute illness, they expected mobility to be a part of their daily care plan. This comprehensive evaluation of an early mobility quality improvement project found the intervention bridged a gap in care for patients. Adding a physical therapist to the Project BOOST team and promoting patient mobility during hospitalization resulted in improved patient outcomes. Early mobility quality improvement projects have the potential to transform clinical practice and improve quality of care.

KEYWORDS: Quality Improvement, Physical Therapy, Mobility, Acute Care, Project BOOST

Audrey M. Johnson

December 7, 2017

Date

MOBILITY BOOST: A QUALITY IMPROVEMENT PROJECT TO BRIDGE A GAP IN CARE
FOR HOSPITALIZED ADULTS

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CHAPTER ONE: INTRODUCTION

Physical therapists who work in acute care are likely to confirm the existence of a persistent and typical patient scenario: An older adult patient living independently at home and managing activities of daily living (ADLs) such as dressing, bathing, or walking household distances without assistance is admitted to the hospital for a general medical problem. During the hospitalization, the patient's mobility and physical activity are likely to be negatively influenced by traditional care processes and the medical environment. For example, the patient may receive a risk assessment indicating high risk of falls or may be confined to the bed with a recommendation for bedrest. Or the patient may experience altered mental status and/or delirium from changes in medications and the unfamiliar environment. The patient may experience poor appetite, dehydration or decreased intake by mouth from a lack of access to fluids or snacks during hospitalization; unmet food preferences or lack of necessary dentures; impaired sleep from frequent noise and disruptions, orthostatic hypotension related to immobility (due to the fall risk label), or generalized weakness from the acute illness mixed with immobility. These traditional care processes combined with environmental influence may lead to low or no mobilization or reduced level of physical activity during hospitalization.

As a result of hospitalization, the patient now presents with generalized extremity weakness, impaired joint range of motion (ROM) to perform ADLs, decreased safety with walking without assistance or an assistive device to prevent falls and impaired balance for standing and dynamic tasks at home. A physical therapy consult reveals the patient is currently unable to safely return home alone.

The recommendation made by the physical therapist is continued rehabilitation in a subacute care or rehabilitation facility.

To summarize, a previously independent older adult walked into the acute care environment and discharged to a post-acute care facility instead of home. Hospitalization and traditional care processes directly related to low mobility in this patient population result in dramatic declines in function¹ and poor prognosis for functional recovery.^{2,3} Changing clinical practice to support mobility and physical activity (including performing ADLs) and embracing new models of care for older adult patients during acute illness is key to solving this persistent problem.

Definitions and Abbreviation of Terms

Term	Definition
Activities of daily living (ADLs)	Typically refers to more simple self-care tasks such as bathing, feeding, toileting, and transfers ⁴
Case Management	Case management blends traditional clinical nursing knowledge with knowledge of quality clinical outcomes, healthcare reimbursement, and cost-containment efforts, and steps toward resource management through care facilitation and clinical best practices ⁵
Discharge planning	The development of an individualized plan for each patient who is leaving the hospital that ensures provision of organized post acute services ^{6,7}
Functional decline	The decrement in physical and/or cognitive functioning that occurs when a person is unable to engage in ADLs ⁸
Hospital Acquired Functional Decline	Functional decline developing between the onset of acute illness and discharge from the hospital ⁹
Hospital Associated Disability	Term more frequently used in medical and nursing literature, meaning a patient has experienced new functional impairment not present on hospital admission ¹⁰ or the loss of ability to complete one of the basic ADLs needed to live independently without assistance: bathing, dressing, rising from a bed or chair, using the toilet, eating or walking across a room ⁹

MD4	Internal Medicine Team 4, intervention group, Project BOOST team with physical therapist involved in rounding and making recommendations on mobility and/or physical activity
MD5	Internal Medicine Team 5, comparison group, Project BOOST team without a physical therapist involved in rounding or making recommendations on mobility and/or physical activity
Mobility Technician or Mobility Tech	A rehabilitation mobility technician trained by the University of Kentucky HealthCare Rehabilitation Department to assist patients in performing the highest level of mobility each day during hospitalization based on the recommendation of the PT. The mobility tech was supervised by nursing staff on the unit when assisting patients with mobility sessions each day but was lead by the PT.
Mobility Tier level	One of three levels of mobility or physical activity recommended by the physical therapist.
	Tier 1 (in bed only): range of motion (ROM) to upper extremities and/or lower extremities in the bed, movement in the bed (rolling, supine to/from sit, sitting edge of bed)
	Tier 2 (in room only): ROM of upper extremities and/or lower extremities in sitting or standing position, transfers from the bed to a chair (bedside chair, bedside commode, wheelchair, etc.), ambulation or wheeling in the room *Includes Tier 1
	Tier 3 (outside of the room): ambulation or wheeling in the hallway, standing upper extremity and lower extremity ROM, and stairs, if appropriate *Includes Tiers 1 & 2
Older Adult	Person age 65 and older ¹¹ http://www.who.int/healthinfo/survey/ageingdefnolder/en/index.html
Physical Therapist (PT)	Physical therapists are health care professionals who help individuals maintain, restore and improve movement, activity and functioning thereby enabling optimal functional performance and enhancing health, well being, and quality of life ¹² http://guidetoptpractice.apta.org/content/1/SEC1.body
	Using this expertise, the physical therapist focused on MD4 patient functional status during the entire admission. The PT rounded with the MD4 Project BOOST Team to track patient's

	function status from admission to discharge (using AM-PAC “6 Clicks”), recommend appropriate mobility and physical activity Tier levels for each patient with the goal of patients’ achieving and progressing to the highest level of mobility each day during hospitalization.
Physician extender	As used in KRS 216.375 and 216.380, a “physician extender” means an advanced practice registered nurse, or a physician assistant. http://www.lrc.ky.gov/Statutes/statute.aspx?id=9033
Postacute Care (PAC) Services	Postacute care includes rehabilitation or palliative services that beneficiaries receive after, or in some cases instead of, a stay in an acute care hospital. http://www.medpac.gov/-research-areas-/post-acute-care
Project BOOST®	BOOST stands for Better Outcomes by Optimizing Safe Transitions (BOOST), program supported by the Society for Hospital Medicine designed to improve hospital discharge care transitions http://www.hospitalmedicine.org/Web/Quality_Innovation/Implementation_Toolkits/Project_BOOST/Web/Quality_Innovation/Implementation_Toolkit/Boost/Overview.aspx
Readmission or 30 day hospital readmission	According to the Center for Medicare and Medicaid Services (CMS), an unplanned readmission to an acute care hospital in the 30 days after discharge from a hospitalization. Patients may have had an unplanned readmission for any reason. https://www.medicare.gov/hospitalcompare/Data/30-day-measures.html
SBAR form	Form used by the physical therapist to provide information regarding patient’s name, diagnosis, recommended Tier level and any precautions or contraindications to consider/follow. The mobility tech used the form to track the number of sessions with each patient and allowed for continuity of mobility sessions if primary MT was off work. SBAR stands for Situation, Background, Assessment and Recommendation. SBAR Is a valuable tool or situational briefing model used in medical communication, to promote effective communication and teamwork, borrowed from extensive study of aviation safety standards. ¹³
Subacute Care and Rehabilitation	According to the American Health Care Association (AHCA), Subacute care is a comprehensive inpatient program designed for the individual who has had an acute event as a result of an illness, injury, or exacerbation of a disease process; has a determined course of treatment;...The severity of the individual’s condition requires an outcome-focused interdisciplinary approach utilizing a professional team to

	deliver complex clinical interventions (medical and/or rehabilitation). ¹⁴
Structured Interdisciplinary Bedside Rounding (SIDR)	SIDR combines a structured format for communication and a forum for regular interdisciplinary meetings. Original publications on SIDR have used a specific tool communication tool focused on overall plan of care, discharge plans and patient safety. ^{15,16}
Teach Back patient education	Teach Back is a patient-centered communication and education style that is based on the premise that providers contribute significantly to patient miscommunication despite making every effort to be as clear as possible. http://www.hospitalmedicine.org/Web/Quality_Innovation/Implementation_Toolkits/Project_BOOST/Web/Quality_Innovation/Implementation_Toolkit/Boost/BOOST_Intervention/Tools/Teach_Back.aspx
UK Good Samaritan 7 th floor unit	30 bed general medicine unit at the University of Kentucky Good Samaritan hospital
Quality Improvement (QI)	Quality Improvement (QI) consists of systematic and continuous actions that lead to measurable improvement in health care services and the health status of targeted patient groups. A QI program involves systematic activities that are organized and implemented by an organization to monitor, assess, and improve its quality of health care. https://www.hrsa.gov/quality/toolbox/methodology/qualityimprovement/ ¹⁷

Background and Need

For older adults especially, hospitalization is a significant independent predictor of adverse outcome, such as decline in activities of daily living (ADLs), new institutionalization or death.¹⁸ All older adult (age 65 or older)¹¹ patients, even those independent with ADLs at admission, are at risk for functional decline during hospitalization.⁹ One third of older adults admitted to the hospital experience functional decline unrelated to the primary diagnosis.¹⁹ Functional decline is defined as the decrement in physical and/or cognitive functioning that occurs when a person is unable to engage in ADLs.⁸ Functional decline encountered during

hospitalization is referred to as hospital-acquired functional decline, developing between the onset of acute illness and discharge from the hospital.⁹ Hospital-acquired functional decline has been strongly associated with low mobility in persons ≥ 65 years old. The impact of low mobility or immobility during the hospitalization, when combined with other physiologic processes of aging, increases risk for functional decline in patients ≥ 65 years.²⁰ Negative consequences of low mobility begins as early as the second day of admission in adult patients ≥ 70 years old.²¹

Contemporary research confirms that all adult inpatients, regardless of age, experience low mobility during the acute care hospital stay.²² During observation of patients of all ages during acute hospitalization, patients spent over 50% of the time in bed, 33% of the time in a chair, and less than 10% of the time standing, walking or wheeling. There was no significant difference between older (>65 years old) and younger patients (<65 years old).²² Similar observations performed in adults ≥ 65 years found that patients spent 17hr/day in bed, 5.1hr/day in a chair and 1.1hr/day standing or walking.²³

The impact of low mobility during hospitalization and hospital-acquired functional decline has far reaching implications. Hospitalization is associated with increased risk for developing new and worsening disability in the older adult population regardless of physical frailty.¹ Illnesses and injuries resulting in hospitalizations for older adult patients precipitate disability, delay recovery from disability or result in the inability to return to pre-morbid baseline ADL function.^{3,24}

Level of mobility has been inversely correlated with the rate of adverse patient outcomes and remained unchanged when controlling for covariates (age, preadmission ADL impairment, etc.).^{18,25} In addition to decreasing risk of adverse patient outcomes, higher levels of mobility have been associated with shorter hospital length of stay (LOS).²⁵ In 2011, Fisher et al²⁶ found that patients with shorter hospital LOS were more likely to take a higher number of steps on the first complete hospital day and increased their steps from first hospital day to second hospital day, measured by accelerometer. Mobility interventions and mobility programs in hospitalized older adults have the potential to promote optimal patient outcomes, decrease hospital costs and decrease need for post acute care services.

The cost associated with hospital acquired functional decline may be difficult to quantify but is most likely related to iatrogenic complications, increased LOS and the need for post acute care services. The total cost of medical and long-term care for older adults with new dependency is estimated at \$26 billion dollars per year.²⁷ Post acute care (PAC) accounts for 17% of Medicare fee for service spending with roughly 40% of beneficiaries discharging from prospective payment system hospitals requiring PAC services.²⁸ Before the advent of diagnosis related groups (DRG) and a redirection of focus to patients on post procedural care pathways or with the potential for quicker discharge, allied health staff managed the recovery of patients who required greater time or support for recovery.²⁸ After this shift in priorities, less attention has been paid to maintenance of function among slowly improving patients in particular, which contributes to their increased requirements for PAC services.²⁸ The magnitude of hospital acquired functional decline, frequently

called hospital acquired disability by physicians and nurses in the literature,^{9,10,28} is overwhelming for any acute care clinician to consider, yet few concerted efforts have been made to address the forces that promote decline, including patient function or mobility level during hospitalization.^{19,28}

Existing programs for hospitalized older adults

Solutions to the problem of low mobility and prevention of hospital acquired functional decline have been described in the literature, yet the problem continues. Geriatric inpatient units, also known as acute care of elder (ACE) units, geriatric inpatient rehabilitation or geriatric evaluation and management (GEM) units, geriatric inpatient consultation, Hospital at Home (HAH), the Hospital Elder Life Program (HELP) and the Nurses Improving Care for Healthsystem Elders (NICHE) program are all interventions developed to reduce the incidence of hospital associated disability.⁹ The financial constraints of specialized units limit the generalizability of the ACE unit model in acute care, despite the overwhelming evidence of the model's success related to hospital length of stay and patient and staff satisfaction.²⁹⁻³² Regarding mobilization for hospitalized adults, including older adults, there are multiple reviews of the literature describing the safety and feasibility of mobility³³ in a variety of acute inpatient populations as well as benefits of standardized or progressive protocols using nursing or physical therapy.³⁴ Other literature reviews have concluded that even organizations benefit from mobilization programs at hospitals.³⁵ Organizational benefits include reduced costs, shorter patient LOS and in some select populations, decreased patient mortality.³⁵ Execution of these programs to increase mobility or prevent hospital acquired functional

decline is not wide spread or has not been operationalized. The greatest success in preventing hospital acquired functional decline has been found in programs using multidisciplinary teams as opposed to relying on physical therapy, occupational therapy and geriatric specialists consultations in isolation.⁹

Integration of all the professions required to address the patient's needs are the foundation of successful programs such as ACE and GEM units.⁹ ACE unit components and interventions include medical review (interventions directed to minimize effects of medical interventions that limit functioning), early physical and occupational therapy focused on rehabilitating functional abilities, early discharge planning (interventions addressing the patient's discharge needs), prepared environment (environmental modifications to promote patient function) and patient-centered care (nursing care directed aimed to prevent decline in physical, cognitive and psychosocial status).³⁶ Daily rounding with the team of professionals from each profession (physician and nursing leaders, primary nurse, social worker, nutritionist, physical therapist, other therapists and a visiting nurse liaison) allows the team to achieve patient-centered care on the unit.³⁰

GEM units typically admit patients after acute medical issues have been stabilized but provide a model that can be used in the acute care environment.³⁷ Much like ACE units, GEM units rely on a multidisciplinary team approach and comprehensive geriatric assessment for select older patients identified to benefit from rehabilitation.^{9,37} In the meta-analysis by Bachman et al,³⁷ which included eight facilities with separate geriatric acute care units plus five facilities with combined acute and post-acute geriatric units and separate rehabilitation hospitals, GEM units

increased the likelihood of functional improvement at discharge and decreased the need for nursing home care post admission. Compared to ACE and GEM unit comprehensive multidisciplinary care, or what is now more frequently considered interprofessional collaborative practice, consultative inpatient geriatric assessments have not demonstrated the same effect on outcomes during acute geriatric care.^{9,38}

Interprofessional Collaborative Practice

Interprofessional collaborative practice occurs when multiple health workers from different professional backgrounds work together with patients, families, caregivers, and communities to deliver the highest quality care.³⁹ ACE and GEM units use interprofessional collaborative practice to achieve improved outcomes for older adults during acute and post acute care. But equally as important as interprofessional collaborative care, the authors Covinsky, Pierluissi and Johnston⁹ argued that “clinicians should view functional status over the course of hospitalization as a vital sign that can help guide care and serve as a key guidepost of clinical wellbeing (pg.1788).”⁹ They suggested that functional status in this patient population fluctuates from onset of acute illness, hospitalization and discharge. This fluctuation serves as an effective prognostic tool that can predict mortality and other health outcomes during and post hospitalization.⁹ The members of the healthcare team most appropriate and extensively trained to observe these fluctuations in functional status during hospitalization are physical and occupational therapists.⁹ Interprofessional collaborative practice that includes physical and/or occupational therapists as members of the healthcare team can help physicians and nurses monitor patient physical function more closely.

“Physical therapists are health care professionals who help individuals maintain, restore and improve movement, activity and functioning, thereby enabling optimal performance and enhancing health, well-being and quality of life,” according to the *Guide to Physical Therapist Practice* version 3.0.¹² Services provided by physical therapists prevent, eliminate or minimize impairments of body functions and structures, activity limitations and participation restrictions for clients.¹² For this reason, physical therapists have the expertise to continually assess functional status of older adults from admission to discharge, as proposed by Covinsky, Pierluissi and Johnston.⁹ In addition to clinical expertise, tools to assess and track functional status and level of activity during the hospitalization exist for physical therapists to provide objective data less susceptible to variability, error and bias.⁴⁰

Tools to assess functional status

The Activity Measure for Post Acute Care (AM-PAC) “6 Clicks” Basic Mobility Short Form has been found valid and reliable for use in the acute care environment to assess and track patient functional status.^{40,41} (See Appendix A.) The internal consistency reliability of the basic mobility items in a population of patients with a wide variety of medical and surgical conditions in acute care was found to be 0.957.⁴⁰ The items selected for the Basic Mobility Short Form relate to patients capacity for functional activities in an acute care setting commonly assessed by physical and occupational therapists.⁴⁰ These items also represent functional activities of interest to post acute rehabilitation providers screening patients for admission. Scores near discharge have a strong correlation ($r=0.69$) with the Functional Independence Measure (FIM) motor subscore used exclusively in the

acute inpatient rehabilitation setting.⁴² Each item/question is scored on one of four levels based on the amount of difficulty or the amount of help from another person needed to complete the task.⁴⁰

To assess and track patient mobility and level of activity during hospitalization, the Johns Hopkins Highest Level of Mobility (JH-HLM) Scale can be used to quantify mobility level.⁴³ (See Appendix B.) The JH-HLM uses an eight point ordinal scale from bedrest (score=1) to ambulation greater than or equal to 250 feet (score=8). Reliability and validity data on the JH-HLM Scale is not available at this time, as researchers at Johns Hopkins University are currently testing the psychometrics.⁴⁴ The JH-HLM Scale was developed using interprofessional input and can be used to record the mobility that a hospitalized patient performs during a shift, not what the patient is capable of performing. This documentation is based on observation and should reflect the highest level of mobility the patient achieves since the last documentation.⁴⁴ The authors recommend JH-HLM documentation twice daily during waking hours on all hospitalized patients. The scale provides a standardized, measurement of patient mobility across professions, allows for individual patient mobility goal setting during hospitalization, and can serve as a performance measure for quality improvement projects aimed at promoting patient mobility.^{44,45} At Johns Hopkins University, the JH-HLM has been used in documentation by nursing staff and in unit-based care-coordination meetings including nurses, physicians, and social workers.⁴³ The Armstrong Institute for Patient Safety and Quality has used the JH-HLM as part of a project to improve the ICU patient experience: the scale is used to set mobility goals and track patient

progress.⁴⁶ Neither the AM-PAC nor the JH-HLM are well known to other healthcare professionals or outside of the facilities where they have been developed and studied.

The physical therapist's role

Armed with tools to assess and track patient functional status during hospitalization, physical therapists are prepared to advance their efforts in the acute care environment. Yet, the current driver of acute hospital care is the physician. Physicians consult physical therapy if and when they determine a patient may benefit from the service, or when patients in the hospital have discharge planning needs identified by a case manager, social worker or other interprofessional team member. Physical therapists working in the acute care environment play a significant role in discharge planning, the development of an individualized plan for each patient who is leaving the hospital that ensures provision of organized post acute services.^{6,7} Evidence shows that physical therapists make accurate and appropriate discharge recommendations for acutely ill patients. When physical therapists' discharge recommendations are followed, patients are less likely to experience readmission to the hospital.⁷

Hospital readmission and patient functional status

Hospital readmission has become a costly problem in the United States (U.S.) with one in five Medicare beneficiaries readmitted within 30 days at a cost of more than 26 billion dollars per year.⁴⁷ The U.S. government has made reduction of hospital readmission a priority using reimbursement penalties against hospitals with higher than expected readmission rates.^{47,48} Readmission for older adults

appears to be closely connected to functional status and level of independence. One study found that 15.5% of Medicare patients are readmitted within 30 days and patients with greater ADL impairment are more at risk: 18.2% of readmitted patients were dependent in three or more ADLs and 14.3% had difficulty with one or more ADLs.⁴⁹ Yet, in a systematic review and meta-analysis of randomized trials to prevent 30-day hospital readmission,⁴⁷ only two trials involved exercise⁵⁰ or rehabilitation interventions⁵¹ for older adults. Leppin et al.⁴⁷ found that effective interventions to reduce or prevent readmission were complex and must support patient capacity for self-care.

Adverse events after discharge from the hospital have led to more frequent emergency visits and redmission.^{52,53} Recent financial penalties for higher readmission rates and increased interest from policymakers to improve quality has led to interventions to decrease hospital utilization after discharge.^{54,55} The Project RED (Re-engineered Discharge) program used multiple methods to advance post hospital outcomes resulting in reduced hospital utilization (emergency visits and readmission), increased primary care provider post discharge follow up and improved patient preparation for discharge.⁵² Interventions included intensified patient education, discharge planning and medication reconciliation, improved discharge instructions, and long-term patient contact using phone calls and trained nursing discharge advocates.^{52,56} Yet, the program was exclusively tested in a single academic medical center.⁵²

Interventions with many components and interventions involving more individuals in care delivery have been found to be more effective than other

interventions.⁴⁷ Many randomized trials tested interventions in both inpatient and outpatient settings with the most common interventions including case management, patient education, home visits, and self-management support.⁴⁷ Another targeted program has had success when implemented in a larger number of facilities but fails to include a component to assess patient functional status or promote patient capacity for self-care.⁵⁶

Project BOOST

Project BOOST (Better Outcomes by Optimizing Safe Transitions) is a transition of care program promoted by the Society of Hospital Medicine, designed to control costs and improve patient outcomes.⁵⁶ Some hallmarks of the Project BOOST intervention include structured interdisciplinary bedside rounding and patient education using Teach Back methods.^{16,56} Eleven facilities using Project BOOST interventions combined with external quality improvement mentorship have seen an absolute 2% reduction in readmission rates compared to control units.⁵⁶ Typical members of the rounding team include a primary care physician, nurse case manager, pharmacist and bedside nurse. Missing from the BOOST team are functional experts who serve to increase patient capacity for self-care after hospital discharge.

Expanding the Physical Therapist's role

Expanding and redefining physical therapists' professional or team role in acute care, beyond only discharge planning and post operative care pathways, could be the agent of change needed to meet the specific needs of older adults during hospitalization. As a member of an interprofessional team, a physical therapist is

uniquely qualified to promote mobility and physical activity. Physical therapists may identify additional methods to minimize the effects of hospital processes and complications that impair functional recovery and discharge planning in older adults.⁹ With evidence mounting to support mobilization for adults during hospitalization, even those patients experiencing critical illness, physical therapists need to intensify their efforts to promote higher levels of activity, self-care, and independence. Expanding physical therapists' role in acute care requires the profession to overcome the access barrier created by the consultative model. A physical therapist becomes involved in a patient's care based on the recommendation of a healthcare provider with less education and training specific to physical function (typically a nurse case manager or a physician/physician extender). If physical therapists, who have expertise in function, were given increased access to patients in the acute care environment through interprofessional collaborative practice and new models of care we could further prevent hospital acquired functional decline, hospital readmission and the negative trajectory post discharge.

Statement of the Problem

Hospitalized older adults presenting with functional decline from acute illness or at risk for developing functional decline during acute hospitalization experience low mobility and their functional status is not adequately tracked and managed during traditional acute care processes. This low mobility and hospital acquired functional decline leads to poor prognosis for functional recovery,^{2,3} increased post acute care costs,²⁷ increased risk of hospital readmission⁴⁹ and increased mortality.¹⁸

Interventions to address low mobility during hospitalization exist at a small number of facilities using QI projects.^{43,57-59} However, these interventions occur in isolation and have yet to be operationalized. Transition of care programs and projects to prevent hospital readmissions occur more frequently and are more wide spread but fail to include physical therapists or regularly consider the functional status of patients.

Significance

This QI project is significant and unique for several reasons. First, this is the only example to our knowledge of a physical therapist being included in an interprofessional care transition program in the acute care environment. Attempts to survey whether physical therapists or any other rehabilitation professionals have been formally or informally involved in Project BOOST programs nationwide proved fruitless. There was no evidence of physical therapist involvement in Project BOOST of the 235 current or past hospital sites. Second, functional status of patients is frequently under reported or not reported at all during hospitalization or admission evaluation.⁹ More than fifty percent of major functional limitations were not documented in the medical chart in a single study.⁶⁰ Tracking functional status of all general medicine patients from admission to discharge is necessary and important. It ensures a functional expert is involved in patient care from the beginning, whether the patient is in need of skilled rehabilitation interventions or simply needs maintenance of their current functional status to prevent functional decline. Finally, if physical therapist involvement in care transition programs is effective and results in improved patient outcomes, physical therapists will have additional evidence

needed to advocate for change in acute care clinical practice. Physical therapists are willing to lead the charge from a culture of immobility to a culture of mobility.

Study Purpose

The purpose of this study is to comprehensively evaluate a QI project that added a physical therapist to an existing interprofessional team and promoted increased mobility and level of activity in general medicine adult inpatients. Project BOOST, a program supported by the Society for Hospital Medicine and designed to improve transitions of care after discharge from the hospital, was the interprofessional team chosen for this QI project. A mixed methods embedded case study approach was used to assess both quantitative results and qualitative findings of the study.

Hypothesis: More consistent and effective tracking and promotion of patient functional status, mobility and level of activity by a physical therapist to prevent or manage functional decline in the acute care environment will result in better patient outcomes (hospital LOS, 30 day, same hospital all-cause readmission rate and incidence of falls and hospital acquired pressure incidence (HAPIs)).

Research Questions

This study proposes to answer the following questions:

Mixed Method Question: What is the impact of adding a physical therapist and mobility technician to an existing interprofessional care transition team on patient outcomes and the patient/staff experience of increased mobility and level of activity during hospitalization?

Quantitative Research Questions:

Qt1 Is there a change in patient frequency of out of bed mobility (increase)?

Qt2 Is there a change in hospital length of stay in patients exposed to the intervention (decrease)?

Qt3 Is there a change in frequency of hospital readmission in patients exposed to the intervention (decrease)?

Qt4 What is the change in AM-PAC “6-Clicks” Basic Mobility Short Form scores from admission to discharge?

Qt6 Is there a change in the incidence of patient falls and the incidence of hospital acquired pressure injuries (HAPIs) (decrease)?

Qt7 Did adding a physical therapist to the Project BOOST change the frequency of PT consultations recommended for MD4 patients?

Qualitative Research Questions:

Grand Question: What is the experience of patients, their family members, and hospital staff related to increased patient mobility and level of physical activity during the implementation of a mobility quality improvement project for general medicine inpatients?

Qualitative Subquestions:

Ql1 How do those involved in the early mobilization program describe their experience?

Ql2 What are the strengths and barriers of the program?

Q13 How do the perspectives differ between patients and staff, and how are they similar?

Q14 How does the context impact the mobility program?

Q15 How does the culture impact the program?

Limitations

There are several limitations of this study. The QI project took place in a dynamic clinical environment; thus, we were unable to control for unit-based or hospital wide changes that occurred during the study period. There were many changes during the mobility QI project study time period: a major change in how isolation precautions were addressed hospital wide occurred, several new internal medicine physicians joined UK Healthcare and Project BOOST teams and the case manager for the MD4 intervention team changed in November 2016. In addition, social issues related to patient discharge from the hospital were out of control of the Project BOOST team and our mobility QI project; for example, when a patient did not have a ride home to Eastern Kentucky until 3 days after being cleared for discharge or when patients were waiting for bed availability at the next environment of care. However, this limitation was likely consistent for both MD4 and MD5. Our qualitative research had the potential for bias simply due to the fact that the PI served as the Project BOOST physical therapist for the intervention group and interviewed all participants. The PI maintained a reflexive journal during all stages of the design, implementation and analysis of the mobility QI project to bracket personal bias or influence.

Summary

Functional decline from acute illness and low mobility during hospitalization is a persistent problem and impacts patient outcomes, especially for older adults. Hospitals fail to adequately track or manage patient functional status concurrent with traditional acute care processes. QI projects designed to improve patient mobility and functional status show promise but have yet to be operationalized. Meanwhile, transition of care programs and projects to prevent hospital readmission are wide spread yet do not include experts in physical function, physical therapists, or consider interventions to increase patient capacity for self-care and function. A mixed methods embedded case study approach was used to assess both quantitative results and qualitative findings of an early mobility QI project that added a physical therapist and mobility technician to an existing transition of care program for general medicine patients.

Organization of Dissertation

This dissertation is organized by the literature review performed and the publications developed from the results and findings. Chapter 2 provides a review of the literature on other mobility QI projects implemented and the opinion of the PI, which served as motivation to design and execute this particular dissertation project. Chapter 3 provides the quantitative results of this mixed methods dissertation project and Chapter 4 provides the qualitative findings. Chapter 5 discusses the integration of these mixed methods, draws conclusions from the project, and provides future directions of this research.

CHAPTER TWO: LITERATURE REVIEW

Physical therapists know function: an opinion on mobility and level of activity during hospitalization for adult inpatients

Introduction:

All adult inpatients, regardless of age, experience low mobility during the acute care hospital stay.²² Observation studies show that during acute hospitalization, patients of all ages spend over 50% of the time in bed, 33% of the time in a chair, and less than 10% of the time standing, walking or wheeling.²² Adults ≥ 65 years were found to spend 17 hours per day in bed, 5.1 hours per day in a chair and 1.1 hours per day standing or walking.²³ The impact of low mobility during hospitalization, which is associated with hospital-acquired functional decline, has far reaching implications, especially for older adult patients (age 65 or older)¹¹ who make up the one third of acute hospital admissions.⁶¹

All older adult patients, even those independent with ADLs at admission, are at risk for functional decline during hospitalization, with one third experiencing decline unrelated to the primary diagnosis.^{9,19} Functional decline is defined as the decrement in physical and/or cognitive functioning that occurs when a person is unable to engage in ADLs.⁸ The impact of low mobility or immobility during the hospitalization, when combined with other physiologic processes of aging, increases risk for functional decline in patients ≥ 65 years.²⁰ Negative consequences of low mobility begins as early as the second day of admission in adult patients ≥ 70 years of age.²¹

Previous models examining mobility during hospitalization and adverse outcomes (new institutionalization, death or new institutionalization) found consistently strong and statistically significant effects. Level of mobility was inversely correlated with the rate of each adverse outcome and remained unchanged when controlling for covariates (age, preadmission ADL impairment, etc.).^{18,25} In addition to decreasing risk of adverse patient outcomes, higher levels of mobility have been associated with shorter hospital length of stay (LOS).²⁵ In 2011, Fisher et al²⁶ found that patients with shorter hospital LOS were more likely to take a higher number of steps on the first complete hospital day and increase their steps on the second. However, there is an “inherent tension” (pg. 759) between fall prevention and promoting mobility.⁶² Current methods to track falls in the hospital have created staff disincentive to mobilizing patients due to the risk of litigation and institutional cultures driven to avoid any financial penalties.⁶² This may explain why implementation and operationalization of mobility interventions for hospitalized older adults have been slow.

Providing care for hospitalized older adults is a complex process requiring an approach to clinical reasoning accounting for the normal process of aging in a complicated environment.⁶³ Failure to recognize this complexity means that staff productivity expectations for mobility may be unrealistic. Professional staff perceives two key factors, time and efficiency, as limiting their ability to provide care for older adults who frequently require additional time for clinical tasks. Priorities in hospitals are typically organized on an imposed time frame thus placing older adults at a disadvantage.⁶³ Focusing on only the acute illness that leads to

hospitalization is another factor in lack of implementation of mobility interventions. More importantly, as all healthcare professionals look to future changes, hospitalists and primary care physicians must be prepared for the Medicare Access and CHIP reauthorization Act of 2015 (MACRA). MACRA continues to shift Medicare reimbursement away from volume-based reimbursements to a value-based payment system.⁶⁴ Physicians will increasingly have financial responsibility for the overall health of patients rather than bearing responsibility for a single episode of care.

Interventions that encourage out of bed mobility while still attending to the risk of falls in older adults are necessary to address the under recognized problem of low mobility during hospitalization.⁶⁵ There is a growing body of literature establishing the safety and feasibility of mobilizing adult inpatients including critically ill patients.³³ Evidence supporting standardized, early mobility protocols and progressions during hospitalization for adult patients exists and the benefits include reduced hospital LOS, improved patient function and fewer post operative complications.³⁴ Additional literature outlines the social, psychological and organizational advantages in patients such as improved quality of life, decreased depression and anxiety, increased patient comfort and satisfaction and reduced hospital costs.³⁵ There are two possible paths for adult patients during hospitalization. One path includes continuing current clinical practice with variable levels of mobility and physical activity, increased risk of functional decline, greater ADL dependence, higher post acute care costs and ultimately a different patient following up with their primary care provider. The other path prioritizes patient

functional status by promoting mobility and increased activity levels, which teaches the patient to value their functional health and independence, placing the patient on a trajectory of higher activity levels after discharge. Inherently acute care health professionals recognize that mobility for hospitalized adults aligns with value-based care for patients and for hospitals. Increased mobility and higher levels of activity of adult inpatients aligns with the Quadruple Aim of healthcare: improved quality of care, improved patient experience of care and decreased per capita cost, along with improved health care provider satisfaction.⁶⁶

The question becomes how to implement mobility best practice in the hospitalized adult patient population more consistently and efficiently. Quality improvement mobility projects show promise. This narrative review of literature aims to demonstrate the value of quality improvement projects that shift the prevailing culture of immobility in hospitals to a culture of mobility. The purpose is for primary care physicians and hospitalists to recognize an opportunity to implement change with the potential for meaningful impact on post acute care. Physical therapists, who are uniquely qualified and ready for increased accountability, can join colleagues and interprofessional team members to implement and operationalize low cost solutions to the persistent low mobility problem. Seizing the opportunity to collaboratively develop guidelines and/or physical activity goals for hospitalized adults with interprofessional team members should be an immediate priority for hospital leaders.

The Value of Quality Improvement Projects to Support Mobility Best Practice

Randomized controlled trials (RCTs) have historically been considered the gold standard in evaluation of effectiveness of healthcare.⁶⁷ The alternative argument to this widely held belief is to recognize that RCTs provide an indication of the minimum effect of an intervention while observational studies offer estimates of the maximum effect.⁶⁷ The limitations of RCTs are significant in the hospital environment: risks include contamination between treatment groups, political and legal obstacles, and reduced generalizability. This becomes especially important when considering activities provided by nursing and physical therapy staff, which are highly dependent on the providers' characteristics and performed with atypical patients.⁶⁷ Quality Improvement (QI) projects designed to provide mobilization interventions to the majority of patients without exclusion in acute care are increasingly needed to provide clinical evidence. These studies demonstrate strong external validity to the hospital environment.⁶⁷

Four QI initiatives published in the last few years have all used a mix of interprofessional staff, relying heavily on nursing and physical therapy staff to achieve increased mobilization, ambulation and/or physical activity for adults during inpatient hospitalization.^{43,57-59} In the study by Drolet et al,⁵⁷ the intervention included a new mobility order set, nursing permission to consult therapy staff and tracking of daily patient ambulation distance. The QI program was updated during the project to include a daily status report distributed to each unit, which included patient LOS and ambulation distance, implemented to increase mobilization on the unit.⁵⁷ In the study by Wood et al,⁵⁹ patients were assigned to one of two activity

tiers based on ability to ambulate. The goal was for patients to participate in protocol activities three times a day with a nursing aide under the direction of a physical therapist.⁵⁹ In the study by Hoyer et al,⁴³ mobilization occurred three times a day with nursing staff, including daily goals, and increased documentation/description of patient mobility across all hospital staff. Five days a week nursing staff met with rehabilitation therapists for unit based huddles to discuss the current mobility status of patients as well as progress with mobility.⁴³ Finally, the Eat, Walk, Engage program⁵⁸ included several mobility activities with different staff responsible for each activity. For example, nursing staff were to encourage sitting out of bed, physical therapy provided a graded exercise program and all staff as well as family were to encourage and assist patients with mobilizing. The mobility portion of the program was part of a larger interdisciplinary collaborative model of care for geriatric patients.⁵⁸ This collaborative care model mirrors other successful geriatric care programs developed such as the Acute Care of Elders (ACE) and the Hospitalized Elder Living Program (HELP), which have been shown to reduce functional decline, decrease LOS and improve patient outcomes.^{68,69}

The common outcomes across all four studies include mobility achievement or change during the project, hospital LOS and rate or incidence of falls. Hoyer et al⁴³ found the percentage of patients with improvement in mobility scores from admission to discharge increased from 32% to 45% and the percentage of patients who ambulated increased from 43% to 70%. Drolet et al⁵⁷ found that 71.8% of patients ambulated within 72 hours of admission compared to 15.5% before project

implementation. Wood et al⁵⁹ found almost 90% of patients achieved twice daily mobility session during the study timeframe. The Eat, Walk, Engage program⁵⁸ did not directly measure patient outcomes since previous mobility and interprofessional team care intervention studies showed improved patient function, reduced hospital mortality and improved self-reported health status.⁷⁰⁻⁷²

A comparison of falls and hospital LOS among these four QI projects showed some inconsistencies. Hoyer et al⁴³ found no difference in rate of falls but LOS was shorter compared to the period immediately before the project ($p < 0.001$). Further separating the patient data into tertiles based on expected LOS revealed patients with higher expected LOS had greater reductions in adjusted median LOS (expected LOS 4-7 days $p = 0.04$ and expected LOS > than 7 days $p < 0.001$).⁴³ Wood et al⁵⁹ found the mean number of falls decreased after three months but the hospital LOS increased slightly (along with case mix index for the hospital during that time). Mudge et al⁵⁸ found the program decreased falls over the long-term period of the project, however in a single month during the project, falls increased.⁵⁸ LOS decreased 3 days during the study period compared to other wards in the hospital.⁵⁸ Drolet et al⁵⁷ did not provide data on falls or hospital LOS.

These QI projects have generated externally valid results achievable in hospitals and units with similar patient populations, staff, and resources. The results suggest the value of increased mobility and activity levels of adult and geriatric general medicine patients exhibits trends toward decreased hospital LOS and falls. The increased mobilization and physical activity may serve to preserve patients' physical function, reducing the risk of adverse outcomes after discharge. However,

given the complexity involved in caring for hospitalized adults, the barriers to achieving these results in hospitals across the nation cannot be overlooked.

Barriers and Challenges to Mobilization for Hospitalized Adults

Multiple barriers to mobilization during hospitalization have been identified. Results from a multicenter, cross-sectional survey of 120 nurses, physical therapists and occupational therapists at both a quaternary academic medical center and a community based hospital revealed barriers common to all three professions and barriers unique to each profession.⁷³ Multivariate regression analysis revealed the perceived barriers to early mobilization were similar between the two hospitals ($p=0.25$), were significantly higher for staff with less experience ($p=0.02$) and nurses had significantly higher barrier scores compared to physical and occupational therapists ($p<0.001$). There was a strong correlation found between level of training in mobilizing patients and confidence for mobilization ($p<0.0001$).⁷³ One item identified as a significant barrier was the belief that increased patient mobility translated to an increased workload for nurses. Two items where nurses and therapists disagreed on the barrier related to whether nursing staff have time available to mobilize patients during their shift and whether patients without contraindications are mobilized at least once daily by nurses. Additional barriers believed to be significant by both nurses and therapists were 1) the lack of regular discussion of patient physical function among healthcare providers and 2) the belief that patients are resistant to mobility or physical activity during hospitalization.⁷³

Multiple qualitative studies have examined factors that influence nursing staff's decision to mobilize hospitalized adults,⁷⁴⁻⁷⁶ reasons for missed mobilization of patients,⁷⁷ and perceived barriers to early mobility interventions targeted at older adults.⁷⁸ Physicians and other healthcare team members also bear some responsibility: lack of physician order specificity⁷⁹ and poor documentation of patient functional status and/or functional limitations in the medical record contribute to the problem.^{9,60} The hospital environment is frequently cited as a barrier to mobility for persons ≥ 65 years old^{10,20,80,81} and this may not be limited to the older adult population.²² Other frequently cited challenges to promoting mobility in the hospital require addressing cultural issues such as promoting patient accountability for early ambulation and giving families permission to assist patients with ambulation.²²

These barriers and challenges to mobilizing adult inpatients make one point clear: no single profession must be responsible for a shift in culture. The hospital environment is a relatively non-modifiable barrier. Financial constraints at many institutions limit the feasibility of altering the hospital environment substantially to support greater patient mobility. Thus, increased mobility and levels of activity provided by physical therapists, proper equipment to assist in achieving mobility goals and more importantly, collaboration among all team members is needed to overcome these barriers and challenges.

Discussion/Conclusion:

Physical therapists are experts in physical function helping individuals maintain, restore or improve movement, activity and functioning for optimal

performance and enhanced health, well-being and quality of life.⁸² This expertise suggests physical therapists have the education and knowledge to lead or supervise mobility and physical activity protocols and progressions for hospitalized adults of all ages. Yet, much of clinical care in the acute setting is driven by physicians through ordering practices, culture, and policy recommendations. One solution is for physical therapists in the acute care environment to embrace a larger responsibility for mobility and activity level of those hospitalized adult patients who require physical therapy services and those who do not.

This does not imply that all older adult patients need physical therapy during hospitalization. In fact, the opposite is true. Physical therapists are more often consulted in cases where patients are medically and functionally compromised with higher chances of negative outcomes.⁷ This leaves adult patients who do not require skilled services on admission at risk of developing functional decline during the hospitalization due to age, co-morbidity or severity of illness. Often, these patients trigger a formal physical therapy consult after experiencing the pervasive immobility during hospitalization, ultimately contributing to the high demand for physical therapy services in acute care. This represents two distinct roles for physical therapists in acute care. One is the traditional role of treating patients referred appropriately by their physicians for skilled interventions. It is in the second role of developing and supervising mobility executed by nursing or rehabilitation technicians, trained to provide these daily interventions from admission to discharge, that physical therapists' added value is currently underutilized by most hospital teams.

Implementation of mobility programs using support staff (trained nursing and/or rehabilitation technicians) may alleviate the volume of patients and ethical dilemmas that occur during patient prioritization. Within the consultative model of care, physical therapists report high demands for services, caseloads beyond what can be served adequately and ethical dilemmas of determining which patients take precedence when demand for services exceeds what can be provided.⁸³ Rather than dismissing ambulation for patients not needing skilled gait training as a waste of resources, the culture can be shifted to one where all members of the team recognize the use of more appropriate resources for that patient situation.⁸³ Mobility interventions should never be viewed as a waste of resources especially considering habilitation is an important aspect of the acute care physical therapists' expertise. Bedside hospital staff (physicians, nursing and rehabilitation staff) must recognize an opportunity to prevent functional decline and maintain or even improve current functional status for all patients. Adequate support staff in the form of mobility technicians trained in techniques to assist patients, especially older adult patients, to perform functional tasks, joint range of motion, transfers out of bed and ambulation are absolutely necessary to meet the current demand. One caveat to consider is the level and intensity of direction/supervision from physical therapists as well as nursing staff on the floors necessary for patient safety. Wood et al⁵⁹ outlined clear roles and responsibilities for the nursing mobility aide; however, other examples in the literature do not mention supervision for research assistants or volunteers used to engage patients in mobility.^{84,85}

All four QI projects in this review utilized various levels of interprofessional communication, collaboration and teamwork to achieve increased mobilization and physical activity of patients. A collaborative care strategy was successful in the Eat, Walk, Engage program with specific nursing and physical therapy staff responsibility for mobility activities, as well as responsibilities shared among all staff on the unit.⁵⁸ At Johns Hopkins, nursing and rehabilitation staff met 5 days per week for unit-based “huddles” to discuss baseline and current functional mobility levels, barriers to mobilizing patients, and set daily goals to progress mobility.⁴³ Discussion of patient mobility scores occurred during daily unit-based care-coordination meetings with physicians, nurses and social workers.⁴³ The mobility aide utilized in the project by Wood et al⁵⁹ was assigned by the nursing manager and worked under the direction of the unit physical therapist and the nursing staff caring for the patients to assist or supervise mobility sessions three times each day. Collaboration among the mobility aide, physical therapist and nursing staff was required to assess patients’ progress, adjust the mobility performed and consult physical therapy for formal evaluations.⁵⁹ Drolet et al⁵⁷ assembled a multidisciplinary team of advanced practice nurses, registered nurses, physical therapists, a critical care pharmacist, a respiratory therapist, and a critical care physician to implement the mobility program in an intermediate care unit. They used a mobility order set with an embedded algorithm to guide mobility potential, which triggered nurses to consult physical or occupational therapy when appropriate.⁵⁷ Interprofessional communication and collaboration is essential to

achieve inpatient mobility or physical activity goals and should be the hallmark of efforts in the future.

Clinical evidence overwhelmingly points to effective methods to achieve best mobility practice for hospitalized adults. Implementation of progressive mobilization and higher levels of activity for hospitalized adults in acute care requires leadership from all members of the interprofessional team, including physical therapists as the functional experts. Partnering with physical therapist or physical therapist assistant “champions” to develop, implement and continually evaluate standardized, progressive mobility protocols or programs for hospitalized older adults is the imperative next step forward.

Operationalizing mobility practices in acute care nationwide has the potential to dramatically alter patients’ trajectory post hospitalization. Life-space mobility, a measure of mobility, function and level of dependence, declines significantly in non-surgical patients after hospitalization with little evidence of recovery.⁸⁶ Hospitalization results in a choice between two paths. One path moves patients towards greater dependence, less activity and worse patient outcomes. The other path maintains patients’ function, progresses their activity level and prepares the patient for life and health after discharge. Prioritizing increased mobility and physical activity levels to preserve function, especially for older adults, may produce meaningful outcomes and is linked to improved patient well being and quality of life.³⁵ Under MACRA, clinical improvement practices and clinical quality markers relate directly to reimbursement; financial accountability will continue to grow each year. As our healthcare system transitions to one based on value of care, rather than

volume of care, clinicians must embrace opportunities now. Solutions to increase the quality of care and improve post acute care outcomes, such as promoting higher activity levels during hospitalization, are within reach. All members of any interprofessional inpatient care team are responsible for creating a culture that encourages, supports and promotes function of older adults. It is our collective charge. Physical therapists leading this charge to support best practice, fostering collaboration of interprofessional team members to achieve mobility goals, and demonstrating our value in financially constricted health systems is the imperative next step forward.

CHAPTER THREE: QUANTITATIVE EVALUATION

Enhancing the role of physical therapy in value based transitions of care

Introduction:

The United States healthcare system continues to be dominated by higher costs of care with outcomes that fail to match the efforts and expense.⁸⁷ New payment models have evolved in an effort to control cost and improve patient outcomes. These payment models emphasize quality of care over volume of care and incentivize consideration of current practices and stronger adherence to evidence based practice.⁸⁸ The Medicare Access and CHIP Reauthorization Act of 2015 (MACRA) will begin shifting reimbursement this year to Value-based payment, which stipulates that physicians, and later many other healthcare professionals, engage in clinical improvement practices.^{64,89} Developing and implementing quality improvement practices in clinical care environments will be necessary to illustrate value added achievements in our evolving healthcare system.

A significant opportunity for value-added clinical practice change continues to exist in the acute care environment. The problem of low mobility during hospitalization for adult general medicine patients, especially in patients 65 years and older, is well known.^{9,18} Immobility during acute illness is a persistent problem for all adult inpatients but results in greater challenges for those patients 65 and older, who comprise one third of all hospital admissions.^{19,22,61} Hospital acquired functional decline begins early in hospitalized older adults and has devastating consequences.²¹ Half of permanent disability in older adults begins with hospitalization and two out three older adults who experience hospital acquired

functional decline are discharged to a nursing facility or experience death within one year of discharge.^{3,90,91} Meanwhile, higher levels of mobility in patients has been associated with shorter hospital length of stay (LOS).²⁵ Patients with shorter hospital LOS take more steps during the first hospital day and increase their steps on the second day.²⁶ Increased mobility of adult inpatients is not only safe and feasible, it has been shown to decrease post operative complications and increase patient function, quality of life, and hospital satisfaction while reducing hospital costs.^{33,34}

Evidence to support clinical practices that increase mobility and physical activity of adult inpatients during hospitalization continue to increase yet the conflict between fall prevention and promotion of mobility remains a barrier.⁶² Our solution to this complex problem is to engage experts in mobility and physical function, physical therapists, in a new way. We hypothesize that engaging physical therapists in a patient's care at hospital admission, rather than waiting for physician consultation, will promote increased mobility and level of physical activity that can be progressed to patient discharge. In addition, we suggest that endorsing physical therapists as key members of the team in determining mobility status and need for physical therapy evaluation in the acute environment, has the potential to improve clinical outcomes in a complex environment of care.

Using the principles of quality improvement (QI), we developed actions designed to increase mobility and level of activity in general medicine adult inpatients and improve patient outcomes of this targeted group.¹⁷ At our institution, an existing interprofessional rounding team designed to improve care transitions in

general medicine patients created a novel opportunity to initiate physical therapist expertise and recommendations from hospital admission to discharge. Project BOOST (Better Outcomes by Optimizing Safe Transitions) is a care transition and readmission reduction program promoted by the Society of Hospital Medicine, designed to control costs and improve patient outcomes.⁵⁶ Typical Project BOOST team members include a primary care physician, pharmacist, nurse case manager or social worker, bedside nurse and occasionally specialist providers. We added a physical therapist to an existing Project BOOST healthcare team. The physical therapist recommended mobility activities facilitated by a trained mobility technician, determined patients appropriate for therapy services (physical and occupational therapy) at the facility, and promoted mobility and increased physical activity of patients during hospitalization.

Our goal was to implement and evaluate the impact of this quality improvement project as follows: (1) observe the frequency of mobility on the unit before and during the QI project, (2) evaluate patient outcomes (hospital LOS, 30 day same hospital all-cause readmission, change in AM-PAC score from admission to discharge, incidence of falls and pressure ulcers, and change in physical therapy consultations) retrospectively, and (3) qualitatively evaluate the mobility QI project. Here we will present and discuss the quantitative results of this QI project.

Methods:

This project occurred on one general medicine unit at the University of Kentucky (UK) HealthCare Good Samaritan hospital (Lexington, KY). The project targeted adult patients admitted to the Internal Medicine Team 4 (MD4) service

(approximately 14 patients on caseload each day) from August 2, 2016 to Feb 3, 2017. MD4 is one of two internal medicine teams on the unit that utilizes the Project BOOST interprofessional bedside rounding and discharge planning approach. Hallmarks of the program include using BOOST tools: bedside Structured Interdisciplinary Rounds (SIDR) to improve communication among team members, patient discharge education with Teach Back methods, an emphasis on discharge planning communication among team members and post acute healthcare professionals, and follow up phone calls with > 80% of patients after discharge.^{15,16,56} Our exclusion criteria included women who were pregnant, individuals <18 years old, prisoners, patients with non-standard discharge dispositions, and patients hospitalized for less than 2 days (48 hours). All patients admit to the seventh floor MD4 service line were recruited during the study time frame.

To provide a comparison of mobility on the unit prior and during the Mobility BOOST project, four Doctor of Physical Therapy students performed observation of mobility on the unit at two time points. Observation occurred the final week of July 2016 and the final week of January 2017 (See Table 3.1). Pairs of students observed patients on the seventh floor on four days during each week for two hours, at different time periods during the day. Effort was made to replicate the time of day during the second observation week (Table 3.1).

Students used a modification of observation methods seen in the existing literature.^{79,92-94} The students documented the position of the patient (lying in bed, sitting on the side of the bed, sitting out of the bed, standing, walking to/from the

bathroom, walking outside of the room, off the floor or unavailable for observation) to determine the frequency of out of bed mobility before and during the research study. Two students observed each patient position in their room for approximately five seconds before moving to the next room, starting with room 702 and ending at room 735 each round of observation. Students worked in pairs in the event a patient or staff member needed to interrupt the observation round for any reason; one student would continue the observation round. On average, one round of patient observation took 8-10 minutes to complete and students completed as many rounds of observation in the two-hour window as possible. A ten-minute break was taken every 30 minutes. Unoccupied and non-patient care rooms were excluded. If a patient had an isolation precaution sign on their door, a patient care technician was asked to open the door for observation. Closed doors were documented during observation rounds.

Table 3.1 Observation Dates and Time Pre and During Mobility BOOST

Pre Mobility BOOST	During Mobility BOOST
7/24/16	1/23/17
8a-10a	6:30a-8:30a
7/26/16	1/23/17
7a-9a	2p-4p
7/27/16	1/25/17
12:30p-2:30p	1:45p-3:45p
7/28/17	1/28/17
3p-5p	9a-11a

MD4 patients were identified on admission based on the electronic medical record system, per the admission criteria and standards at UK Good Samaritan Hospital. Physical function of MD4 patients was evaluated within 24-48 hours of

admission by a physical therapist using the Activity Measure for Post-Acute Care (AM-PAC) “6 Clicks” Basic Mobility Short Form, which has been determined to be a valid measure of functional status in hospitalized adults with a variety of diagnoses (see Appendix A).⁴⁰ The physical therapist continued to track patient functional status during the admission, entering a score each day or every other day before or after BOOST rounding, to track changes in patients’ scores and capture a discharge AM-PAC score within 24-48 hours of discharge. The physical therapist recommended the highest level of mobility appropriate for each patient given the patient’s personal history, current functional status (via AM-PAC score) and physical presentation at time of admission. In addition, the physical therapist recommended consultation with rehabilitation staff on the unit, which included physical therapy and occupational therapy for appropriate patients. A mobility technician was responsible for assisting with or facilitating participation in mobility and increased level of activity consistent with the mobility recommendation, in addition to any physical and occupational therapy evaluation or treatment the rehabilitation department determined. A trained rehabilitation technician served as the mobility technician for this project. The mobility technician performed or facilitated mobility sessions with each patient, with the goal of three mobility sessions per patient over the course of the mobility technician work shift (a typical eight hour work day, five days of week). Daily tracking of mobility and level of activity occurred in the electronic medical record using a mobility daily score, the Johns Hopkins-Highest Level of Mobility (JH-HLM) (see Appendix B).⁴³

The mobility recommendations were based on tier levels developed prior to

start of the project (Table 3.2). The physical therapist monitored changes in each patient’s functional mobility during Project BOOST interprofessional rounding and communicated the current, up-to-date functional status of each patient to the interprofessional team (Table 3.3). Adjustments to mobility recommendations were routinely made after chart review, communication with the mobility technician, nursing staff and other members of the team. The physical therapist promoted patient/interprofessional team mobility goal setting using the JH-HLM scale. To better understand both the physical therapist and mobility technician role and daily activities executed see Table 3.3. All tasks and responsibilities performed by the physical therapist and mobility technician are outlined clearly (Table 3.3).

During this QI project, patients had the right to decline participation at any time during their hospitalization. However, patients did not object to the physical therapist tracking functional status, as all were made aware of the project end goal to improve quality of care. Patients occasionally declined participation in the mobility sessions intermittently during hospitalization, and a number of patients declined participation in mobility at all or did not have an opportunity to participate because of their hospital course.

Table 3.2 Mobility Tier Levels

Mobility Tier Level 1: (Bed Level)	Range of motion (ROM) to upper and lower extremities and other movements performed independently or with assistance including sitting edge of bed, rolling, and scooting
Mobility Tier Level 2: (In room only)	Transfers out of bed, seated or standing ROM movements, ambulation or wheelchair mobility in room only in the

event the patient presents with behaviors that limited the MTs ability to maintain patient safety during mobility (impaired cognition, agitation or high fall risk)

Mobility Tier Level 3: (In and out of room mobility)

Transfers out of bed, standing ROM movements, hallway ambulation or wheelchair mobility and stair climbing (if appropriate)

Table 3.3 Detailed Task List for BOOST Physical Therapist and Mobility Technician

BOOST Physical Therapist Daily Tasks	BOOST Mobility Technician Daily Tasks
Review medical chart of current and new admission MD4 patients (5-6 days/week)	Review current list of MD4 patients and current/updated SBAR form provided by BOOST physical therapist
a. Round with interprofessional team to communicate patients current functional status and promote mobility (3-4 days/week)	a. Check with nursing staff regarding each patient’s status for mobility every day, if needed schedule time to see patient based on timing of medical procedures anticipated
b. Place mobility sign in patient rooms to communicate mobility tier level, functional status and needed assistance/equipment. Update as needed based on patient changes during admission. Remove mobility signs once patient is discharged (5-6 days/week)	b. Place mobility sign in patient rooms to communicate mobility tier level, functional status and needed assistance/equipment. Remove mobility sign if patient discharges during mobility technician shift.
Communicate with mobility technician regarding MD4 patients in person or by phone: patients on hold, off the floor for procedures, or changes in mobility tier levels (or any other important information) to assist mobility technician in engaging patients in mobility/achieving higher level of activity (5 days/week)	Communicate with physical therapist regarding MD4 patients in person or by phone.
Document AM-PAC “6 Clicks” Basic Mobility Score for each MD4 patient every day or every other day in the electronic medical record, based on anticipated discharge information or change in functional status.	Document JH-HLM score and other details for each mobility session in the electronic medical record

Table 3.3 (continued)

Communicate discharge recommendations with BOOST team (if not already completed by physical/occupational therapy staff members) and communicate with physical/ occupational therapy staff members regarding new consults and up to date medical plan for MD4 patients	Encourage or perform mobility session with all MD4 patients each day, up to three times per day
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Ethics Approval and Consent to participate

We received ethics approval from the University of Kentucky Institutional Review Board, Office of Research Integrity, IRB #16-0479. Informed consent was waived as we evaluated the QI project quantitative data retrospectively. All research procedures were carried out in accordance with relevant guidelines and regulations.

Data Source and Covariates for Project Evaluation:

Data were collected retrospectively, with assistance from the UK Center for Health Services Research, using the UK Healthcare Enterprise Data Warehouse. We used physician service line (Internal Medicine team 4, MD4, and Internal Medicine team 5, MD5) to identify our intervention and control groups, both during the QI project and during the same time period one year prior to the project.

Covariates included patient age, Case Mix Index (CMI), and Elixhauser Index. CMI represents the average diagnosis-related group (DRG) relative weight for the hospital, calculated by summing the DRG weights for all Medicare discharges and dividing by the number of discharges.⁹⁵ CMI is used to determine allocation of resources necessary to provide care for and/or treat patients in a specific group.⁹⁶ It historically has been used to calculate adjusted cost per patient per day as it reflects the diversity and clinical complexity of patients and associated resources utilized.⁹⁶

The Elixhauser Index is a comorbidity measure developed for administrative datasets to predict hospital charges, LOS, and in-hospital mortality.⁹⁷ It is used to control for a broad array of patient preexisting conditions in research studies and includes a comprehensive list of 30 conditions, including conditions such as obesity, weight loss, and psychiatric disorders not accounted for in previous measures.⁹⁷

Outcome Measures:

Primary outcome measures included hospital LOS and 30-day same hospital all-cause readmission. LOS index (LOSi) was used in the advanced statistical analysis, as it serves as a hospital efficiency performance metric.⁹⁸ To determine LOS index, the observed hospital LOS is divided by the expected LOS.⁹⁸ Observed LOS refers to the number of actual observed calendar days a patient was in the hospital. Expected LOS is the amount of time a patient was expected to be in the hospital with several factors such as patient age, sex and diagnosis being used to determine the expected LOS.⁹⁸ Expected LOS was calculated using the risk adjustment method developed by the University Health System Consortium (UHC), now known as Vizient, to construct risk adjustment regression models that assign an expected value to LOS.^{43,99} We interpret a LOSi score of 1.00 to mean the expected LOS and the observed LOS are equal; thus, patients were not staying in the hospital longer than expected. A score of greater than 1.00 means a patient stayed in the hospital longer than expected and a score of lower than 1.00 means a patient stayed in the hospital a shorter time than expected.⁹⁸ Hospital readmission to the same hospital (UK HealthCare) was used and was defined using a modification of

the Centers for Medicare and Medicaid Services methodology for 30 day all-cause readmission.¹⁰⁰

Statistical Analysis:

Bivariate comparison of LOS (logarithmic transformation) and 30 day same hospital, all-cause readmission rate between intervention and control groups was tested using a t-test and chi-square test, respectively. All reported p-values were two tailed and $p < 0.1$ was considered statistically significant. Difference in Difference methods for LOS index and 30 day same hospital all-cause readmission were used to calculate the treatment effect given that pre and post treatment comparisons can be impacted by temporal trends in the outcome variable and by other events unaccounted for between the two time periods.^{101,102} Finally, to determine the difference in functional change using AM-PAC scores between the two subgroups, AM-PAC only and AM-PAC & Mobility, we used a non-parametric Wilcoxon Rank Sum test. Again, statistical significance was set at $\alpha = 0.1$ and all analyses were performed using Statistical Analysis Software, version 9.4 (SAS Institute, Inc., Cary, NC).

The Difference in Difference method estimates the treatment effect by examining the difference between the average outcome in the control and intervention group before and after treatment (Table 3.4). This requires data are available for two time periods for both the treatment and control group.^{101,102} The primary assumption, known as the “parallel trend assumption,” assumes in the absence of treatment, the average outcome of the treatment and control group would follow parallel paths over time.^{101,102} Thus, Difference in Difference methods

can account for unobserved variables, which are expected to remain fixed over time.¹⁰³ Specifically, we used Difference in Difference regression estimation for hospital LOS and 30 day same hospital, all-cause readmission rate. This method created an interaction term between time (pre and post intervention time period) and group (intervention and control group) (Table 4). This estimates the magnitude of the treatment effects by controlling for the time period to evaluate how much treatment contributes to outcomes.¹⁰² Second, it tests if those differences were statistically significant.¹⁰²

Table 3.4 Difference in Difference Model Coefficient Interpretation

Model equation: $Y = MD4 + POST + MD4*POST$

MD4	Estimates mean outcome difference between treatment (MD4) and control groups (MD5) prior to the intervention.
POST	Estimates mean outcome difference from before to after the intervention for the control group (this can also be thought of as the effect of the passage of time—what would have happened if there was no actual intervention on the treatment group)
MD4*POST (interaction term)	Estimates difference in mean outcome between the treatment and control groups from pre to post intervention. This is the coefficient of interest in the Difference in Difference model. It tells us whether the estimated mean outcome difference from before to after was different between the two groups.

Results:

Comparison of mobility using observation:

Our attempt to evaluate for confounding that may have resulted from implementing this QI project on a single unit failed. Our observation of mobility on the unit before and during the QI project was affected by a new hospital policy. A

change in patient isolation precautions resulted in greater availability to observe patients during the second observation. This resulted in dramatically increased number of observations, 963 observations versus 1327 observations respectively. This resulted in comparisons that were statistically significant due to the increased number of observations, not a change in frequency of mobility. Therefore, no conclusions can be drawn from the observation data.

Evaluation of mobility QI project

Initial descriptive statistics for patients in the intervention and control group are provided in Table 5. The number of patients on each internal medicine team increased from the pre to post intervention period. Our results indicate that a small percentage of patients in the MD5 control group had AM-PAC Scores, as there was a change in how rounding occurred on the unit in the third month of the project, resulting in a small number of patients changing internal medicine teams (Table 3.5). Not all patients in the MD4 intervention group have AM-PAC scores due to exclusion criteria. Additionally, there was ramp up and down phase of the project. The first week of the project only the newly admitted MD4 patients were exposed to the mobility program and similarly, during the final week of the project, new MD4 patients were not exposed to the mobility program (Table 3.5).

There were small differences in average age, CMI, average Elixhauser Index and average expected LOS for patients on MD4 and MD5 teams pre and post intervention (Table 3.5). Interestingly, CMI was higher for MD4 patients and lower for MD5 patients pre intervention. Additionally, average Elixhauser index and

expected LOS were slightly higher for the intervention team, MD4, but slightly lower for the control group team, MD5 (Table 3.5).

The primary outcome measure hospital LOS and 30 day same hospital, all-cause readmission rate are found in Tables 3.6 and 3.7. We found a statistically significant difference in observed hospital LOS during the mobility QI project ($p=0.073$) (Table 3.6 and 3.7). The meaningful decrease in readmission rate seen during the project was not statistically significant ($p=0.180$); however, it appears clinically meaningful when considering hospital readmission penalties (Table 3.6 and 3.7).

Table 3.5 Descriptive Statistics

	MD4		MD5	
	Pre (SD)	Post (SD)	Pre (SD)	Post (SD)
Number of Patient Visits	205	291	236	284
% Patients with AM-PAC Score	0	86.3	0	2.5
% Male	46.3	51.9	48.7	47.9
Average Patient Age	53.6(17.7)	55.2(18.2)	51.9(17.0)	54.3(18.3)
Case Mix Index (CMI)	1.23(0.84)	1.28(0.82)	1.37(1.12)	1.24(0.69)
Average Elixhauser Index	4.0(2.1)	4.2(2.1)	4.2(2.2)	4.1(2.2)
Average Expected LOS (days)	4.8(2.2)	5.0(2.5)	5.2(2.7)	5.0(2.4)
% Congestive Heart Failure	15.6	20.3	17.4	16.9
% Cardiac Arrhythmia	16.6	17.5	15.7	18.7
% Valvular Disease	4.4	1.7	2.1	3.2
% Pulmonary Circulation Disorders	4.9	4.5	5.9	4.2
% Peripheral Vascular Disorders	7.8	5.2	6.4	5.3
% Hypertension, uncomplicated	50.7	40.9	50.0	38.0
% Hypertension, complicated	11.7	22.3	13.6	22.9

Table 3.5 (continued)

% Paralysis	2.4	2.4	3.4	2.1
% Other Neurological Disorders	14.1	18.9	15.3	14.1
% Chronic Pulmonary Disease	31.7	29.6	34.3	33.5
% Diabetes, uncomplicated	21.5	11.3	19.5	7.7
% Diabetes, complicated	13.7	23.4	18.3	23.9
% Hypothyroidism	11.2	13.1	13.6	14.8
% Renal Failure	15.6	19.2	14.8	20.1
% Liver Disease	13.2	16.8	13.6	13.0
% Peptic Ulcer Disease	1.5	1.0	2.5	0.0
% AIDS/HIV	0.0	2.4	0.8	1.4
% Lymphoma	0.0	0.7	0.0	0.4
% Metastatic Cancer	1.5	2.1	2.1	1.4
% Solid Tumor without Metastasis	3.4	2.4	3.8	1.8
% Rheumatoid Arthritis/Collagen	4.9	6.5	3.4	2.8
% Coagulopathy	9.3	7.2	6.8	9.2
% Weight Loss	11.7	15.1	16.9	17.3
% Obesity	18.0	22.0	19.9	20.4
% Fluid and Electrolyte Disorders	48.3	45.7	41.1	47.2
% Blood Loss Anemia	1.0	1.0	1.7	0.7
% Deficiency Anemia	10.2	4.5	10.6	4.9
% Alcohol Abuse	16.6	18.6	16.1	16.5
% Drug Abuse	15.1	15.1	16.5	18.3
% Depression	23.4	26.8	28.9	26.4
% Psychosis	3.9	2.7	3.8	1.8

(SD)=Standard Deviation

Table 3.6 Outcome Measure Results: Observed LOS and Readmission

	Total	MD4		MD5	
		Pre (SD)	Post (SD)	Pre (SD)	Post (SD)
Number of Patient Visits	1016	205	291	236	284
Average observed LOS (days)	6.6 (5.7)	7.1(6.3)	6.2(5.5)	6.8(5.4)	6.3(5.5)
% of Patients readmit within 30 days	16.6	19.4	14.6	16.9	15.7

Table 3.7 Bivariate Analysis for Observed LOS and 30 day Readmission

MD4 LOS (log) t test		MD4 Readmission rate Chi-square test	
Pre	Post	Pre	Post
7.1	6.2	19.4%	14.6%
p value= 0.071*		p= 0.180	

*=statistically significant

Readmission rate= % of patients experiencing 30 day readmission to UK HealthCare during the QI project

Our Difference in Difference results indicate the effect of the intervention on LOS differs by treatment group (Table 3.8). The effect is negative yet fails to reach statistical significance in the model (Table 3.8). With the alpha level set at 0.1, this result is trending toward significance and we believe it to be clinically meaningful in the population studied (Table 3.8). The readmission rate in our Difference in Difference model was also lower in the treatment group than the control group, but the interaction term fails to achieve statistical significance (Table 3.9). However, this larger decrease in readmission rate seen in the treatment group compared to the control group has clinical relevance.

Table 3.8 Difference in Difference Results for Observed LOS (LOS index)

Parameter	Coefficient	95% CI (lower)	95% CI (upper)	Std Error	t value	Pr > t
Intercept	1.339	1.209	1.469	0.066	20.18	<0.001
POST	-0.027	-0.202	0.149	0.090	-0.30	0.770
MD4	0.184	-0.007	0.374	0.097	1.88	0.060
POST*MD4	-0.191	-0.444	0.061	0.129	-1.48	0.138
R-square	Coeff Var	Root MSE	LOSi Mean			
0.0067	74.58	1.01	1.36			

LOSi=LOS index

Table 3.9 Difference in Difference Results for Readmission (30 day)

Parameter	Coefficient	95% CI (lower)	95% CI (upper)	Std Error	t value	Pr > t
Intercept	0.169	0.119	0.219	0.025	6.65	<0.001
POST	-0.012	-0.080	0.055	0.035	-0.36	0.721
MD4	0.025	-0.048	0.097	0.037	0.67	0.504
POST*MD4	-0.035	-0.132	0.062	0.049	-0.71	0.477

Parameter	Odds Ratio	95% CI (lower)	95% CI (upper)	Pr > t
Intercept	1.184	1.126	1.245	<0.0001
POST	0.991	0.926	1.061	0.795
MD4	1.025	0.953	1.102	0.505
POST*MD4	0.962	0.873	1.060	0.430

R-Square	Coeff Var	Root MSE	Readmit (30 days) Mean
0.0022	225.788	0.372	0.164

Subgroup comparison

A comparison between patients who did not participate in the mobility sessions but received AM-PAC scores from admission to discharge (AM-PAC only)

and patients who did participate in mobility sessions (AM-PAC & Mobility) are included in Table 3.10. The AM-PAC only patients were more frequently younger, male and had a shorter average observed and expected LOS, and lower average Elixhauser Index and CMI than patients who received full mobility intervention (Table 10). Additionally, AM-PAC only patients had lower percentage of 30 day same hospital, all-cause readmission than AM-PAC and Mobility patients.

Examining the AM-PAC score difference between patients who did not receive the full mobility intervention (AM-PAC only) and those patients who did (AM-PAC & Mobility) reveals differences between these two subgroups (Table 3.11). AM-PAC only patients had slightly higher initial AM-PAC scores and less change in AM-PAC score from admission to discharge compared to AM-PAC & Mobility patients (Table 3.11). The difference in the two groups change in AM-PAC score was statistically significant, $p=0.025$ (Table 3.11). Figure 3.1 displays the AM-PAC score distribution between the two subgroups analyzed and Figure 3.2 provides a visual representation of the change in AM-PAC score for the two subgroups during their admission. A more positive change in AM-PAC Basic Mobility Short Form scores from admission to discharge is reflected in Figure 3.2 for AM-PAC & Mobility patients.

Table 3.10 MD4 Intervention Subgroup Comparison

	AM-PAC only	AM-PAC & Mobility	Total
Number of Patient Visits	86	172	258
% Male	61.6	47.1	51.9
Average Age	51.7(19.2)	59.4(16.2)	56.8(17.6)

CMI	1.1(0.4)	1.4(1.0)	1.3(0.9)
Average Elixhauser Index	3.9(2.2)	4.4(2.1)	4.3(2.1)
Average LOS (days)	4.6(3.4)	7.6(6.4)	6.6(5.8)
Median LOS (days)	3.3	6.0	4.8
Average Expected LOS (days)	4.6(1.6)	5.4(2.9)	5.2(2.6)
% 30 day Readmission	14.0	18.0	16.7

Table 3.11 AM-PAC Score Statistics by Subgroup

	AM-PAC only	AM-PAC and Mobility
Number of Records	59	173
Average First AM-PAC Score	19.4	18.2
Average Last AM-PAC Score	20.6	20.3
Average AM-PAC Score Change	1.2	2.1* (p=0.025)
Median First AM-PAC Score	23.0	20.0
Median Last AM-PAC Score	24.0	22.0

*= statistically significant using Wilcoxon Rank Sum Test

Figure 3.1 Distribution of Admission MD4 Patient AM-PAC Score by Subgroup

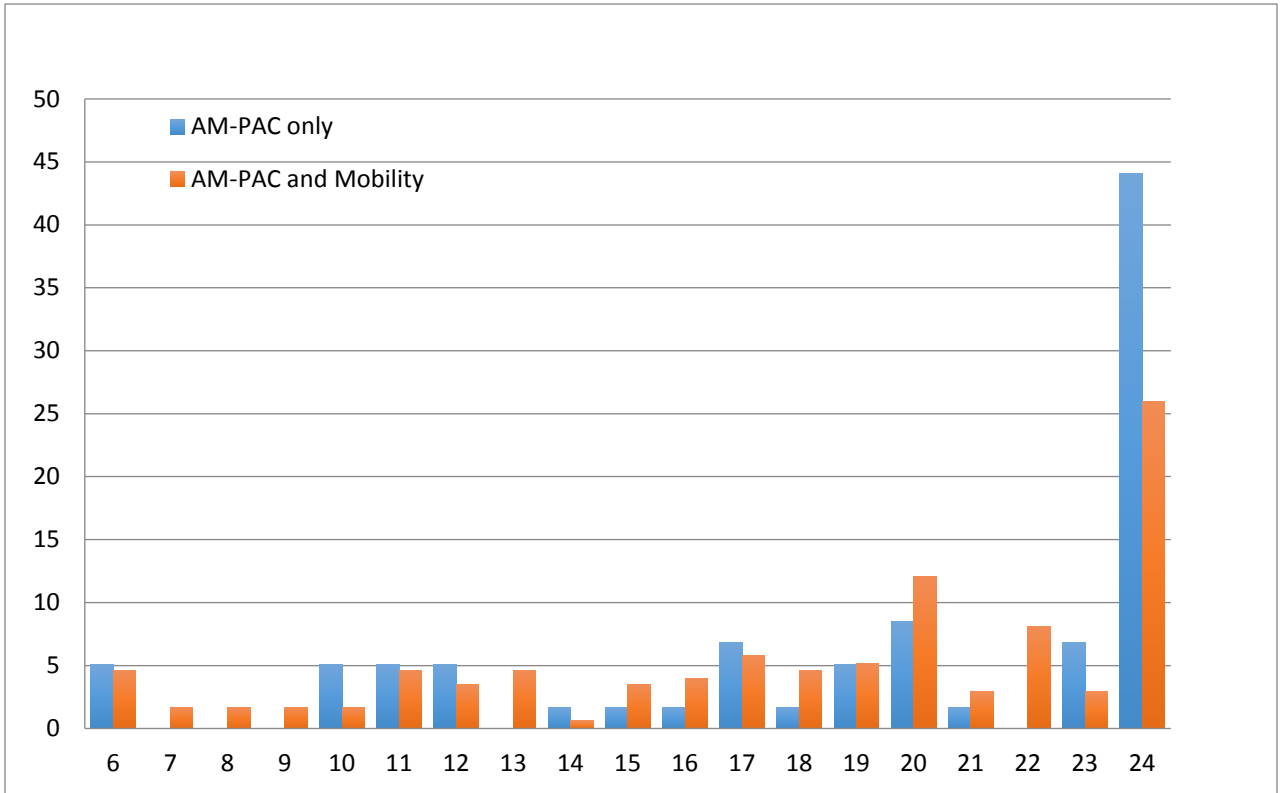


Figure 3.2 Change in AM-PAC Score Admission to Discharge Comparison between Subgroups

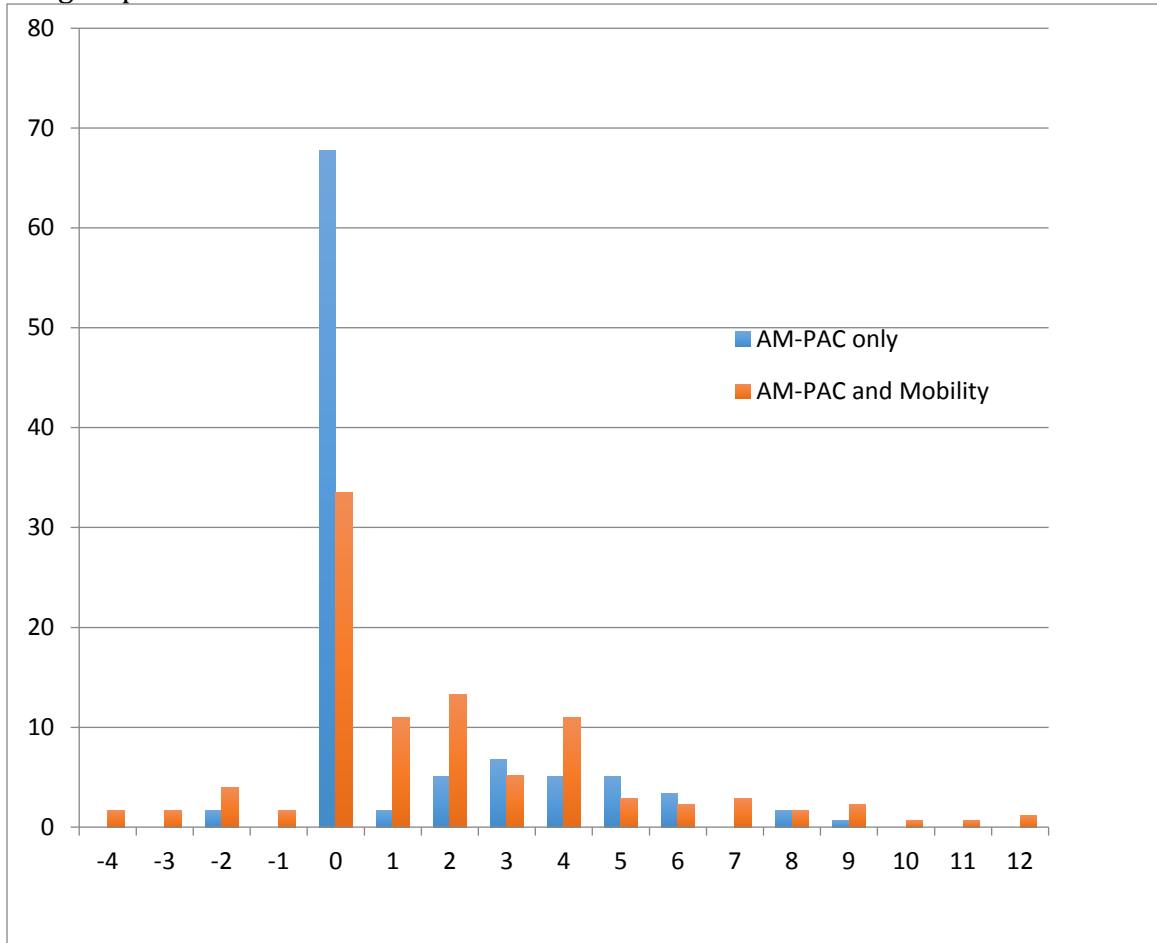


Table 3.12 Comparison of Falls and Hospital Acquired Pressure Injuries

Falls	Prior to Mobility BOOST	During Mobility BOOST	Additional Details
MD4	8	9	3/9 falls during QI project occurred overnight; none with MT or during mobility session
MD5	12	10	3/10 falls during QI project occurred overnight

Hospital Acquired Pressure Injuries (HAPIs)

	Prior to Mobility BOOST	During Mobility BOOST	
Unit	5	1	Physician service line unknown

Finally, no change in falls was seen in the intervention group during the mobility QI project (Table 3.12). A change in incidence of HAPIs was seen on the unit during the intervention; however, the physician service line was not tracked (Table 3.12). We also examined the change in physical therapy consultation for both intervention and control group patients. These data were analyzed prior to applying strict exclusion criteria as the MD4 BOOST team physical therapist’s role was to assist in identifying patients with skilled needs. The intervention (MD4) group saw physical therapy consultations increase from 30% a year prior to 38% during the early mobility QI project, ($p=0.04$ using t test) while the control group (MD5) physical therapy consultations decreased from 33% to 30%. The MD5 change was not statistically significant.

Discussion:

Our results indicate that adding a physical therapist to an existing Project BOOST team and increasing patient mobility and level of activity can decrease hospital LOS and 30 day same hospital all-cause readmission to the hospital. These results, when combined with previous research, continue to build an argument for consistent evaluation of patient functional status and interventions to maintain patient function in acute care.⁹ Members of the healthcare team most qualified to increase a patient's capacity for self-care are not typically included in the Project BOOST team. Physical therapists are health care professionals who help individuals maintain, restore and improve movement, activity, and functioning, thereby enabling optimal functional performance and enhancing health, well being, and quality of life.¹² To optimize patient mobility in the hospital setting, we believe physical therapists have an unrealized expanded role to fill but are not needed to assist every patient. The use of support personnel under the supervision of a physical therapist, such as the mobility technician in this study, is the key to engaging patients in higher levels of physical activity during acute illness at a lower cost.

The average cost of the last inpatient hospital day on this unit in early 2017 was \$557.65. The intervention group saw an average 0.9 day decrease in observed LOS compared to the control group, which resulted in a cost savings of \$501.89 ($\557.65×0.9). When we multiply these cost savings by the 291 patients in the intervention group, we see \$146,048.54 in total cost savings from the QI project. A mobility technician at this institution would receive an hourly wage anywhere from

\$13.46-\$20.13 with benefits. If we estimate a mobility technician receives approximately \$42,000 per year (\$21,000 over 6 months), the QI project savings would easily pay for seven day per week, full time mobility technician coverage on the unit. With an increased number of mobility techs, the potential exists for even higher cost savings from decreased observed LOS from a larger number of patients experiencing greater mobility and physical activity on the unit.

Observed hospital LOS decreased as a result of the mobility QI project, despite challenges encountered during implementation in a natural, clinical environment. Project BOOST at UK HealthCare Good Samaritan hospital uses hospitalist physicians, who specialize in the care of hospitalized patients, and these physicians provide care from Tuesday through Monday of the following week. During implementation of the QI project, eight different hospitalist physicians were introduced to the physical therapist and mobility technician, educated on the QI project, and adjusted to a new member of the Project BOOST rounding team. In addition, UK HealthCare hired multiple new hospitalist physicians who began rotating through Good Samaritan hospital in the fall of 2016. Thus, practice variation may have impacted observed LOS results during the mobility QI project. Significant variation in hospital LOS and discharge destination has been found among hospitalists.¹⁰⁴ Case management similarly impacts patient LOS during hospitalization as case managers interact daily with patients and staff members while facilitating care across the continuum.⁵ New models of case management where nurse case managers communicate daily with members of the medical team, clarify treatment plan intervention and goals, and anticipate patient or payer needs

to efficiently manage the clinical and financial aspects of care have proven crucial.⁵ Such models, used in Project BOOST, show statistically significant reductions in observed hospital LOS in all levels of care.⁵ We can then anticipate that instances during the mobility QI project where case management was not present on the unit due to staffing issues may have impacted observed hospital LOS for intervention patients.

Readmission penalties have increased from 0.61 to 0.73 percent of each Medicare payment and half of United States (U.S.) hospitals faced readmission penalty in 2016.¹⁰⁵ Addressing hospital readmission is a priority for hospitals. Project BOOST, when implemented at eleven sites in the U.S., decreased 30 day same hospital all-cause hospital readmission by 2.0% in 12 months compared to no change in readmission in the site-matched control units.⁵⁶ Adding a physical therapist and mobility technician to the Project BOOST early mobility QI program at our facility resulted in a 4.8% decrease in 30 day same hospital all-cause hospital readmission over a six-month period in a general medicine population. Despite not finding statistical significance, our results are clinically meaningful and important for general medicine patients. Approximately fourteen fewer patients were readmitted to the hospital in the intervention group compared to just two for the control group.

Our results add to the mounting evidence demonstrating how functional status and readmission are associated. In a study of hospitalized older adults, 15.5% of Medicare patients were readmitted within 30 days. Patients with the greatest Activity of Daily Living (ADL) impairment were at the greatest risk: 18.2% of

readmitted patients were dependent in three or more ADLs and 14.3% had difficulty with one or more ADLs.¹⁰⁶ Similarly, Hoyer et al.¹⁰⁷ found functional status at time of admission to inpatient rehabilitation facility was associated with unplanned readmission to an acute care facility. Lower scores in the motor domain of the inpatient functional assessment tool, known as the Functional Independence Measure (FIM), were more predictive of readmission than lower scores in the cognitive domain in this diverse inpatient rehabilitation population.^{42,107} Patients with medical diagnoses and lower FIM scores who were discharged to inpatient rehabilitation had the highest 30 day readmission rate in another study.¹⁰⁸ Functional status is a more valuable predictor of readmission risk than medical comorbidities in the medically complex inpatient rehabilitation.¹⁰⁹ Preservation of functional status for general medicine patients during hospitalization through early mobility programs appears necessary to decrease hospital readmission and reduce financial penalties.

The mobility QI project patients who received the full intervention had improved patient function on the AM-PAC during hospital admission compared to those patients who did not participate in mobility sessions. AM-PAC only patients had higher functional status scores at admission than our AM-PAC & Mobility patients, which may suggest that patient's self-selected mobility sessions based on their needs. AM-PAC & mobility patients more than likely needed assistance from the mobility technician to engage in mobility and increased levels of activity compared to the AM-PAC only group. Unfortunately, improved functional status did not change the number of falls for the intervention group during this early mobility

QI project. Falls appeared to remain consistent before and during the project for both groups yet patients did not fall more with increased mobility and higher level of physical activity. Considering no specific balance intervention was included in the early mobility program, falls may not have been an appropriate outcome measure to use. Two other mobility QI projects have seen overall decrease in falls^{58,59} yet many other programs have not provided evidence of falls during mobility programs.^{43,57,110} Stolbrink et al¹¹¹ found an increase in falls for older adult patients exposed to an early mobility intervention; however, authors felt this was related to a strong culture of falls reporting and reporting bias in older adults. Meanwhile, falls did decrease slightly in a recent randomized clinical trial of an in hospital mobility program.¹¹² Promotion of mobility during hospitalization while preventing falls continues to be essential and aligns with the broader health care mission to maintain quality, decrease costs, and enhance patient-centered care.⁶²

Frequency of physical therapy consultations did increase for the intervention group yet not dramatically. The difference was statistically significant but our results demonstrate that a physical therapist did not excessively identify patients in need of skilled physical therapy intervention. We hypothesize the physical therapist provided knowledge and expertise to identify patients with skilled physical therapy needs earlier during admission and supported the work of the physician and case manager to identify appropriate patients previously overlooked. However, we were unable to determine the appropriateness of these consultations or examine those patients evaluated but not added to the physical therapists' caseload on the unit.

Limitations:

This early mobility QI project encountered multiple unexpected challenges. The observation of mobility on the unit was impacted by a hospital-wide isolation precaution treatment change. Additionally, our mobility technician, who had twenty two years of training as a rehabilitation technician in an acute rehabilitation setting, experienced an injury in September. She was unable to continue as the mobility technician for the project near the end of November and was replaced by another less experienced rehabilitation technician. The project was expected to conclude in December but was extended through January 2017; however, mobility technician coverage for MD4 patients was less consistent due to rehabilitation department needs over the holidays and in early January. Finally, the AM-PAC Basic Mobility Short Form assessment tool was changed slightly by PAC Metrix in mid-October and the company recommended all facilities using the tool adapt to the change. The change made all six mobility questions consistent in phrasing of questions due to confusion reported from users, which resulted in a slight change to the first three questions. The first three questions previously asked, “how much difficulty does the patient currently have” and were changed to “how much help from another person does the patient currently need.” Incidentally, the PI had already made this change in phrasing due to confusion when interviewing patients, family members or staff on patient mobility during the project. Thus, the impact of this change is likely negligible.

There are several potential limitations to this early mobility QI project. First, this early mobility QI project occurred at a single site, within an academic medical

center. Additional research is needed to evaluate if similar results are found in different hospital settings (i.e. community hospitals) and in different inpatient populations. Second, as is common with QI projects, our results cannot be viewed as a direct cause and effect between increased mobility and decreased observed LOS and same hospital readmission. Third, we compared Project BOOST teams located on the same hospital floor; thus, there was the potential for confounding from staff who worked with both patient care teams. Fourth, our readmission data only allowed examination of 30 day same hospital all-cause readmission, eliminating the ability to evaluate patient readmission at other hospital facilities in our area. Fifth, evaluation of outcomes was performed via retrospective analysis of data as opposed to prospective data collection, which could have led to errors in determining our patient population and outcomes.

Conclusion:

Adding a physical therapist to an existing transition of care team improved patient functional status from admission to discharge and decreased observed LOS and 30 day same hospital all-cause readmission. This intervention, designed to prevent functional decline during hospitalization and increase patient mobility, can be provided in a cost-effective manner using trained support personnel under the supervision of a functional expert. Engaging physical therapists as members of the healthcare team early in admission and through patient discharge, has the potential to demonstrate significant value for hospital systems.

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CHAPTER FOUR: QUALITATIVE FINDINGS

Mobility bridges a gap in care: Findings from an early mobility quality improvement project in acute care

Introduction:

Low mobility in acute care is a well recognized area for improved quality of care. Quality in healthcare is increasingly scrutinized in the United States (US) healthcare system as we experience higher costs without improved outcomes when compared to other Organization for Economic Co-operation and Development (OECD) nations.¹¹³ The Triple Aim of Healthcare, developed and disseminated by the Institute for Healthcare Improvement (IHI), specifically emphasized quality of care as an approach to optimizing health system performance.¹¹⁴ The problem of low mobility during hospitalization has been well documented and, for older adults in particular, results in a negative post acute trajectory.^{18,19,22,65}

There appears to be an inherent tension between fall risk and promotion of mobility for individuals who experience illness in acute care.⁶² Fear of litigation and financial penalties have created disincentives for mobility, lack of clear role delineation among staff have been expressed, and professional and environmental barriers have created challenges to patients being more mobile and prepared for discharge.^{62,73,75} However, quality improvement (QI) projects developed to increase patient mobility and level of activity increasingly show positive results. Successful mobility QI projects engage a combination of interprofessional staff members to promote, encourage, and facilitate increased mobility and level of activity for

hospitalized patients, and could lead to a change from a culture of immobility to a culture of mobility.

There are multiple examples of early mobility QI programs implemented in acute care. In a study by Wood et al,⁵⁹ patients participated in one of two mobility protocols based on walking ability using a nursing aide, under the direction of a physical therapist. In this study, patient mobility increased to three times a day.⁵⁹ Hoyer et al⁴³ developed and implemented a collaborative mobility program with nursing and rehabilitation therapy staff. Nursing staff met with rehabilitation therapists for unit based huddles each weekday to discuss the current mobility status of patients as well as progress with mobility.⁴³ The Eat, Walk, Engage program⁵⁸ used multiple mobility activities with certain professionals responsible for different activities. All staff and family members were encouraged to assist patients with mobility, while nursing staff were instructed to facilitate patients getting out of bed, and physical therapy staff provided progressive exercises. As the title suggests, the mobility program was part of a larger collaborative model of care for geriatric patients.⁵⁸ Drolet et al⁵⁷ developed a new mobility order set, granted nurses permission to consult rehabilitation therapy staff and tracked daily patient ambulation distance. In addition, when challenges arose, daily status reports of each patient's length of stay (LOS) and ambulation distance were used to motivate staff to increase patient mobilization on the hospital unit.⁵⁷ All four of these mobility QI projects were evaluated using quantitative measures, typically hospital LOS, level of mobility achievement (or ambulation distance achieved) during the hospitalization, and number of falls.

What is missing from research on QI projects to increase mobility in acute care is data reflecting the patient experience with early mobility during hospitalization and the staff experience with this clinical practice change. Previous qualitative research has investigated factors older adults perceive as influencing physical function during hospitalization,¹¹⁵ older adult patient, nursing staff and physician perspectives on barriers to mobility during hospitalization,¹¹⁶ and nurses perceptions of physical function in older adults⁷⁴ as well as how nurses decide to assist patients with mobility⁷⁵ or attribute that responsibility.⁷⁶ Gaining data to reflect the patient and staff members' experience during the implementation of an early mobility program, particularly when this is a change in routine clinical practice, was warranted. A qualitative case study provides a compatible method of inquiry for the analysis of clinical practice, with the potential to result in transformation of practice in others.^{117,118} Increasingly, qualitative case study methods are recognized as an effective method to evaluate clinical research.¹¹⁹ Our goal was to qualitatively evaluate a new early mobility QI project recently implemented on a general medicine unit.

Description of the mobility program

An existing transition of care program for general medicine patients engaged multiple members of the healthcare team to improve outcomes after hospitalization. Project BOOST (Better Outcomes by Optimizing Safe Transitions) is a nationally recognized QI program designed to implement best practice for hospital discharge transitions supported by expert mentorship through the Society for Hospital Medicine.⁵⁶ Typical team members include a primary care physician, nurse case

manager or social worker, bedside nursing staff, and a pharmacist. The team members perform structured bedside interdisciplinary rounding with patients using teach back patient education methods and team communication to improve discharge planning.⁵⁶ To enhance this program and interprofessional team, we added a physical therapist to one of two Project BOOST teams on the unit. The physical therapist promoted and encouraged patient mobility during rounding and supervised a mobility technician, who assisted patients with and encouraged higher levels of physical activity each week day. To determine patient functional status and recommended mobility level, a quick but thorough assessment or patient or family member interview was performed by the physical therapist. The physical therapist tracked each patient's functional status from admission to discharge and the mobility technician documented the highest level of mobility the patient achieved each day.

Study Design:

Case study research was used to provide an intensive, in-depth method of inquiry to evaluate the implementation of the mobility QI project.^{117,120,121} Our case included the general medicine unit, the two internal medicine patient care teams using Project BOOST (an intervention and control group), and the hospital unit staff. To comprehensively evaluate the mobility QI project from a case study approach, we used both quantitative and qualitative methods. The quantitative evaluation included examining hospital LOS, 30 day same hospital all-cause readmission and the change in functional status from admission to discharge between the intervention and control group patients. Quantitative results from the project are

provided in a separate publication. The qualitative portion of the project began in November of 2016 and continued through March of 2017.

The qualitative evaluation used a phenomenological lens to explore the lived experience of patients as well as staff members exposed to the mobility QI project. Qualitative phenomenology studies the lived or shared experiences of a group of individuals to find common meaning.^{117,122} Examining the case through the experience of the patients and staff members enhances our understanding of the mobility QI project and its particular features.^{117,123} A grand qualitative question guided the research: what is the experience of patients, their family members, and staff members on the unit during this mobility QI project in the acute care environment?

Methods:

Recruitment of participants was conducted by a mobility technician working with patients on the medical floor, and from hospital staff including nurse and physician leaders for project BOOST. To recruit patient participants, the mobility technician asked patients if they were willing to participate in an in-person interview and shared the names and room numbers of those patient volunteers with the Primary Investigator (PI). To recruit staff participants, the seventh floor nursing manager and the BOOST physician leader sent emails to all nursing and physician staff respectively, about participation in the qualitative interviews on two separate occasions half way through implementation of the QI project. The emails included instructions on how to contact the PI in person, by phone or email to ask questions and/or schedule an interview. The PI spoke in person to any patients or staff willing to participate in the interviews to explain the research project, review the consent

form, and schedule a time for the interview. All participants (patient or staff members) signed the informed consent form prior to initiation of an in person interview.

One or two semi-structured interviews were performed with patients and staff members who volunteered. The semi-structured interviews were flexible and allowed the researcher to understand the participant's perspective by probing for additional information when novel information emerged or to refocus the questions.¹²⁴ Sample interview questions are provided in Appendix A. Patient interviews, which occurred in the patient's hospital room, lasted approximately 10-20 minutes. Staff interviews, which occurred in a quiet location at the hospital, lasted approximately 15-25 minutes. The PI performed all interviews. All interviews were audio-taped then uploaded to a data management software program (NVivo qualitative data analysis Software; QSR International Pty Ltd. Version 10, 2012) where the interviews were labeled as a patient or staff interview and each participant was given a pseudonym. Next, two trained undergraduate research assistants transcribed the interviews verbatim. The PI then re-read and reviewed all the transcribed interviews for accuracy and clarity, making minor corrections prior to beginning data analysis.

Analysis:

Qualitative case study analysis methods typically borrow from other qualitative approaches, allowing the researcher to identify appropriate methods that will provide a detailed description of the case and its setting.^{122,124} To analyze our qualitative case study data, an inductive approach was used. Each interview was

coded separately using open coding to ensure the codes remained rooted in the participants' voices.¹²² Next the process of direct interpretation began, which allowed the PI to examine the data closely then begin to put the data together in a meaningful way.^{122,125} At the completion of open coding and direct interpretation, a few categories or patterns emerged from the data.^{122,125} All codes were then reviewed to evaluate how the data corresponded, especially when considering the unique experiences of patients compared to staff members.^{122,125} Using pattern matching and constant comparison of codes initiated the categorical aggregation and allowed individual and shared categories to emerge between the two groups of participants.^{122,124,125} Each code was reviewed and determined to fit into one category: this ensured there was no overlapping data in each category. When the researcher systematically reviewed the codes to determine which of the categories the data fit best, if there was a question regarding which category was most appropriate, the data from the representative source was reviewed to make a decision. The categorical aggregation using pattern matching and constant comparison was utilized repeatedly to finalize ten categories of codes developed.^{122,125}

From the ten categories formed, the final step involved re-organizing the data to reflect the common, shared experience between staff members and patients using support from quotes in the data. From that document, the qualitative themes were confirmed by the data.

Trustworthiness

To maintain rigor during this qualitative evaluation of the QI project, multiple methods to ensure trustworthiness were used. First, as is customary for phenomenological methods, the PI maintained a reflective journal during the conception and development of the QI project, and during all stages of the data collection, analysis, and writing the final manuscript.^{117,119,126} The PI and primary author is a physical therapist who developed and implemented the mobility QI project on the unit. All participants were known to the PI from rounding with staff, tracking patient mobility, recommending mobility levels, and working closely with the mobility technician to promote mobility on the unit. Maintaining a reflexive journal was necessary to bracket any biases about the project and served to provide data triangulation during analysis as weekly observations were recorded in the journal during implementation of the QI project.^{117,119,126,127} Implementation of the project occurred over a prolonged period of time with the PI exposed to the phenomenon under study within its context. This allowed multiple perspectives to be collected and understood.¹²⁶ Data triangulation involved multiple methods: interviewing patients and staff members (nurses and physicians) provided a wide range of experiences and reviewing the reflective research journal during data analysis verified the participant's experiences.^{117,119,126,127} The PI maintained a data-driven audit trail making clear the interpretations and methodological decisions used during analysis.^{117,127,128} Peer review with an expert qualitative researcher was necessary at various stages in the analysis to challenge assumptions, provide a fresh, detached perspective on the data, and refine the PI's methods.^{117,119,127,129} Finally,

member checking was limited as contacting patients to examine the findings was not possible; however, member checking with two nurses and one physician did occur.^{119,126} A document briefly describing the overarching and subsequent themes was provided for the staff to read and review in person with the PI. All three participants confirmed the qualitative findings.

Ethical Considerations

A university Institutional Review Board (IRB) approved the study and all participants signed informed consent. Data collection was extended 2 months after the conclusion of the mobility QI project in order to recruit physician participants, who were not successfully recruited during the project.

Findings:

A total of 12 participants were interviewed for this study (see Table 4.1 for participant information). One overarching theme emerged from the data, with four additional themes helping to describe and support it (see Figure 4.1). The overarching theme and four supporting themes are described below, with participant quotes provided as evidence.

Table 4.1 Participant information

Type of Participant	Gender	Age	Diagnosis	Number of admissions	Pseudonym
Patient	F	75	Osteomyelitis	1	Nancy
Patient	M	58	Left foot wound	2	Greg
Patient	F	52	Cellulitis, groin mass	1	Susan
Patient	M	57	Dysphagia, Cervical dystonia	1	William
			Clinical Experience (years)	Years at facility	

Nurse	M	39	2	2	Michael
Nurse	F	23	6 mos.	6 mos.	Josie
Nurse	F	28	1.5	1.5	Amanda
Nurse	M	52	7	3	Rick
Nurse	F	42	6 mos.	6 mos.	Margaret
Mobility Technician	F	55	20+	10 mos.	Sally
Physician	F	42	5	2	Caroline
Physician	M	35	10	6	Paul

Overarching Theme: Early mobility bridged a gap in care

The staff at this facility had a pre-existing belief that early mobility was important and necessary for patients, and that engaging in early patient mobility practices was helpful for both staff and patients. However, without a specific mobility program in place, early mobility did not occur with consistency and regularity. The early mobility program was able to bridge this gap in care.

The early mobility program helped staff better understand each patient's functional status and level of mobility from consistent communication and reporting of patient function. The addition of a physical therapist and mobility technician to the team meant that discussion of each patient's level of mobility and independence occurred more frequently. The physical therapist asked staff daily about their observation of a patient's functional status on admission, prior to and consistently after assessing function using the tool. The mobility technician reported patient functional level and achievements in each session to the nurse on duty for shift change reports. The physician, Paul, expressed he knew the most up to date information about the patient's functional status from the physical therapist being involved in rounds. Margaret, a nurse, echoed those statements, saying that once

they have had a mobility session, “I know exactly what their [the patient’s] functional level is and what they can do on their own.” There were additional benefits for staff. Having a greater awareness of patient function and mobility helped staff target unexpected changes and advocate for patient discharge. Amanda, a nurse, reported, “you are able to see when patients are having problems” and Rick, a nurse, said, “it helps nurses know how ready the patient is for discharge.”

Participants reported that patients had time available between procedures, visitors, and other medical care needs that could be utilized for early mobility. Michael, a nurse, reported, “a doctor comes in, sees the patient for five minutes, the nurse comes in, sees the patient for 5 minutes, then patients sit here for 2-3 hours by themselves.” The options for entertainment on the unit were limited and patients may have been restricted from leaving the unit by telemetry monitoring. Greg, a patient, said, “you can only walk down the hall so far.” Another patient, Nancy, explained how she entertained herself. “I try to go where there are glass windows and doors so I can see out.” She later explained another benefit of walking in the hallway: “you get depressed...I think it changes your whole outlook once you get out in the halls.”

Participants believed the early mobility program filled a need for patients that was unmet prior to the project. Patients reported they appreciated the help during a time of need. Susan reported, “I do not have to sit here and wait forever before someone helps me.” The fact that getting up out of bed during acute illness is not easy, requiring assistance from staff and increased effort from the patient was described. William, a patient, said, “I have difficulty getting up and was landlocked.”

Susan, a patient, reported, “It is really hard to get up, pull yourself up and just get to the restroom.” Michael, a nurse, felt that this project helped patients feel cared for, reporting, “mobility makes a huge difference in the progress of the patient, how they feel [about independence].” He later explained, “when patients are able to move around and function with assist they feel secure.”

The Early Mobility Project reinforced existing opinions that supported early mobility

The mobility project reinforced staff member’s opinion that early mobility and higher levels of physical activity were beneficial for patients, and in some cases resulted in clinical practice change. Sally, a mobility technician, stated in her interview, “my opinion did change, my opinion was strengthened.” Similarly, Caroline, a physician, reported “after you are seeing how great [patients] did...it impacted me in terms of changing practice.” She later described offering help to the nursing staff with certain patients in need of greater mobility and a willingness to provide more education to any patients who demonstrate resistance to mobility during hospitalization.

Participants expressed that witnessing patients ambulating in the hallways and getting out of bed confirmed their belief in early mobility. Caroline, a physician, reported, “you see [a patient] coming down the hallway with a mobility expert...then you can actually say, Yes! This definitely works.” Observing patients gaining more independence and endurance during illness resulted in staff wanting the program expanded to the other patient cohort on the unit. Rick, a nurse, reported dissatisfaction about the project ending: “it would be nice if it was continuing on in

the future.” Michael, a nurse, said, “I would roll the program out for more than the medical team that was served.” One nurse, Amanda, was quite enthusiastic in her support of the project: “I want to make sure I say that I want to get this full time on our floor.” Interestingly, staff began to identify patients not exposed to the program who would benefit from early mobility. Amanda, nurse, stated “I’ve had patients where I’m like Sally (mobility technician), I really wish you had this patient...they would really benefit from working with you.”

Patients knew that participating in the mobility program was the right thing to do, even when it was a challenge. William, a patient, said, “my leg is swollen, sore, and painful but I could hobble to the bathroom.” He later expressed he was surprised by the weakness he experienced, “just the acute weakness, I was not expecting to be that weak.” Susan agreed, saying, “it was hard some days due to health problems going on...that slowed me down. I had a few setbacks but not many.”

Early mobility was necessary for patient function

Both patients and staff recognized how important mobility and maintenance of physical function is during hospitalization. Loss of mobility and function resulted in patients feeling overwhelmed and frustrated. William, a patient, expressed that the experience was “extremely aggravating and a little bit scary” and “the first three days it was impossible to move.” Nancy, a patient, was initially uncertain about the experience because, “I have to have something or somebody right there...because I fall.” Patients could connect immobility with potential complications. William said, “I did not want to be bedridden...did not want to develop bedsores, leg weakness,

inability to get up and become institutionalized.” Susan described the significance of why she valued her experience with greater mobilization during illness. She stated, “it was important to get up because I have had a prosthetic since March of 2016...I was starting to get my freedom and then I felt like it was taken away.” She later explained that her ability to function connected to her quality of life, “it is not just for pleasure but to be able to do things.” Greg shared similar statements saying, “I think the quicker I get back to my routine, the better I will be and that is what I shoot for [with mobility].”

Staff believed the project prepared patients for discharge. Nurses described how the program helped patients regain independence with important tasks. Michael said, “the mobility program helped patients get to the point where they can go to the bathroom themselves.” Given that returning home after acute illness can be a difficult transition, Michael, a nurse, further explained his thoughts: “it helped patients feel psychologically safe enough for when they return home.” Rick, a nurse, echoed that sentiment saying, “I think the program prepared patients for discharge in a faster amount of time.” Amanda, a nurse, reported, “we had patients who were getting back to their normal baseline a lot quicker and improved their own confidence about what they were able to do.”

Early patient mobility and function helped staff and patients

Patients with greater functional independence and higher mobility level reduced nursing burden of care. Staff shared that their experience with the project improved their workload. Amanda, a nurse, reported, “When you have a patient who is just laying [in bed] it is harder to get them to the bedside commode or to the

chair.” She went on to say, “the benefits are that my patients do get up and move more on their own and they are able to alleviate some of their pain they do not realize is coming from laying in the same position.” Staff also felt more confident when assisting patients with mobility during the project. Margaret, a nurse, said, “it made me feel more comfortable doing what I needed to do with them.”

Patients shared similar views. Greg stated, “I like to do things on my own...I like to be independent and I just like to go. I like to be on the move.” The patients voiced a desire to get moving and described their first sessions with the mobility technician. William said, “I was wanting to get up and move around.” Nancy related her views to her diagnosis. “I have Parkinson’s disease so it is important that I keep active.” Susan had experienced a recent upper extremity fracture and felt she needed to be mobile to improve her balance. “I am new with a prosthetic and it is really important to balance.”

The early mobility project resulted in staff feeling supported in their ability to care for patients and reassured that a trained mobility technician was providing the optimal level of care. Having trained team members with specific expertise was a relief for staff. Rick, a nurse, reported, “just knowing that my patients are able to get up and walk with someone who is trained to assist them and evaluate their progress.” Amanda, a nurse, went on to explain, “it is nice to have the added support... when we are not able to [assist with mobility], we feel we are not properly caring for patients.” This frequently led to a conversation on existing barriers to daily mobility for patients on the unit prior to the project, which included conflicting

unit priorities, staffing levels, time availability and lack of specific mobility protocols.

Early mobility project created patient expectation

The level of participation from patients surprised staff members and patients expressed a commitment to higher levels of mobility with the program. Josie, a nurse, said, “we had a patient who was grumpy and just wanted pain medications. The mobility technician asked if she can work with him...the patient walked all the way to the nurses station and back!” Some patients even used their improved function to advocate for discharge. “They bragged...they were proud...and they tried to use [their success with mobility] to go home early,” Josie reported. Margaret, a nurse, further explained she was frequently surprised by patient’s participation saying, “the patient’s willingness to do it, how proud of themselves they were [after mobility sessions].” Staff frequently reported in interviews that patients looked forward to the mobility technician visits each day.

Patient participants suggested that the program tapped into existing internal motivation. Greg said, “I do not stay in bed at home...I get up early...I have a routine.” Susan further explained why she was motivated to participate. “I retired a year and a half ago and I am a real outdoors person.” William reported, “the talks [conversations] were motivating me to do more than before.” Even staff overheard how patients were gaining motivation over time with the program. Caroline, physician, said, “especially with obese people, she got them up and I can hear...the patient would say “you know, I think I can do more tomorrow.””

Providing an opportunity for patients to consistently engage in mobility and higher levels of activity created a patient expectation for mobility during hospitalization. Sally, a mobility technician, reported “there were expectations, the patients knew I was coming, they could depend on me and there was consistency.” When one patient experienced a hospital readmission during the mobility program but was admitted to the control group medical team, he sought out the mobility technician on the unit. Sally reported, “the patient had expected that I would walk with him when he came back to the hospital...he said he had been waiting all day for me!” Michael, a nurse, reported that patients asked about the program on the weekends, when the mobility technician was off work. “I had several patients on weekends ask “hey are we doing this [mobility] today?”

However, staff and patients frequently reported the mobility technician had unique skills suited for the task of assisting patients with mobility during illness. Rick, a nurse, stated, “she kept up her persistence.” Margaret, a nurse, said, “she is very upbeat and positive no matter what is going on...it out shines other stuff.” Susan, a patient, reported her experience with the mobility technician as positive because, “she had a plan worked out in her head for what we needed to do.” Caroline, a physician, wondered if her abilities would bias the project results, “That is one of the things that biased it, she had the personality.” Margaret, nurse, said, “she finds a way to communicate with everybody or something in common with everybody.” Participants revealed a positive attitude and friendly, encouraging demeanor was essential to the mobility technician role.

Discussion:

Our evaluation of this QI project, which used a lens focused on the shared experience of the staff and patients, revealed greater mobility and level of activity for general medicine patients filled an unmet need. Staff understood and supported early and increased opportunities for patient mobility during acute illness while reflecting on the challenges that typically inhibited mobility from occurring regularly without the QI program. Prioritizing mobility and higher levels of activity for patients served to improve staff workload and aligned with patient desires. Patients and staff members felt buoyed by trained experts (physical therapist and mobility technician) optimizing patient care. All participants expressed the importance of physical functioning either as it related to discharge from the hospital or their quality of life after illness. More importantly, when patients were consistently presented with assistance for mobility and increased levels of activity during acute illness, they participated at a high level and expected to continue that participation during their hospital stay.

These findings provide support to previous literature that patients are concerned about physical function after discharge.¹¹⁵ Our participants identified that mobility was essential to maintaining function and quality of life. Patients were not unaware of the risks of immobility during hospitalization but reported being overcome with the initial physical struggles and a sense of dependence. Patients' perception of their condition and awareness of risk in developing functional decline appeared to precede implementing strategies to maintain physical abilities and

autonomy during hospitalization.¹³⁰ Our mobility QI project created consistent opportunity for patients to engage their personal strategies and may have eliminated barriers. Three of the most common barriers to using personal strategies to prevent functional decline during hospitalization were found by Lafrenière et al.¹³⁰ Participants reported a fear of bothering staff and their reaction, not wanting to further overburden staff, and a negative perception tied to seeking or receiving help or feeling dependent on others.¹³⁰ Two previously independent patient participants in our study similarly expressed discomfort with seeking assistance. The primary role of the mobility technician was to offer and provide mobility assistance to patients, which removed that internal factor while tapping into participant personal strategies.¹³⁰ Our participants reported internal motivation to participate in mobility sessions based on previous experiences with successful rehabilitation, a desire to maintain their personal routines, and preservation of independence and quality of life.

Even with education and support for early mobility among staff, executing QI programs may be necessary to transform the clinical culture in support of greater patient mobility and level of activity. Our participants felt this project reinforced their knowledge and understanding of how mobility can benefit patients during acute illness. However, staff had not prioritized mobility on the unit before the mobility program, which is consistent with the existing literature. Mobilization in the form of ambulation was one of nine themes identified as regularly missed nursing care.⁷⁷ Responsibility for patient mobility during acute illness is another reason for the mobility gap during hospitalization. Although over fifty percent of

nurses claimed ambulation as a nursing responsibility in a recent study, the remainder attributed the responsibility to other professions.⁷⁶ Even when nurses believe mobility to be their responsibility, nurses have been found to use a conceptual model when deciding whether to assist older adults with ambulation.⁷⁵ They consider the purpose of the patient mobility, the patient's hospital trajectory, the subjective patient label given (nursing home patient versus community dwelling patient) and a general risk versus opportunity assessment before assisting patients with ambulation.⁷⁵ This subjective patient label is most concerning as patients labeled as nursing home patients were transferred to the next facility with little regard for new ambulation dependence while patients labeled as community dwelling patients were more frequently and consistently encouraged to ambulate.⁷⁵

The burden of making decisions on who and when to provide mobilization with patients was removed from nursing staff and the responsibility was transitioned to an additional team member. Increased observation, knowledge and awareness of patient functional status resulted in increased staff confidence when assisting patients with mobility on the unit and in providing report at shift change or to the next level of care. Staff additionally felt the mobility project and the mobility technician buoyed their efforts and care on the unit.

Four of the nursing staff participants had fewer than five years of clinical experience as a nurse. Significant differences have been found in perceptions of barriers to mobility during hospitalization when nurses have fewer than five years of experience.¹³¹ Nurses with less experience were less likely to view mobility as a

priority and more likely to perceive time constraints in mobilizing patients.¹³¹

Nurses with less experience also had lower perceptions on survey knowledge items related to receiving training and when to refer to physical and occupational therapy.¹³¹ The mobility QI project may have bolstered our participants with less nursing experience, leading staff to feel supported by the mobility project and the mobility technician's efforts to mobilize patients. Hearing the participants acknowledge how mobility in action deepened their understanding of its impact on patients could be key in continuing small cycles of change that result in clinical practice transformation.

The mobility technician had an approach used to engage patients in mobility and progress patients to higher levels of activity during sessions. All participants mentioned the mobility technician's ability to connect with each patient using a positive attitude, friendly demeanor, and skilled motivational techniques. The relational approach and encouragement provided by nursing staff has previously been found useful in maintaining physical abilities and autonomy, as well as promoting a positive outlook in patients.¹³⁰ It is unknown whether this approach and the encouragement given to patients must be provided by clinical staff such as nurses and mobility technicians or can be shifted to non-clinical staff, such as hospital volunteers. Other QI projects have used trained volunteers to mobilize older medical inpatients but little evidence exists related to this practice.⁸⁵ The mobility technician used for the majority of this mobility QI project had more than twenty years of experience as a rehabilitation technician assisting physical, occupational and speech therapists in an inpatient rehabilitation hospital. Our

findings suggest that greater clinical experience, a positive personality, and strong interpersonal skills were traits well suited to the role of a mobility technician in acute care.

Interestingly, we found that patients expected the mobility technician to provide assistance with mobility and higher levels of activity after repeated exposure during their hospital stay. Each week day intervention group patients were visited by the physical therapist and mobility technician, each providing a consistent message to promote achievement of recommended mobility to maintain their physical function. This positive patient expectation was likely related to the consistency and continuity of care provided by the mobility technician during the QI project. Continuity of care is associated with higher patient satisfaction in outpatient physical therapy.¹³² Unlike the rehabilitation staff, who rotate throughout the hospital on a quarterly basis at this facility or shift their weekday schedule to accommodate weekend coverage, the mobility technician remained constant from August to mid-November. A second mobility technician was utilized from mid-November to the completion of the mobility QI project. Further study is required to explore patient expectations related to mobility and higher levels of activity during mobility QI projects.

Elements of the project's success were attributed to three specific components. The leadership provided by the physical therapist/PI to organize and coordinate the mobility efforts was recognized. Clinical champions in other examples of mobility QI projects were also necessary to effectively make a

change.^{57,59} Teamwork and team communication among all members of the healthcare team was deemed vital. Participants mentioned that communication was necessary with a large number of individuals on the healthcare team and that both formal and informal communication fostered team building. Communication was believed to be partly responsible for how teamwork manifested during the project; for example, when multiple patient care responsibilities needed to occur with a patient during or before a mobility session. Conversation is essential to effective team coordination and “sense making” (pg. H02).¹³³ Healthcare professionals reach a shared understanding of patients through in-person conversation, strong relationships among team members and greater opportunities for face-to-face communication.¹³³ Finally, the training and expertise to recommend and facilitate increased mobility and level of physical activity with these patients was recognized. This is consistent with previous survey evidence in nurses and rehabilitation staff. Strong correlations were seen in responses related to receiving training in mobilizing patients and confidence to assist patients with mobilization.⁷³

Limitations:

The project was not without challenges; however, many were seen as modifiable. For example, the mobility technician worked an 8a-5p schedule but several participants noted that mobility during rounds was more challenging than in the afternoon. Frequent topics of conversation related to the allocation of resources for mobility, targeting patients with the greatest mobility needs, and the how to address needs in patients that show resistance to the help. Adaptations to the

mobility project methods in the future will be made based on this valuable feedback from participants.

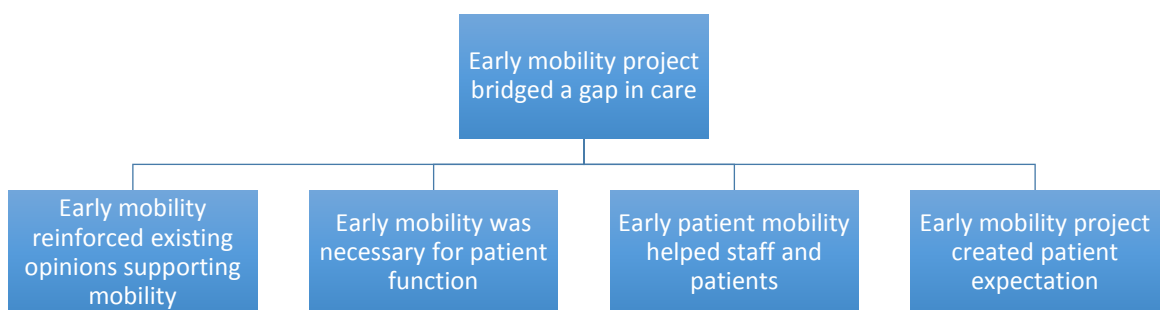
There were several limitations to this qualitative evaluation of the mobility QI project. First, interviews occurred only with patients who participated in the full intervention. No patients who declined to participate in mobility sessions were interviewed, as our gatekeeper for patient participants was the mobility technician. Interviewing patients who did not take advantage of the opportunity to be more mobile and achieve higher levels of physical activity would have significant value in determining how to adjust or target mobility interventions for those individuals. Other Project BOOST team members' voices were not included in the data, as the PI was concerned that being fully integrated into the rounding team would bias their responses. Second, the number of patient participants was small. Patient participants were typically interviewed after two or more sessions with the mobility technician. Interviews were scheduled without interference with medical care, mobility sessions, or other patient needs. Inevitably, challenges were experienced related to the PI's schedule and the timing of patient medical procedures, visitors, and their discharge to the next environment of care. Finally, case study research is not well recognized in the healthcare community and misconception of the method exists.^{117,126}

Conclusions:

The essence of our participants experience with increased mobility and higher levels of physical activity during hospitalization is that the mobility QI

project filled a gap in patient care. Simply knowing that mobility is important and necessary for patients to engage in during hospitalization does not create opportunities for patient mobility to occur. Both patients and staff benefitted from higher levels of mobility and physical activity. Mobility aligned with patients' preferences and their preparation for discharge. Staff members felt confident patient mobility needs were being met and could focus their attention on other patient needs. Finally, when patients were provided with consistent opportunities to mobilize and remain active during acute illness, they began to expect that as a significant piece of their daily care plan. Early mobility QI projects are necessary to implement small cycles of change needed to transform clinical practice and achieve improved quality of care.

Figure 4.1 Visual Representation of Themes



CHAPTER 5: MIXED METHODS CONCLUSIONS

Rationale for Mixed Methods

This project was designed and executed using a mixed methods case study approach to provide a more comprehensive evaluation of the quality improvement (QI) project implemented on a single general medicine unit. Mixed methods research is research in which the investigator collects and analyzes data, integrates the findings, and draws inferences using both qualitative and quantitative approaches or methods in a single study or program of inquiry.^{134,135} Physical therapy is a profession aimed at restoring physical function in patients who present with complex movement impairments influenced by personal, social and other contextual factors.¹³⁶ Mixed methods research has been encouraged as a method for physical therapists to broaden their depth of understanding illness, injury, and rehabilitation.¹³⁶ The evolving relationship between physical and psychosocial contextual factors that influence an individual's recovery is well matched to mixed methods research design as it provides context and aims to address "how" and "why" relationships between variables exist.^{136,137}

The strength of mixed methods lies in its ability to cross-validate results.¹³⁶ Quantitative research methods lack an understanding of context or setting when considering research questions. Qualitative research is believed to be subject to personal researcher bias and reduced generalizability as a result of smaller sample sizes.¹³⁸ The limitations of each individual method are offset by the strengths of the other method.¹³⁸ The combination of both quantitative and qualitative data provides

a deeper, more comprehensive understanding of the research problem than using one approach alone.¹³⁸ Mixed methods was chosen for this QI project as it is considered a practical approach to solving complex research problems.¹³⁸

Similarly, case study research allows the researcher to explain complex social phenomena.¹³⁹ Case study research is an empirical inquiry that investigates a contemporary phenomenon in depth and within the real world context, especially when the phenomenon and context may not be clearly evident.¹³⁹ This research approach retains a holistic, real-world perspective while providing in depth results of the case, which typically includes a large number of variables, the contextual conditions of the case, and how those contextual conditions extend over time.¹³⁹ The acute care setting is a dynamic, complex environment presenting with unique challenges and opportunities for quality improvement. A mixed methods case study approach appeared to be a natural fit to provide an enhanced understanding of how this early mobility QI project impacted patient outcomes and how patients and staff members experienced this clinical practice change.¹³⁸

Integration of results: Impact of the QI project

Using quantitative methods, results clearly showed the early mobility QI project improved patient outcomes. Observed hospital LOS decreased almost one full day for intervention group patients and 30 day same hospital all-cause readmission decreased 4.8%, which means fourteen fewer patients experienced readmission to UK Healthcare. Of equal importance given the recognition that functional status is associated with hospital readmission, patient functional status

improved from admission to discharge when patients participated in the full early mobility intervention. Finally, hospital cost savings were not insignificant. As a member of the transition of care team, the physical therapist promoted greater mobility and higher levels of activity of patients on the unit. The mobility technician, a lower cost employee, was responsible for facilitating patient achievement of the mobility recommendations. Not every patient requires the skills of a physical therapist during acute hospitalization but these patients have the potential to benefit from more mobility and higher levels of activity during acute illness. Cost savings from decreased patient observed LOS were identified and potential added savings from reduced readmission penalties is possible.

Unfortunately, these results failed to achieve statistical significance given the sample size. However, the study design was carefully chosen to implement change in the natural environment with a diverse patient population not seen in a controlled clinical trial. These quantitative results are exciting and reflect positive trends toward improved quality of care for hospitalized adults. Clinically, these results are recognized as meaningful, but how do these results translate into value for a patient or a staff member on the unit?

To answer this, we must turn to the findings from the embedded qualitative inquiry. Our goal was to describe the shared experience of patients and staff members exposed to the early mobility QI project. We found one overarching theme and four supporting themes reflective of participant's shared experience.

The early mobility QI project bridged a gap in care

More frequent and consistent communication of patient functional status and mobility level strengthened staff member's awareness and reporting of function.

Early mobility did not exist prior to the project and filled a necessary patient need.

The early mobility project reinforced existing opinions in support of mobility

It was clear that staff members shared or strengthened their opinion that early mobility and higher levels of activity helps patients. In some cases participants were so motivated and encouraged by the increased mobility they witnessed on the unit, they reported altering their clinical practice in support of greater patient mobility.

Early mobility was necessary for patient function

Patients and staff members shared a common sentiment: mobility was necessary to maintain function. The loss of mobility and function created overwhelmed and frustrated patients, while staff believed patients were more prepared for discharge to the next environment of care.

Early patient mobility helped staff and patients

Patients who had greater functional independence and engaged in higher levels of activity decreased the nursing burden of care, which led staff to feel supported by the project. Use of a trained mobility technician assured staff that patients were receiving optimal care.

Early mobility project created patient expectation

Staff was surprised at patients' level of participation in the project. Patients expressed commitment to higher levels of mobility with the project. Providing an

opportunity for patients to regularly engage in mobility led to a patient expectation for mobility during the hospitalization.

To determine the impact of this early mobility QI project, the quantitative results and the qualitative findings cannot be viewed independently. Both methods provide distinct data for a robust evaluation of the QI project. One statement best describes an integration of the evidence found: the early mobility project filled a gap in patient care and served to connect patient mobility and function during hospitalization to improved outcomes.

The early mobility project served to initiate small cycles of change necessary to transform a culture of immobility to a culture of mobility. In the short period of time during project implementation, there was a true change among patients and staff in support of patient mobility and function during hospitalization. Patients began to expect that mobility sessions were a significant part of their daily care plan. A physician was offering to help nursing staff assist patients with out of bed mobility. Nursing staff identified patients in need of mobility sessions. The project clearly set the stage for continued progress and interventions on the unit and beyond. The future of healthcare improvement rests on a collective ability of both the system and healthcare professionals to change and generate innovative care processes. This QI project generated small changes, which built support for continued and further expansion of mobility and promotion of function of adults during hospitalization.

Imagine a hospital where all members of the healthcare team treated a patient's functional status on admission as a vital sign of health. Imagine all

members of hospital staff viewed patient hospitalization as an opportunity to change a patient's trajectory of health by emphasizing and focusing on patient function during hospitalization and after. That is the future I imagine and will work toward. The implications from this QI project are widespread. Physical therapists can see how our leadership and collaboration with other members of the team can begin to shift the culture and improve patient outcomes. Rehabilitation colleagues, such as occupational therapists and speech language pathologists or others, can recognize similar opportunities in their practice to partner with teammates or lead QI projects to change traditional care processes to support patient function. Hospital administrators and leaders can see an opportunity to improve hospital efficiency and LOS index. Policymakers should take note: this project adds support to a growing number of QI projects with positive outcomes for hospitalized adults. The development of policies and procedures in support of increased patient mobility during hospitalization is on the horizon.

Future Research Directions

This research has prompted more questions and analysis to consider moving forward. First, I was unable to analyze the change in JH-HLM score from first mobility session to final session for intervention group patients. Examining the change in highest mobility level achieved each day would provide valuable information about mobility sessions and serve as a comparison to the change in AM-PAC scores from admission to discharge seen in this dissertation research. Second, I

plan to analyze this data further to determine how this intervention differs for patients with lower admission AM-PAC scores versus higher admission AM-PAC scores. It is unclear which patients had the greatest change in AM-PAC score from admission to discharge. Determining which patients had greater change in functional status from the mobility sessions may help determine the appropriate target population for these interventions. A major question prompted by this research is how do I target the most appropriate patients in need of mobility sessions and the most appropriate patients in need of skilled physical therapy services during hospitalization? Acute care clinicians are typically inundated by new patient consultations on a daily basis to provide discharge recommendations. Identifying which patients are most appropriate for mobility sessions versus physical therapy evaluation and treatment could improve the use of support personnel and skilled clinician resources in this environment of care.

Next, repeating this research at other Project BOOST sites and in new patient populations, specifically with higher acuity patients, is necessary to further evaluate the project's success. Larger patient populations and multiple sites will be needed to appropriately power this study in the future. Qualitative methods will include interviews with patients who decline or resist participation in mobility sessions. QI projects have the potential to expand hospital leadership's recognition that focusing

on and promoting patient function during hospitalization can improve quality of care and patient outcomes without increased hospital costs. Expanding this pilot research would be one step toward that goal. Finally, rehabilitation professionals have a unique opportunity to change a patient's trajectory of health during hospitalization, and there is much more research needed to explore that further. Our health care system presents many artificial barriers as patients move from setting to setting, but my research and that of other rehabilitation professionals will continue to focus on patient function across environments of care.

Ultimately, my goal is to be an agent of change in the acute care environment. This early mobility project was effective at initiating small cycles of change, characteristic of quality improvement efforts. Clearly, this project resonated with patient participants. Continued, sustained efforts are necessary in this environment to make mobility and functional status of hospitalized patients a priority to hospital systems.

Appendix A. AM-PAC “6 Clicks” Basic Mobility Short Form

AM-PAC Inpatient Basic Mobility Short Form

Boston University AM-PAC™ “6 Clicks” Basic Mobility Inpatient Short Form

Please check the box that reflects your (the patient’s) best answer to each question.

How much difficulty does the patient currently have...	Unable	A Lot	A Little	None
1. Turning over in bed (including adjusting bedclothes, sheets and blankets)?	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄
2. Sitting down on and standing up from a chair with arms (e.g., wheelchair, bedside commode, etc.)	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄
3. Moving from lying on back to sitting on the side of the bed?	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄

How much help from another person does the patient currently need...	Total	A Lot	A Little	None
4. Moving to and from a bed to a chair (including a wheelchair)?	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄
5. Need to walk in hospital room?	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄
6. Climbing 3-5 steps with a railing?	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄

Raw Score: _____

CMS 0-100% Score: _____

Standardized Score: _____

CMS Modifier: _____

Note: Use the AM-PAC [Basic Mobility Inpatient](#) Short Form Conversion Table to convert raw scores.

Johns Hopkins Highest Level of Mobility (JH-HLM) Scale

Updated: July 3, 2014

Background - A decline in functional status is common during acute care hospitalization. This decline can be mitigated through hospital-based early activity and mobility programs. An important component of such programs is the systematic measurement of patient mobility. We developed the Johns Hopkins Highest Level of Mobility (JH-HLM) scale to serve as a regular assessment of patient mobility.

Johns Hopkins Highest Level of Mobility (JH-HLM) Scale			
		Score	
↑ MOBILITY LEVEL	WALK	250+ FEET	8
		25+ FEET	7
		10+ STEPS	6
	STAND	≥1 MINUTE	5
	CHAIR	TRANSFER to CHAIR	4
	BED	SIT AT EDGE OF BED	3
		TURN SELF/BED ACTIVITY*	2
		ONLY LYING	1

*Bed activity includes passive or active range of motion, movement of arms or legs, and bed exercises (e.g., cycle ergometry, neuromuscular electrical stimulation).

The JH-HLM scale was developed based on input from multiple disciplines (nursing, rehabilitation therapists, physicians, etc.) for the following uses:

- To record the mobility that a hospitalized patient *actually* does, not what they are capable of doing. Documentation is based on observation and should reflect the highest level of mobility the patient performed since the last documentation. We recommend JH-HLM documentation twice daily, during waking hours, on all patients.
- To standardize the description of patient mobility across multi-disciplinary providers (i.e. physicians, nurses, rehabilitation therapists, support staff).
- To set individual patient mobility goals during hospitalization (e.g. move up 1 step on the scale tomorrow).
- A performance measure for quality improvement projects aimed at promoting patient mobility.

Case examples of JH-HLM scoring:

- A nurse assumes care of a patient at 8am, after which the patient ambulated to the bathroom (estimated at less than 25 feet) with assistance of walker and another staff member. Otherwise, the patient has been sitting in the chair watching TV since last assessment.
Correct JH-HLM: 6
- A patient takes 3 steps from the bed to the commode.
Correct JH-HLM: 5 (if patient stood ~~10~~ minute during this mobilization), otherwise 4.

Appendix C. Sample Qualitative Interview Questions

Patient Questions:

1. Can you describe your experience getting out of bed while you feel sick?
2. What was your initial reaction to staff helping you get up and moving? Was it positive or negative or both?
3. Can you describe what is challenging about getting moving while you are sick in the hospital? Can describe what is not challenging? Did anything surprise you about the experience of getting out of bed and moving in the hospital?
4. Can you describe how you view this illness/sickness you have been experiencing when you get up and moving with the staff here? Has there been any change in how you feel about your illness/sickness?

Staff Questions:

1. Describe your opinion of early mobility and mobility for patients during hospitalization. Did your opinion of early mobility and mobility for patients during hospitalization change in anyway? If so, please describe.
2. In what ways has this early mobility and mobility project helped to make staff more aware of patients' functional status during hospitalization? Please describe.
3. Can you describe anything you noticed as different in patients who participate in the mobility project compared to patients you treated a year ago who did not participate in the project? How do you account for these differences? Please describe.
4. What challenges did you experience related to patient mobility and functional status during the project and how did you overcome those challenges? What benefits have you experienced during the project? What do you attribute the benefits to? Can you describe anything that surprised or shocked you about your experience with the project?
5. What do you believe worked well about this project to support early mobility and continued mobilization during hospitalization? What has not worked well? Is there anything you would change about the project in the current form?

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**Curriculum Vitae
Audrey M. Johnson**

General Information

Education

University of Kentucky

Rehabilitation Science PhD – December 2017

Doctor of Physical Therapy – August 2010

Master of Science in Physical Therapy – August 2007

Bachelor of Health Sciences – May 2007

Academic Experience

**Lecturer – University of Kentucky College of Health Science Division of Physical Therapy
August 2017- Present**

**Teaching Assistant – University of Kentucky College of Health Sciences 2013 – July 2017
Division of Physical Therapy**

Other Professional Experience

**University of Kentucky Amyotrophic Lateral Sclerosis (ALS) Clinic - Dr. Edward Kasarkis
(August 2015-Present)**

Cardinal Hill Rehabilitation Hospital Lexington, KY (March 2013 - June 2015)

Fusion Medical Staffing (August 2011 - December 2012): Travel Physical therapist position in Washington State and Kentucky.

Auburn Regional Medical Center Auburn, WA

Golden Living Center Stanford, Stanford, KY

Jewish Hospital Shelbyville, Shelbyville, KY

Georgetown University Hospital Clinician I Washington, D.C. (Oct 2007 - August 2011):

Peer Reviewed Publications

Audrey M. Johnson & Dana M. Howell (2017) International service learning and interprofessional education in Ecuador: Findings from a phenomenology study with students from four professions, *Journal of Interprofessional Care*, 31:2, 245-254.

Johnson AM, Henning AN, Morris PE, Tezanos, AGV, Dupont-Versteegden EE. Timing and amount of physical therapy treatment are associated with length of stay in the Cardiothoracic ICU. *Sci Rep*. 2017 Dec 14;7(1).

Johnson AM, Kuperstein J, Howell D, and Dupont-Versteegden EE. Physical therapists know function: an opinion on mobility and level of activity during hospitalization, *in review*.

Honors and Awards

Awarded the ***College of Health Sciences Marie C. Vittetoe Award for Excellence in Service*** (May 2007). This is awarded to a student in the College of Health Sciences who demonstrates outstanding service nationally or internationally.

Awarded the ***College of Health Sciences Robinson Graduate Award for Research Creativity*** (March, 2017). This is awarded to a graduate student in the College of Health Sciences who demonstrates and engages in productive and successful scientific research.