Methods for Improving Quality of Care within Acute and Post-Acute Settings

Kelly L. VanKoevering

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METHODS FOR IMPROVING QUALITY OF CARE
WITHIN ACUTE AND POST-ACUTE SETTINGS

by

Kelly L. VanKoevering

A dissertation submitted to the Graduate College
in partial fulfillment of the requirements
for the degree of Doctor of Philosophy
Interdisciplinary Health Sciences
Western Michigan University
June 2020

Doctoral Committee:
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Ben Atchison, Ph.D, OTR/L
METHODS FOR IMPROVING QUALITY OF CARE
WITHIN ACUTE AND POST-ACUTE SETTINGS

Kelly L. VanKoevering, Ph.D.

Western Michigan University, 2020

According to the Centers for Medicare and Medicaid (CMS), over the next 7 years, U.S. national healthcare spending is projected to grow at an average of 5.7% per year, up from 4.8% in 2019. Additionally, personal health care cost is expected to increase by 2.7% per year. As a result, there have been increased efforts among healthcare systems and hospital organizations to improve quality of care while decreasing healthcare cost. The research reported in this dissertation builds upon the existing literature regarding interventions to improve hospital performance and quality metrics. Two of the most researched and effective strategies for improving hospital performance and quality of care include predictive modeling and care coordination. Predictive models utilize historical data to predict the probability of an outcome, while care coordination organizes information among health care providers to deliver appropriate services to a patient. One aim of this research was to explore modifiable risk factors associated with quality metrics utilizing predictive modeling. A second aim was to explore the role of occupational therapists (OTs) in care coordination. Effective care coordination has been shown to lead to better patient outcomes and decreased healthcare costs.

The first two studies examined a national database of more than 800 inpatient rehabilitation facilities (IRFs) to determine patient characteristics predictive of discharge location. An IRF, considered a post-acute facility, is useful in examining modifiable risk factors and quality
metrics due to its intensive rehabilitation of patients with various medical conditions. The source of data was the Functional Independence Measure (FIM®), a criterion-referenced measure of disability consisting of 18 items designed to assess the level of assistance an individual requires to perform activities of daily living (ADL). The studies examined how change in function as depicted by FIM® scores, as well as patient characteristics, could predict discharge location from the IRF. Additionally, a third study involved a survey examining OTs’ use of occupational or functional performance assessments in relation to care coordination and discharge planning.

The findings from the first two studies revealed the self-care FIM® subscale scores on admission were an important factor in determining discharge location when only function was considered in the predictive model. When patient characteristics, functional status (depicted by the FIM®), and diagnoses were considered, the admission FIM® motor subscale was the greatest predictor of discharge location followed by the cognitive FIM® subscale across the top five rehabilitation impairment groups (stroke, brain injury, spinal cord injury, neurological impairment, and orthopedic injury).

The results from the survey indicated OTs utilize an occupational or functional performance assessment for discharge planning and participate in many care coordination activities including advocacy, caregiver education/training, and equipment recommendations. This suggests members from the interdisciplinary rehabilitation team, including OTs, may have a role in discharge planning and care coordination such as family education and interprofessional communication. Further research should continue to examine rehabilitation professionals’ role in care coordination and improving hospital performance, thus impacting quality metrics and healthcare costs.
ACKNOWLEDGMENTS

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To my family and friends, thank you for your patience, endless encouragement, and support over the last four years. I could not have completed this program without all of you. I would also like to thank the Interdisciplinary Health Sciences Cohort: so many of you have become like family. Thank you for the continued support throughout this process! Most importantly, to my family, thank you for the inspiration, guidance, and input. I am eternally grateful to my mom, dad, brother (Kyle) and sister-in-law (Meredith) for the confidence to continue this quest! Thank you to my niece and nephew for bringing me joy throughout the process!

Kelly L. VanKoevering
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CHAPTER 1

INTRODUCTION

Following the establishment of the Affordable Care Act in 2010, there have been widespread efforts to reduce excess hospital expenses. Hospitals now face financial penalties (i.e., a reduction in reimbursement) if quality metrics such as readmission rates, length of stay, and discharge location (e.g., home/community or rehab facility) are not met.\textsuperscript{1,2} According to the Centers for Medicare and Medicaid (CMS), in 2018 alone the United States spending for hospital associated care increased by 4.5%, with a large portion of this spending ($17.4 billion) linked to potentially avoidable cost.\textsuperscript{3} As a result, new regulatory standards such as the Inpatient Quality Reporting Program (IQRП) have been implemented to monitor and evaluate quality metrics, safety, and/or resource use.\textsuperscript{3} The current research supports a variety of methods that improve hospital performance and are linked to quality metrics. Predictive modeling and care coordination are two interventions found to be effective in evaluating hospital performance and quality of care. Predictive models forecast the probability of an outcome such as readmission rates or discharge location utilizing historical or previously collected data. Care coordination is the act of organizing a patient’s care and sharing information among health care providers to deliver appropriate services.\textsuperscript{4} Additional evidence supports the use of a multidisciplinary approach—which includes members from the rehabilitation team—within these methodological interventions to improve health outcomes, quality, and hospital performance.\textsuperscript{5,6} However, there is limited evidence regarding the influence of the rehabilitation team, specifically occupational
therapists, in reducing modifiable risk factors associated with quality metrics through predictive models and care coordination.

**Predictive Models**

Predictive models identify patterns utilizing patient and facility variables to forecast quality metrics, with the goal to develop interventions that will result in positive patient outcomes. Current evidence supports the use of predictive models utilizing modifiable risk factors to predict hospital readmissions, patient falls, and discharge location.\(^1\)\(^-\)\(^3\),\(^7\) Examples of risk factors include functional status, facility information, and comorbidities. Shih et al.\(^1\) found predictive models which examine a patient’s functional status in addition to comorbidities and demographics outperform models that include only patients’ comorbidities and demographics as predictors for 30-day acute care readmissions. Findings also suggest a patient’s motor functional status at admission is a stronger predictor than cognitive status in predicting length of stay, discharge disposition (home versus skilled nursing facility) and readmission.\(^7\)\(^-\)\(^9\) Although the discriminative capability of current predictive models is varied, Kripalani, Theobald, Anctil, and Vasilevskis\(^3\) suggest the utilization of predictive models can identify high-risk patients and possibly assist with the development of a multifaceted plan of care, thus reducing avoidable readmissions, improving quality of care, and decreasing healthcare cost.

**Care Coordination**

As noted above, care coordination is a method for helping to improve hospital performance and quality metrics, such as readmission rates. Care coordination helps to facilitate transitions between the next level of care (i.e., home, rehabilitation facilities, etc.) through activities such as medication management, patient/family education, and facility transfers. Nineteen to twenty-
three percent of patients suffer an adverse event, half of which are considered preventable.\textsuperscript{10} However, care coordination has been shown to decrease preventable adverse events and unfavorable symptoms associated with medical intervention.\textsuperscript{10} The literature demonstrates a relationship between care coordination and quality metrics, including a reduction in hospital readmissions, lengths of stay, and emergency department visits as well as decreased complications due to chronic conditions.\textsuperscript{11–13} Conversely, the lack of care coordination results in medication errors, service duplication, and increased cost.\textsuperscript{14} A systematic review by Burke and colleagues\textsuperscript{15} found a combination of several care coordination interventions (i.e., medication safety, advance care planning, promotion of self-management, etc.) is required to demonstrate a statistically significant reduction in hospital readmissions, improve patient education, and engagement in community resources. Kripalani, Theobald, Anctil, and Vasilevskis\textsuperscript{3} suggest an interdisciplinary discharge team may further assist with reducing preventable adverse events by assessing the needs of a patient and coordinating follow-up treatment post-discharge, thus positively impacting quality metrics and potentially reducing healthcare cost.

**Inpatient Rehabilitation Facilities**

The inpatient rehabilitation setting, considered a post-acute facility, provides intensive, interdisciplinary, and therapeutic services to individuals who have sustained a complex medical event. The inpatient rehabilitation facility (IRF) accounts for a substantial portion of hospital readmission rates, with an average of 13.06\% of patients readmitted within 30 days.\textsuperscript{1,10} Furthermore, the rate of readmissions within post-acute settings has increased by 30\% since 2000.\textsuperscript{10} An IRF is useful in examining modifiable risk factors and quality metrics due to its emphasis on the rehabilitation of patients with various medical conditions. Implementation of
regulatory standards such as the IRF Quality Reporting Program (QRP) and the Improving Medicare Post-Acute Care Transformation (IMPACT) Act has influenced reimbursement policies, thereby impacting hospital-level practices in the post-acute setting. The IMPACT Act mandates the assessment of functional domains including self-care, mobility, and cognition, which are largely rehabilitation discipline-specific (mobility – physical therapy; self-care – occupational therapy; cognition – occupational and/or speech/language therapy). The Functional Independence Measure (FIM®) is one of many outcome tools utilized by rehabilitation professionals within the inpatient rehabilitation setting to evaluate functional performance including mobility, self-care, and cognition. The FIM®, a criterion-referenced measure of disability, consists of 18 items designed to assess the level of assistance an individual requires to perform activities of daily living (ADL). Currently, there is limited evidence regarding the use of the FIM® within diagnosis-specific predictive models and the influence of the interdisciplinary rehabilitation team on hospital quality metrics. Information regarding an individual’s risk for rehospitalization or discharge disposition utilizing function (as depicted by the FIM®) and diagnosis may further assist multidisciplinary interventions.

**Significance of the Research**

Although predictive models and care coordination are the most researched interventions addressing quality metrics, the results are varied. Few studies have considered the influence of the interdisciplinary rehabilitation team on hospital quality outcomes utilizing predictive models and care coordination. Research suggests that hospital strategies and interventions to improve patient results and reduce reimbursement penalties should be multifactorial. A systematic review reported that multifaceted discharge interventions (i.e., patient education, early discharge planning,
dedicated social worker/care manager, etc.) are more likely to reduce the risk of hospital readmissions versus singular interventions. However, current evidence is inconclusive on how to best evaluate modifiable risk factors and hospital-level practices associated with patient quality and safety within the acute and post-acute settings.

**Purpose**

This dissertation consists of three studies which aim to explore how rehabilitation professionals can potentially reduce modifiable risk factors associated with quality metrics through predictive models and care coordination. The first study examined the use of the Functional Independence Measure® (FIM®) in predicting discharge location. A retrospective study utilizing data from the Uniform Data System for Medical Rehabilitation (UDSMR) analyzed the impact of the FIM® on hospital-level practices and quality metrics. The FIM®; an 18-item assessment, was classified into three subscales based on the functional domains consistent with the IMPACT Act (self-care, mobility, and cognition) according to three discharge locations (home, skilled nursing facility, and acute care). Further knowledge of the change in function through FIM® subscales may improve care coordination, patient outcomes, and hospital protocols.

The second study explored variables including the 18 individual FIM® items and patient demographics to determine the greatest predictors of discharge disposition from IRFs among the top five primary diagnoses. The top five impairment groups include: (1) stroke, (2) traumatic brain injury (TBI), (3) spinal cord injury (SCI), (4) neurological impairment, and (5) orthopedic injury. By examining predictive variables across the top five diagnoses, the results may improve and expand the role of rehabilitation professionals in care coordination and discharge.
The third and final study investigated how occupational therapists currently utilize functional outcome measures to assist with care coordination and discharge planning. The study surveyed a sample population of occupational therapists working within the acute and post-acute settings regarding their use of occupational or functional performance assessments to assist with discharge planning. Furthermore, the survey explored occupational therapists’ role in coordinating transitions of care (i.e., communication with interdisciplinary team, family education, etc.) by evaluating and addressing complex tasks required for independent living.

**References**


CHAPTER 2

PREDICTING DISCHARGE DISPOSITION FROM INPATIENT REHABILITATION USING THE FIM®

Introduction

New regulatory standards aimed at decreasing costs are placing hospitals and post-acute services under increased scrutiny. As a result, increased efforts towards reducing modifiable risk factors related to patient quality and safety have become a priority within many facilities.\textsuperscript{1,2} Metrics such as readmission rates, discharge disposition, length of stay, infections, and pressure ulcers are considered indicators for reimbursement and measures of quality.\textsuperscript{3} Furthermore, hospitals face financial penalties if quality metrics, such as readmission rates, are higher than expected, leading to a number of studies and predictive models aimed at reducing these risks.\textsuperscript{1,2} Hospitals with higher than expected readmission rates are penalized a percentage of their total CMS reimbursement, beginning at 1\% in year 1 of the program, up to 3\% in year 3. These financial penalties have produced the intended outcome of intensifying hospital efforts to reduce excess readmissions. Few studies have considered the influence of the interdisciplinary rehabilitation team, specifically therapists, on practices within a post-acute facility related to patient outcomes and safety, and their overall impact on reimbursement.

An inpatient rehabilitation facility (IRF) provides intensive, interdisciplinary, therapeutic, and function-based services to individuals who have sustained a complex medical event. For the purpose of this study, function was defined as real world activities, including but not limited to an individual’s motor, cognitive, and self-care abilities. The focus of inpatient rehabilitation includes “patient/caregiver education, durable medical equipment training, and other similar
therapeutic activities] that prepare the patient for a safe discharge to the home or community-based environment. An interdisciplinary team typically consists of a physiatrist; physical, occupational, and/or speech therapist; nurse; and prosthetist and/or orthotist. Due to the multifaceted and complex rehabilitation continuum, treatment often begins in the acute care hospital and continues after discharge to home or the next level of care (e.g., skilled nursing facility, long term care, assisted living facility, etc.).

CMS reports 370,000 annual admissions to IRFs, with an average readmission rate to the acute care hospital of 13.06%. Although the median hospital length of stay has decreased, hospital readmission rates have demonstrated an upward trend over the last few years. The establishment of the Affordable Care Act, the IRF Quality Reporting Program (QRP), and the Improving Medicare Post-Acute Care Transformation Act (IMPACT Act) have influenced post-acute care providers and facilities. The IMPACT Act has also mandated the assessment of functional domains including self-care, mobility, and cognition within post-acute settings. The inpatient rehabilitation setting is useful in examining modifiable risk factors and quality metrics based on the provider’s clinical assessment and the variety of diagnoses observed.

The Functional Independence Measure (FIM®) is one of the many measures utilized within the inpatient rehabilitation setting to evaluate patient performance. The FIM®, a criterion-referenced measure of disability, determines level of independence and quantifies burden of care or assistance needed (from another individual) in number of hours per day for the home or community setting. Several studies have demonstrated the validity and reliability of the FIM® instrumentation, which consists of 18 items designed to assess the level of assistance an individual requires for performing activities of daily living (ADL). The FIM®, created by the
Uniform Data System for Medical Rehabilitation (UDS<sub>MR</sub>), has now been adopted for financial and regulatory purposes.\textsuperscript{10}

Various FIM® scores have been utilized in predictor models, such as the admission/discharge FIM® scores, total or functional subscale scores.\textsuperscript{1,11–16} Several studies have demonstrated motor FIM® scores at admission are a stronger predictor than cognitive FIM® scores, impacting length of stay, discharge disposition, and readmission rates across multiple impairment groups (stroke, neurologic conditions, spinal cord injury, amputation, pulmonary, and cardiac).\textsuperscript{17–19} Patients dependent for mobility (transfers and locomotion), self-care (grooming, dressing, bathing, toileting, and sphincter control) and cognition at discharge had increased odds of rehospitalization of 50\%, 36\%, and 19\%, respectively.\textsuperscript{8} Individuals most likely to discharge to home were independent with transfers, locomotion, and sphincter control, requiring less than 50\% assist for all functional tasks.\textsuperscript{20} Furthermore, literature suggests that FIM® motor scores are a stronger predictor than cognitive FIM® scores, impacting length of stay, discharge disposition, and readmission rates across multiple impairment groups (stroke, neurologic conditions, spinal cord injury, amputation, pulmonary, and cardiac).\textsuperscript{17–19} Bottemiller, Bicber, Basford, and Harris\textsuperscript{21} found that individuals with total FIM® scores less than 40 points at admission and discharge (63\% and 78\%, respectively) were likely to be discharged to a facility, while those with scores greater than 80 points were likely to discharge to home (80\%).

The rehabilitation team of an IRF has a unique role in influencing patient function. Working within an interdisciplinary framework, occupational therapists focus on tasks that assist in helping patients avoid risks associated with self-care, mobility, and cognitive deficits, as well as providing education to families and caregivers regarding home set-up, safety, and adaptive equipment.\textsuperscript{22} Studies have shown that occupational therapy’s role in comprehensive discharge
planning, cognitive, and physical training has decreased readmissions. According to Smith, Fields, and Fernandez, patients are 2.9 times more likely to be readmitted to the hospital when follow-up services are not in place at the time of discharge or recommendations made by the physical therapist are not implemented. The rehabilitation team develops a patient-centered plan of care, focused on strength, endurance, mobility, safety, cognition, and engagement in ADL.

There is currently no consensus on the FIM® score that best predicts hospital readmissions or additional quality metrics. Research studies have utilized the total FIM® score or the motor and cognitive subscales to predict hospital or acute care readmissions within an impairment-specific population. Individual FIM® scores, FIM® efficiency, and FIM® change have also been utilized to measure and assess function. Few studies have assessed the influence of the three FIM® subscales on discharge disposition. Findings have been further limited by small sample sizes and specific impairment populations, impacting generalizability. Recent evidence continues to show that patient function, as described by the FIM®, is related to hospital outcomes. This suggests that by improving function, rehabilitation therapists have the ability to positively affect outcomes. Understanding the change in function through FIM® subscales has the potential to improve care coordination, patient outcomes, and hospital protocols.

The aim of this study was to determine which FIM® subscale effectively predicted discharge disposition from inpatient rehabilitation facilities. To achieve this goal, the study examined the three FIM® subscales (self-care, mobility, and cognition) according to discharge disposition (home, acute care, and skilled nursing facility).
Methods

Study Design, Setting, and Population

The study utilized a retrospective design. De-identified, secondary data were obtained and analyzed from the UDS\textsubscript{MR} database. UDS\textsubscript{MR} is responsible for maintaining the largest body of data on rehabilitation outcomes, including FIM® data, for more than 800 IRFs nationwide, which represents approximately 70\% of the industry.\textsuperscript{1,10} The UDS\textsubscript{MR} utilizes processes to uphold data quality, detect inconsistencies, and monitor for FIM® rating accuracies.\textsuperscript{1,10} To monitor for accuracy and inconsistencies, UDS\textsubscript{MR} examines the data for individual FIM® gains within three standard deviations above or below the expected gain.\textsuperscript{10} UDS\textsubscript{MR} also records FIM® admission and discharge scores, FIM® change scores, length of stay, discharge location, and 30-day readmissions to the acute hospital.\textsuperscript{10} These items are used in measuring a patient’s functional status, predicting resource needs, cost, and monitoring quality assessments.\textsuperscript{10} The data set included the IRF-Patient Assessment Instrument (IRF-PAI) which consisted of demographics, functional, medical, and facility data for patients in the United States from 2006 through 2016. Adults ages 18 years or older admitted to an IRF classified according to the RIC classification system were included in the study. Individuals whose IRF stay was interrupted or who died during an admission were excluded from the study. The study was considered exempt by the Western Michigan University Institutional Review Board (see Appendix A).

Outcome Measures

The Functional Independence Measure® consists of 18 items, each of which is measured on a scale of 1 to 7, with 1 indicating total assist and 7 indicating independence. The FIM® is composed of motor, cognitive, and sphincter subscales. Items are summed to create subscale and
total scores, which can be translated into hours of assistance required per day (or burden of care). For example, a raw FIM® score of approximately 60 requires 4 hours of assistance per day. The total summed score ranges from 18 to 126, with lower scores representing poorer function. FIM® instrument scores are obtained within 72 hours of admission and 24 hours of discharge, indicating a standardized measure of function. For the purpose of this study, the FIM® subscales were classified based on the functional domains identified within the IMPACT Act (self-care, mobility, and cognition). The three FIM® subscales and associated FIM® items are: (1) motor (locomotion, stairs, and transfers), (2) self-care (bathing, toileting, upper and lower body dressing, and grooming as well as bowel and bladder management), and (3) cognition (social interaction, problem solving, memory, comprehension, and expressive communication). Admission subscale scores were utilized to evaluate functional status within the predictive model, with a potential for rehabilitation personnel to influence or improve patient outcomes. Previous literature by Pretz et al.26 also demonstrated three FIM® subscales representing self-care, mobility, and cognition through a unidimensional Rasch model development.

**Data Analysis**

The data was examined, and descriptive statistics were computed, including the central tendencies for the independent variables. The independent variables included the three FIM® subscales (self-care, motor, and cognition). The outcome variable was discharge disposition and included three levels: home, skilled nursing facility, and acute hospital. Discriminant analysis was performed to predict discharge location based on function. By examining functional performance, rehabilitation personnel may be able to assist in improving patient outcomes and
influencing hospital-level practices such as readmission to the acute hospital (discharge location). IBM SPSS Statistics Version 24 was utilized for statistical analysis.

**Results**

Between 2006 and 2016, there were 4,789,557 individuals admitted to inpatient rehabilitation facilities within the UDS$_{MR}$ database. Table 2.1 depicts the demographics and overall characteristics of the sample population. A discriminant analysis was conducted to determine which FIM® subscale discriminated between the three discharge locations.

<table>
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<tr>
<td>Age (years)</td>
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</tr>
<tr>
<td>Male (%)</td>
<td>44.3</td>
</tr>
<tr>
<td>Female (%)</td>
<td>55.7</td>
</tr>
<tr>
<td>Race/Ethnicity (%)</td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>77.6</td>
</tr>
<tr>
<td>Black</td>
<td>11.5</td>
</tr>
<tr>
<td>Hispanic</td>
<td>5.7</td>
</tr>
<tr>
<td>Other</td>
<td>5.2</td>
</tr>
<tr>
<td>Facility Information</td>
<td></td>
</tr>
<tr>
<td>LOS (days)</td>
<td>13.76</td>
</tr>
<tr>
<td>Total Admission FIM® score</td>
<td>57.5</td>
</tr>
<tr>
<td>Total Discharge FIM® score</td>
<td>83.8</td>
</tr>
</tbody>
</table>

The characteristics of the independent variables between discharge locations are compared in Table 2.2. The homogeneity test of equality of covariance was violated (Box’s $M = p \leq .001$); however, this is attributed to the large number of observations. The assumption of equal variance was met by examining the standard deviations of the independent variables. Results from the discriminant analyses demonstrated statistically significant ($p \leq .001$) results for all three subscales, indicating the FIM® subscales are predictive of discharge location. The self-care subscale demonstrated the largest predictive power, with a canonical correlation of 0.900.
Table 2.2. Comparison of Mean Scores Between Independent Variables and Discharge Locations

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Home</th>
<th>Acute</th>
<th>SNF</th>
</tr>
</thead>
<tbody>
<tr>
<td>(mean ± SD)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-care subscale</td>
<td>28.98 ±</td>
<td>21.98 ± 8.99</td>
<td>20.38 ±</td>
</tr>
<tr>
<td></td>
<td>8.74</td>
<td>8.31</td>
<td></td>
</tr>
<tr>
<td>Motor subscale</td>
<td>11.55 ±</td>
<td>8.63 ± 3.82</td>
<td>7.89 ±</td>
</tr>
<tr>
<td></td>
<td>4.44</td>
<td>3.44</td>
<td></td>
</tr>
<tr>
<td>Cognition subscale</td>
<td>24.80 ±</td>
<td>20.30 ± 7.92</td>
<td>19.01 ±</td>
</tr>
<tr>
<td></td>
<td>7.23</td>
<td>7.61</td>
<td></td>
</tr>
</tbody>
</table>

*Note. SD = standard deviation*

The motor subscale was the second most predictive variable in predicting discharge location, followed by the cognitive subscale with canonical correlations of 0.766 and 0.713, respectively. The overall classification accuracy was 86.6%, suggesting discharge location predictions were correctly classified for the majority of cases (Wilks $\lambda = .895$, df = 6, $\chi^2 = 345973.27$, $p \leq .001$). The classification results indicate that 99.7% of patients discharging to home were correctly classified using the independent variables; however, 0% were correctly classified for discharge to acute care and only 1.9% to skilled nursing facility. Table 2.3 demonstrates the structural coefficients for the predicted discharge locations.

Table 2.3. Predicted Group Membership

<table>
<thead>
<tr>
<th>Variable</th>
<th>Home</th>
<th>Acute Hospital</th>
<th>Skilled Nursing Facility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home</td>
<td><strong>2691858 (99.7%)</strong></td>
<td>0</td>
<td>9246 (.3%)</td>
</tr>
<tr>
<td>Acute Hospital</td>
<td>180002 (97.7)</td>
<td>0</td>
<td>4281 (2.3%)</td>
</tr>
<tr>
<td>Skilled Nursing Facility</td>
<td>224276 (98.1%)</td>
<td>0</td>
<td><strong>4249 (1.9%)</strong></td>
</tr>
</tbody>
</table>

*Note. Bold numbers represent the original grouped cases, which were correctly classified by the predictor variables.*
Discussion

Various functional risk factors have been reported as predictors associated with discharge location. In particular, the FIM® has been utilized as a measure of function to predict quality metrics, including discharge location. The FIM® is one of the most widely used outcome measures in the IRF setting; however, to our knowledge this is one of the few studies to use discriminant analysis to predict discharge location using the FIM® subscales. The FIM® measures the severity of disability and allows rehabilitation professionals to assess functional activities, effectively and efficiently. The aim of the present study was to determine which admission FIM® subscale predicts discharge location in order to assist with clinical decision making and establish benchmark criteria.

The findings from the discriminant analysis suggest the self-care subscale scores on admission are an important factor for determining discharge location. Furthermore, these scores indicate independence in personal activities such as bathing, toileting, and dressing are important clinical factors for discharge planning. In a small study of patients with severe stroke, Mokler et al., reported discharge destination was associated with admission self-care FIM® items including bladder management and toilet transfers with up to 75% accuracy. This may suggest that rehabilitation professionals—specifically occupational therapists focusing on activities of daily living (ADLS)—have an important role in influencing and providing appropriate recommendations for discharge. The admission motor subscale was the second most predictive variable in the model, followed closely by the cognitive subscale. Previous literature suggests the motor subscale, which includes transfers and mobility, demonstrates statistically significant differences between admission and discharge FIM® scores but inconsistent results regarding its association with discharge location or length of stay. Research regarding the predictive power of the FIM®
cognitive scores remains inconclusive. For example, in a study using admission FIM® scores, Nguyen, Page, Aggarwal, and Henke\textsuperscript{30} found lower admission cognitive scores (less than 25 points) was associated with a higher probability of discharging to a SNF. However, Denti et al.\textsuperscript{31} found the cognitive FIM® subscale was the greatest contributor to discharge disposition in patients with stroke; indicating diagnoses may be an important consideration for predictive models. Further research is required for determining the predictive power of the cognitive FIM® scores.

Individuals discharging to home were classified 99.7\% correctly; however, those discharging to the acute hospital and skilled nursing facilities were poorly classified. This may be associated with the unequal group sizes; over three-fourths of the sample were unequally proportioned into the home discharge location. Future studies should address the limitation related to unequal group sizes as well as provide further understanding of which characteristics better discriminate between discharge to the acute hospital and SNF in order to prevent readmissions and improve discharge home.

Black, Solitis, and Bartlett\textsuperscript{27} found in addition to functional status (as measured by the FIM®), social support or the availability of caregivers were more likely to be found among patients discharged home. Future studies should consider examining individual FIM® items as well as differences among impairment groups, and other characteristics such as prior level of function, social support, and home set-up. A more predictive model will assist rehabilitation personnel in improving patient outcomes and influencing hospital level practices.
Limitations

There are several limitations to this study. The study did not control for confounders or consider additional comorbidities or risk factors. Based on previous literature, functional status has been identified as more significant when compared to comorbidities and demographics in predicting quality metrics.\(^1\) However, future studies should consider additional characteristics such as diagnoses, prior level of function, insurance, and social support upon discharge. Another limitation was the proportionally unequal group sizes of the dependent variable, which may have impacted the results. A greater number of individuals were discharged home compared to the acute hospital and skilled nursing facility. The study also utilizes the inpatient rehabilitation population; patients are selected based on the presence of modifiable functional impairments; therefore, a selection bias may be present.\(^1\) However, inpatient rehabilitation facilities collect functional data routinely, supporting the aims of the study. Beginning in the year 2019, the updated IRF Prospective Payment rule aimed to alleviate the administrative tasks associated with the FIM® instrument and removed the tool from the IRF-Patient Assessment Instrument (IRF-PAI).\(^32\) The updated rule replaces the FIM® with the IRF Quality Indicators.\(^32\) Many of the data elements from the FIM® are captured within the new Quality Indicators including eating, bathing, dressing, stairs, toilet transfer, etc. Additional outcome requirements include curb management, functional mobility at various distances and the Brief Interview for Mental Status (BIMS).\(^32\)

Conclusion

The findings from this study support the importance of functional status related to discharge disposition. Furthermore, classification of the FIM® subscales based on the functional domains identified within the IMPACT Act (self-care, mobility, and cognition) reflects the clinical
practice of the IRF setting including the rehabilitation professional’s responsibility for assessing scores. Although the interdisciplinary team (consisting of occupational, physical, and speech therapists) is trained in the FIM® scoring process, each discipline is most proficient with scoring within their domain. For example, occupational therapists focus on self-care items, physical therapist on motor items, and speech language pathologist on cognitive items where applicable. Understanding the influence of the FIM® subscale on discharge location may provide greater clinical insight and assist clinicians with improved discharge planning and care coordination. The results suggest the FIM® self-care subscale is the greatest predictor of discharge location followed by mobility and cognitive FIM® subscales. Further research is needed on additional modifiable risk factors to assist with informing clinical practice and care coordination, thus decreasing associated costs. Future studies should include examining additional factors such as age, prior level of function, social support, and the influence of individual FIM® items by impairment groups in hopes of creating a more predictive model or clinical pathway to assist with discharge planning.

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References


CHAPTER 3

PREDICTING DISCHARGE DISPOSITION FROM INPATIENT REHABILITATION USING THE FIM® AND PATIENT CHARACTERISTICS

Introduction

The number of hospitalized patients discharged to a post-acute setting has increased nationally nearly 50% since 1996 and is currently the most rapidly growing area of Medicare spending. Furthermore, the average hospital length of stay has decreased, resulting in an increase in more medically fragile or clinically unstable patients being discharged to post-acute facilities. A post-acute setting provides services following a hospitalization and may include a skilled nursing or rehabilitation facility, home health services, or outpatient rehabilitation. According to a report from The Office of Inspector General, 22% of Medicare beneficiaries discharged to a post-acute facility experience an adverse event resulting in hospital readmission. As a result, policies such as the Affordable Care Act (ACA), the Inpatient Rehabilitation Facility (IRF) Quality Reporting Program (QRP), and the Improving Medicare Post-Acute Care Transformation Act (IMPACT Act) have influenced post-acute care providers and facilities by implementing greater regulations on patient outcomes, safety, and quality. These policies have intensified efforts to improve post-acute performance measures and quality metrics by examining potential interventions such as predictive models. Predictive models utilize historical data to quantify the risk associated with quality metrics such as readmission rates or discharge location. Current literature supports the use of predictive models to improve hospital performance and assess a number of variables such as patients’ functional status and comorbidities in relation to quality metrics. However, few studies have considered the influence of the interdisciplinary
rehabilitation team, specifically therapists, on practices within post-acute facilities related to quality metrics, and their overall impact on reimbursement.

One example of a post-acute facility is an inpatient rehabilitation setting, which provides intensive, interprofessional, and therapeutic services to individuals who have sustained a complex medical event and which follows their hospital admission. An interdisciplinary team, within an inpatient rehabilitation facility (IRF), typically consists of a physiatrist, physical, occupational, and/or speech therapist, nurse, and prosthetist and/or orthotist. The focus of inpatient rehabilitation includes “patient/caregiver education, durable medical equipment training, and other similar [therapeutic activities] that prepare the patient for a safe discharge to the home or community-based environment.”\textsuperscript{7(p33)} Due to the multifaceted and complex rehabilitation continuum, treatment often continues after discharge from the IRF, to home or the next level of care (e.g., home health, outpatient, skilled nursing facility, long term care, assisted living facility, etc.) and requires proper discharge planning and care coordination. The IRF setting is useful in examining modifiable risk factors that influence quality metrics such as readmission rates, due to the rehabilitation of patients with various medical conditions requiring care coordination. Furthermore, IRFs utilize standardized outcome measures and have regulations and policies in place such as the IMPACT Act to examine and ensure quality of care.

The Functional Independence Measure (FIM\textsuperscript{®}) is one of many measures utilized within the inpatient rehabilitation setting to evaluate patient performance. The FIM\textsuperscript{®}, a criterion-referenced measure of disability, determines level of independence and quantifies burden of care or assistance needed (from another individual) in number of hours per day for the home or community setting.\textsuperscript{8,9} Several studies have demonstrated the validity and reliability of the FIM\textsuperscript{®} instrumentation, which consists of 18 items designed to assess the level of assistance an
individual requires for performing activities of daily living (ADL). The FIM®, created by the Uniform Data System for Medical Rehabilitation (UDSMR), has now been adopted for financial and regulatory purposes.

Predictive modeling has shown that variables such as a patient’s mobility and functional status, as defined by the FIM®, can predict patient quality metrics such as length of stay, discharge disposition, and readmission rates within the IRF population. Patients dependent for mobility, self-care, and cognition as depicted by the FIM® at discharge had increased odds of rehospitalization of 50%, 36%, and 19%, respectively. In addition to the FIM®, patient characteristics have also been associated with hospital performance and quality metrics. Carney and Ulrich found that patients 65 years or older who have experienced a medical event such as an infection, pulmonary distress, shunt failures, and neurological or psychiatric issues are at a greater risk for readmission to the acute hospital. Furthermore, research suggests that predictive models which are diagnosis-specific may have a greater influence on hospital performance measures such as 30-day readmission rates and discharge location. Predictive models utilize previously collected data to predict an outcome. Modeling has been used successfully to predict discharge location, readmission rates, and length of stay for specific diagnoses, including stroke, amputation, and chronic obstructive pulmonary disease (COPD). However, the models have typically included three or fewer diagnostic groups, therefore limiting the clinical interpretation for rehabilitation professionals. The Centers for Medicare and Medicaid (CMS) have supported the development of predictive models specific to diagnoses; however, results of these studies have depicted fair to poor C-statistics (a measure of model classification or goodness of fit) ranging from 0.60 to 0.66. Carney and Ulrich found that patients with a diagnosis of spinal cord injury or amputation demonstrate a statistically significant rate of readmissions to the acute
hospital from an IRF compared to other diagnoses, such as traumatic brain injury and stroke. Understanding diagnosis-specific predictive models that include patient characteristics and function has the potential to improve care coordination, patient outcomes, and hospital protocols. This suggests a role for rehabilitation professionals, such as occupational therapists, to assist influencing with modifiable risk factors (i.e., functional status, patient characteristics, etc.), thereby positively affecting quality and safety and potentially impacting post-acute performance measures. A study by Carney and Ulrich demonstrated the importance of understanding modifiable risk factors, including patient characteristics in relation to healthcare quality and patient safety; unplanned transfers to the acute hospital can impact a patient’s discharge to home or the community from an IRF. Patients who are readmitted to the acute hospital from an IRF are more likely to be discharged to a skilled nursing facility and less likely to be discharged to home or the community. Furthermore, 72% of overall patients from an IRF are discharged to the community, compared to only 51% of individuals who experienced an acute hospital readmission during their IRF stay. Patients readmitted to the acute hospital from an IRF were 2 to 3 times more likely to be discharged to a skilled nursing facility.

Currently, there is limited evidence regarding the use of diagnosis-specific predictive models and the influence of the interdisciplinary rehabilitation team on hospital quality metrics, such as discharge location. The aim of this study was to determine which potentially modifiable variables effectively predict discharge disposition from IRFs as a function of diagnosis. To achieve this goal, the study examined discharge disposition using FIM® items and patient demographics across five diagnostic impairment groups. By examining predictive variables across five impairment groups, diagnosis-specific models may further assist with early discharge planning and proper care coordination (i.e., caregiver education, follow-up appointments, etc.).
Furthermore, the results may serve to expand the role of rehabilitation professionals in improving patients’ post-acute level of performance and quality metrics, such as readmission rates.

**Methods**

**Study Design, Setting, and Population**

The study utilized de-identified, secondary data obtained from the UDS\textsubscript{MR} database, years 2006 to 2018. The UDS\textsubscript{MR} database includes over 200 variables such as FIM\textsuperscript{®} items, IRF information, patient demographics, social support, as well as additional characteristics (falls, pressure ulcers, etc.). UDS\textsubscript{MR} is responsible for maintaining the largest body of data on rehabilitation outcomes, including the FIM\textsuperscript{®}.\textsuperscript{4,9} The UDS\textsubscript{MR} maintains data quality, detects inconsistencies, and monitors FIM\textsuperscript{®} rating accuracies for 70% of the industry, more than 800 IRFs nationwide.\textsuperscript{4,9} UDS\textsubscript{MR} also records FIM\textsuperscript{®} admission and discharge scores, FIM\textsuperscript{®} change scores, length of stay, discharge location, and 30-day readmissions to the acute hospital.\textsuperscript{9} These items are used in measuring a patient’s functional status, predicting resource needs, and monitoring quality assessments.\textsuperscript{9} Adults ages 18 years or older admitted to an IRF and grouped according to the rehabilitation impairment category (RIC) classification system were included in the study. The RIC is utilized to determine the primary reason or diagnosis for admission to the inpatient rehabilitation facility. Individuals whose IRF stay was interrupted or who died during an admission were excluded. The study was considered exempt by the Western Michigan University Institutional Review Board (IRB # 19-09-21 – see Appendix B).
Outcome Measures

The FIM®, a standardized assessment, consists of 18 items, each of which is measured on a scale of 1 to 7, with 1 indicating total assist and 7 indicating independence. The 18 individual FIM® items can be combined to create subscale scores and a total score. Individual FIM® items, as well as subscale scores, were considered for the study. The total score ranges from 18 to 126, with lower scores representing poorer function. FIM® instrument scores are obtained within 72 hours of admission and 24 hours of discharge. FIM® subscales are the summation of individual FIM® items. Although there are many variations of subscales, for the purpose of this study, the three FIM® subscales utilized for this study were based on the IMPACT Act. The IMPACT Act mandates the assessment of self-care, mobility, and cognitive functional domains within the post-acute setting. The corresponding three FIM® subscales and associated FIM® items are: (1) motor (locomotion, stairs, and transfers); (2) self-care (bathing, toileting, upper and lower body dressing, and grooming as well as bowel and bladder management); and (3) cognition (social interaction, problem solving, memory, comprehension, and expressive communication).

Only variables that were calculated during the admission period were considered in this study. Seventeen variables from the UDS_{MR} database were included for the initial analysis. These variables included FIM® scores, patient demographics (age and race), comorbidities, prehospital living conditions, and expected length of stay. The admission comorbidities were coded according to the CMS payment tier for comorbid conditions. There are four payment tiers (A-D); cases are grouped into one of the four tiers based on the presence of certain comorbidities; the greater the number of comorbidities, the higher the payment. Pre-hospital living conditions include the setting preceding hospitalization (i.e., home, assisted living, transitional living, etc.)
and individuals living with the patient (i.e., alone, family/relatives, assistant, etc.). Last, the expected length of stay is calculated based on a combination of case-mix groups, which classifies similar cases according to age, motor, and cognitive scores as well as comorbidity tiers. The outcome variable, discharge disposition, includes three levels: home, skilled nursing facility, and acute hospital.

**Data Analysis**

**Principal Component Analysis**

A principal component analysis (PCA) uses a data reduction technique to examine the variation patterns for the dataset and generate a smaller number of uncorrelated variables or factors that share a common variance.\(^{14}\) The aim of a PCA is to identify the smallest number of underlying/latent variables that affect the outcome variable utilizing a process called factor loading.\(^{14}\) For the purpose of this study, a PCA was performed for the top five impairment groups within an IRF. There are seventeen impairment groups; however, the top five occupy approximately 80% of the IRF population; these include: (a) stroke, (b) brain injury (TBI), (c) spinal cord injury (SCI), (d) neurological impairment, and (e) orthopedic injury. The dataset was reduced to the smallest number of variables for each impairment group during the factor loading process.\(^{14}\) The simplified dataset may be of greater use to the interdisciplinary team for comparison across multiple diagnoses.

**Discriminant Analysis**

A discriminant analysis predicts group membership based on a combination of independent variables. Following the results of the PCA, a discriminant analysis was performed to predict
discharge location (i.e., home, skilled nursing facility, acute hospital) specific to the five largest impairment groups. The data was examined, and descriptive statistics were computed, including the central tendencies for the independent variables. IBM SPSS Statistics Version 24 was utilized for statistical analysis.

**Results**

The study included 1,641,782 individuals admitted to inpatient rehabilitation facilities between 2006 and 2018 within the UDSMR database. Table 3.1 depicts the demographics and overall characteristics of the sample population.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>68.95</td>
</tr>
<tr>
<td>Impairment group [%]</td>
<td></td>
</tr>
<tr>
<td>Stroke</td>
<td>22.6</td>
</tr>
<tr>
<td>Brain Injury</td>
<td>9.9</td>
</tr>
<tr>
<td>Spinal Cord Injury</td>
<td>5.8</td>
</tr>
<tr>
<td>Neurological Impairment</td>
<td>11.0</td>
</tr>
<tr>
<td>Orthopedic Impairment</td>
<td>28.2</td>
</tr>
<tr>
<td>Facility Information</td>
<td></td>
</tr>
<tr>
<td>Length of stay (LOS) [days]</td>
<td>13.36</td>
</tr>
<tr>
<td>Total Admission FIM® score [18-126]</td>
<td>68.9</td>
</tr>
<tr>
<td>Total Discharge FIM® score [18-126]</td>
<td>88.7</td>
</tr>
</tbody>
</table>

**Factor Analysis**

Three independent variables were identified from the PCA for all five impairment groups. The three variables were comorbidity tier, admission FIM® cognitive, and admission
FIM® motor subscale scores. These variables demonstrated the largest variance impacting discharge location among those entered into the analysis. Appendix 3-1 demonstrates the results of the rotated component matrix for each of the diagnoses from the factor analysis. Comorbidity tier utilizes comorbid conditions to determine placement in CMS payment tiers at admissions. The admission cognitive and motor subscales are the sum of the cognitive and motor FIM® items combined during the admission period. Table 3.2 depicts the mean and standard deviation of the independent variables identified within the PCA across all five impairment groups.

Table 3.2. Independent Variable Characteristics

<table>
<thead>
<tr>
<th>Characteristics (mean)</th>
<th>Stroke</th>
<th>Brain Injury</th>
<th>Spinal Cord Injury</th>
<th>Neurological impairment</th>
<th>Orthopedic impairment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admission FIM® Motor</td>
<td>36.44 ± 14.01</td>
<td>36.93 ± 14.37</td>
<td>35.66 ± 12.21</td>
<td>34.00 ± 12.86</td>
<td>38.46 ± 11.03</td>
</tr>
<tr>
<td>Admission FIM® Cognition</td>
<td>19.22 ± 7.47</td>
<td>18.18 ± 7.40</td>
<td>23.10 ± 6.73</td>
<td>26.95 ± 6.20</td>
<td>25.85 ± 6.77</td>
</tr>
<tr>
<td>Comorbidity Tier</td>
<td>.90 ± 1.34</td>
<td>1.32 ± 1.30</td>
<td>1.33 ± 1.344</td>
<td>1.00 ± 1.32</td>
<td>.82 ± 1.29</td>
</tr>
</tbody>
</table>

Note. Admission FIM® motor score [possible score 13-19]
Admission FIM® cognition scores total out of [possible score 5-35]
Comorbidity tier [0= Tier A- “None”; 1= Tier B- “Major”; 2= Tier C- “Medium”; 3= Tier D- “Minor”; where the Tier is the presence of comorbidities.]

**Discriminant Analysis**

The discriminant analyses demonstrated statistically significant ($p \leq .001$) results for all three independent variables identified from the factor analysis. The homogeneity test of equality of covariance was violated (Box’s $M = p \leq .001$); however, this is attributed to the large number of observations. The assumption of equal variance was met by examining the standard deviations of the independent variables. Across all five impairment groups, admission FIM® motor and cognitive FIM® scores and comorbidities were predictive of discharge location. Table 3.3 demonstrates the canonical function coefficients for all three independent variables. Canonical coefficients represent
the relationship and magnitude between the independent and dependent variables. A higher (closer to 1) and positive score represents a greater relationship to the dependent variable; the score closer to -1 demonstrates an inverse correlation. The results demonstrated the admission FIM® motor subscale had the greatest predictive power among the five impairment groups followed by the admission FIM® cognitive subscale. Admission comorbidity tier was the least predictive among impairment groups and demonstrated an inverse correlation to discharge location.

Table 3.3. *Canonical Function Coefficients*

<table>
<thead>
<tr>
<th>Impairment Group</th>
<th>Canonical Function Coefficients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Admission FIM® Motor</td>
</tr>
<tr>
<td>Stroke</td>
<td>.931</td>
</tr>
<tr>
<td>Brain Injury</td>
<td>.926</td>
</tr>
<tr>
<td>Neurological Impairment</td>
<td>.939</td>
</tr>
<tr>
<td>Spinal cord injury</td>
<td>.876</td>
</tr>
<tr>
<td>Orthopedic Impairment</td>
<td>.910</td>
</tr>
</tbody>
</table>

*Note.* The canonical coefficient represents the overall relationship and magnitude between the two sets of variables (independent and dependent). The higher the score (closer to 1 or -1) the greater the relationship to the dependent variable.

Table 3.4 depicts the overall classification accuracy (%) for the five impairment groups across the three discharge locations. The percentage represents the probability of group membership according to discharge location; a value closer to 100 indicates a stronger classification within the observed group. Discharge to home was the largest location correctly classified for the majority of cases, among the five impairment groups, followed by skilled nursing facility and the acute hospital.
### Table 3.4. Classification Summary

<table>
<thead>
<tr>
<th>Impairment Group</th>
<th>Predicted Group Membership According to Discharge Location (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Home</td>
</tr>
<tr>
<td>Stroke</td>
<td>64.5</td>
</tr>
<tr>
<td>Brain Injury</td>
<td>60.1</td>
</tr>
<tr>
<td>Neurological Impairment</td>
<td>57.8</td>
</tr>
<tr>
<td>Spinal cord injury</td>
<td>61.5</td>
</tr>
<tr>
<td>Orthopedic Impairment</td>
<td>66.0</td>
</tr>
</tbody>
</table>

*Note.* Percent probability for predicted group membership. A value near 100 gives a strong indication that the observation belongs in that group.

### Discussion

Previous research has demonstrated the use of a variety of predictive models utilizing independent variables to assist with predicting quality metrics, such as hospital readmissions or discharge location. The FIM®, specifically, has been used as a measure of function to predict patient outcomes and quality metrics within predictive models. The FIM® measures the severity of disability and allows rehabilitation professionals to assess functional activities effectively and efficiently.\(^\text{15}\) To our knowledge, this is the first study to consider functional status, as depicted by the FIM® and patient characteristics across five impairment groups in relation to discharge location.

The findings from the PCA identified the same three variables in each of the five impairment groups: FIM® motor subscale, FIM® cognitive subscale, and comorbidity tier. Furthermore, the results from the follow-up discriminant analysis demonstrated the FIM® motor subscale was the greatest predictor followed by the cognitive subscale and comorbidity tier. This suggests the variables associated with discharge location are not dependent on the top five diagnoses; the results were confirmed across the PCA and discriminant analysis. These findings
differ from the literature regarding 30-day readmission rates, which indicates diagnosis plays an important role.\textsuperscript{4,11} Hebert et al.\textsuperscript{16} suggest diagnosis-specific predictive models should be adjusted frequently in order to respond to changes within data sources and electronic healthcare systems. As a result, additional patient characteristics and variables must be included as electronic healthcare systems become more advanced, allowing for more precise predictive models.

The findings from this study, which include data from more than ten years, depict the admission FIM® motor subscale as the greatest predictor of discharge followed by the cognitive FIM® subscale across all five impairment groups. Previous research supports the findings from this study; the FIM® motor subscale has been associated with readmission to the hospital, length of rehabilitation stay, and discharge destination.\textsuperscript{10,17} However, past findings have been limited to three or fewer diagnoses, therefore hindering clinical interpretation for healthcare professionals.\textsuperscript{4–6} Although the directionality of the admission cognitive FIM® scores is not indicated within the predictive model, previous research depicts the importance of cognition related to discharge location. In a study using admission FIM® scores, Nguyen, Page, Aggarwal, and Henke\textsuperscript{18} found lower admission cognitive FIM® scores (less than 25 points) were associated with a higher probability of discharging to a SNF. Furthermore, Denti et al.\textsuperscript{19} found the cognitive FIM® subscale was the greatest contributor to discharge disposition in patients with stroke. The results support the role of the interdisciplinary rehabilitation team including physical, occupational, and speech therapist during the admission period in evaluating functional status and assisting with discharge disposition. Therapists have a unique understanding regarding the impact of functional status on the activities required for the next level of care (i.e., rehabilitation facility to home).\textsuperscript{20} This suggests members from the interdisciplinary rehabilitation team, including occupational therapists, may also have a role in discharge planning and care coordination which may include
arranging follow-up appointments, educating family or caregivers, and communicating with appropriate healthcare professionals. Preliminary studies have found the presence of a physical therapist within the interdisciplinary discharge team may decrease hospital quality metrics such as 30-day readmissions and emergency department visits. Furthermore, Rogers, Bai, Lavin, and Anderson found that higher hospital spending on occupational therapy was associated with lower readmission rates for heart failure, pneumonia, and acute myocardial infarction.

The discriminant analysis also revealed individuals discharging to home were classified correctly, when all three variables were entered into the model, among the top five diagnoses between 56% and 66% of the time. A value near 100 indicates greater group classification utilizing the independent variable. Individuals who discharged to skilled nursing facilities were correctly classified approximately 50% of the time. However, those who discharged to acute care facilities were poorly classified (less than 32%). The poor classification seen within individuals who discharged to acute care may be attributed to the unequal group sizes; over three-fourths of the sample were unequally proportioned into the home discharge location.

**Limitations**

There are several limitations to this study. The group sizes of the dependent variable were disproportionally unequal, which may have impacted the results. A greater number of individuals were discharged home compared to the acute hospital and skilled nursing facility. The study also utilizes the inpatient rehabilitation population; patients are selected based on the presence of modifiable functional impairments; therefore, a selection bias may be present. However, inpatient rehabilitation facilities collect functional data routinely, supporting the aims
of the study. Beginning in the year 2019, the updated IRF Prospective Payment rule aimed to alleviate the administrative tasks associated with the FIM® instrument and remove the tool from the IRF-Patient Assessment Instrument (IRF-PAI). The updated rule replaces the FIM® with the IRF Quality Indicators. However, many of the data elements from the FIM® are captured within the new Quality Indicators including eating, bathing, dressing, stairs, toilet transfer, etc. Additional outcome requirements include curb management, functional mobility at various distances, and the Brief Interview for Mental Status (BIMS). The change in the tool may impact the implications of this study. Future studies should address the limitation related to unequal group sizes as well as further understand which characteristics including social determinants better discriminate discharge to the acute hospital in order to further prevent readmissions.

**Conclusion**

The findings from this study further advance the literature regarding diagnosis specific predictive models related to discharge location from a rehabilitative perspective. The results suggest variables predictive of discharge location do not vary among the top five primary rehabilitation diagnoses. Admission FIM® motor and cognitive subscales demonstrate the largest predictive power in regard to discharge location. Rehabilitative professionals such as occupational, physical, and speech therapists who are responsible for scoring the FIM® must be attentive to admission FIM® subscale scores, specifically motor and cognition. Knowledge regarding the influence of the FIM® subscale on discharge location provides clinical insight and may assist clinicians with preparing patients and families with discharge needs earlier in the process. Furthermore, the results of this study align with the IMPACT Act, which mandates the assessment of functional domains including self-care, mobility, and cognition in post-acute
settings. The IMPACT Act is largely rehabilitation discipline specific (mobility – physical therapy; self-care – occupational therapy; cognition – occupational and/or speech/language therapy). The findings not only demonstrate the importance of rehabilitation professionals in evaluating functional status utilizing the FIM® for discharge planning but also their potential to influence quality reporting programs such as the IMPACT Act.

Further research is needed on how these variables can be utilized to assist with informing clinical practice and care coordination, thus decreasing associated costs. There is potential for a simple assessment tool/checklist to be incorporated into electronic health records and documentation to assist or notify rehabilitation professionals regarding potential risk factors associated with readmissions and/or discharge location. Future studies should include examining the new functional assessment tool, the IRF Quality Indicators, and the scores associated with discharge location.

Disclosure Statement

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References


APPENDIX 3-1

Stroke

Table 3.5. *Rotated Component Matrix for Stroke*

<table>
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</tr>
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<td>Admission FIM Motor 13</td>
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<tr>
<td>Admission Tier</td>
<td></td>
</tr>
<tr>
<td>Age group</td>
<td></td>
</tr>
<tr>
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</tr>
<tr>
<td>Admission FIM Self-care</td>
<td>.844</td>
</tr>
<tr>
<td>Admission FIM social cognition subscore</td>
<td>.241</td>
</tr>
<tr>
<td>Admission FIM sphincter subscore</td>
<td>.695</td>
</tr>
<tr>
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<td>.785</td>
</tr>
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<td>Admission FIM total 18</td>
<td>.785</td>
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<tr>
<td>Admission FIM transfer subscore</td>
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</tr>
<tr>
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**Brain Dysfunction**

Table 3.6. *Rotated Component Matrix for Brain Dysfunction*

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<tr>
<td>Expected net LOS</td>
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### Neurological Conditions

Table 3.7. *Rotated Component Matrix for Neurological Conditions*

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<tr>
<td>Admission cog</td>
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### Spinal Cord Injury

Table 3.8. *Rotated Component Matrix for Spinal Cord Injury*

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**Orthopedic Conditions**

Table 3.9. *Rotated Component Matrix for Orthopedic Conditions*

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<tr>
<td>Admission FIM transfer subscore</td>
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<tr>
<td>Admission motor</td>
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<tr>
<td>Admission cog</td>
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</table>
CHAPTER 4

OCCUPATIONAL THERAPISTS’ ROLE IN CARE COORDINATION

Introduction

The United States national healthcare spending, the largest in the world, is expected to grow an average of 5.5% annually over the next 7 years.\(^1\) It is estimated to be the greatest increase in nearly two decades and likely associated with demographic and economic factors within the healthcare sector.\(^1\) As a result, Medicare and other healthcare payers have shifted from a volume- to a value-based healthcare reimbursement model (i.e., basing reimbursement on the value of the services rather than the volume of services provided) in order to decrease cost and improve quality of care.\(^2\) Value-based healthcare, considered accountable care, provides payment incentives to healthcare organizations that demonstrate measures of quality of care, such as increasing access to care, reducing readmission rates, and improving care coordination. In an effort to optimize the healthcare system, control the rising cost, and shift to value-based care, new policies and regulatory standards have been implemented such as the Affordable Care Act and the Improving Medicare Post-Acute Care Transformation Act (IMPACT Act). The Affordable Care Act, enacted in 2010, expanded coverage to uninsured individuals, reduced overall cost to qualified beneficiaries, and ensured essential health benefits were provided within basic plans. The aim of the IMPACT Act is to improve patient outcomes through shared decision making, care coordination, and enhanced discharge planning.\(^3\) Although the IMPACT Act was originally signed into law in 2014, the final rule specific to discharge planning and care coordination was published in 2019.\(^4\) The rule places patients at the forefront of transitions from acute hospitals
to post-acute facilities and thus, allowing patients access to important facility performance data in order to make an informed decision regarding discharge planning. According to the final rule, discharge planning from acute to post-acute facilities must focus on a patient’s goals and treatment preferences and be documented within the medical record to ensure the patient is an active member of the process.

Following the implementation of these new regulatory standards and policies, hospital initiatives, as well as emerging roles for members of the healthcare team, continue to develop as organizations attempt to improve quality, promote the value of care, and decrease cost. Initiatives include increasing access to care and improving care coordination over the life of the client. The Centers for Medicare and Medicaid (CMS) support care coordination as a method for improving hospital performance, experience, and quality metrics. Research has demonstrated care coordination is an effective method for reducing 30-day hospital readmissions, decreasing healthcare costs, and improving patient quality of life. Care coordination is the process of coordinating and advocating for essential services (in a variety of settings), considering fiscal resources and benefits available to the client, and advising the client, family, or caregiver regarding the transition of care. Care coordination has been defined in the literature using a variety of interchangeable terms such as transitional care, case management, and discharge planning.

**Transitional Care, Care Coordination, and Case Management**

According to Holland and Harris, transitional care services are supportive services that provide interventions and follow-up from pre-hospital to discharge home. The principles of transitional care have emerged more recently (in the 1980s) and incorporate the coordination of
services between transitions of care, such as rehabilitation facilities or home. Care coordination, related to discharge planning and transitional care, is the management and integration of multiple providers and information into a summative plan. A variety of health professionals may provide formal and informal care coordination services. Case managers often perform case management or formal care coordination services, such as evaluating fiscal resources and benefits and monitoring the use of resources. The Commission for Case Management Certification (CCMC) defines case management as “a collaborative process that assesses, plans, implements, coordinates, monitors, and evaluates the options and services required to meet the client’s health and human service needs.” According to Berwick, Nolan, and Whittington, case management is one initiative that has been found to impact the overall health of populations and reduce the per capita cost of healthcare. Although care management does not require formal academic preparation, certification may be obtained through the CCMC. The role is often filled by registered nurses (RNs) and social workers; however, other health professionals including occupational therapists are academically prepared to evaluate participation in daily activities and bridge the gap among the service delivery models. In fact, the CCMC has a category for non-RNs to apply and qualify for the certification examination.

Several studies have demonstrated the impact of care coordination, case management, and transitional care on quality metrics, including readmissions, length of stay, and improved access to health care. Care coordination intervention has been shown to reduce hospital readmissions by 6 or more percent and decrease the number of emergency department and therapy visits, while lowering the cost per claim. Lim et al. found care coordination decreased length of stay in older adults who had been re-admitted to the hospital. Additionally, care coordination demonstrated improved clinical metrics (e.g., blood pressure)
and reduced complications due to chronic disease.\textsuperscript{14} According to Burke, Kripalani, Vasilevikis, and Schnipper,\textsuperscript{2} the lack of care coordination resulted in medication errors, service duplication, and increased health care costs.

**Occupational Therapy and Care Coordination**

Occupational therapy has a distinct history, established on interdisciplinary collaboration. The profession was founded by several professionals including a physician, nurse, architect, social worker, and teacher.\textsuperscript{15} Occupational therapy has roots in holistic health and utilizes occupations or everyday activities as interventions to increase social participation and improve independence.\textsuperscript{15} As a result of the profession’s historical background, occupational therapists recognize and understand the importance of collaboration in order to promote health outcomes, including return to home or the community, self-management, and transition planning between settings.\textsuperscript{7} According to the AOTA Model Practice Act, “care coordination, case management and transition services” are included within the practice of occupational therapy.\textsuperscript{16} Furthermore, “occupational therapy practitioners are academically prepared to examine all conditions that affect participation in everyday activities and are distinctly equipped to bridge gaps among the medical, educational, and social services delivery models that are inherent in case management.”\textsuperscript{7}(p2)

Occupational therapists are academically prepared to perform the roles of a case manager as outlined by the Commission for Case Management Certification (CCMC). According to Baldwin and Fisher,\textsuperscript{17} the Standards of Practice for Occupational Therapy align closely with the Standards of Care for Case Management. Currently, there are no academic specifications for case management; a variety of professionals may enter into the field including social work, nursing, occupational therapists, and other health professionals.\textsuperscript{7} Occupational therapists are skilled in
screening and evaluating relevant data and patient information through the use of an occupational performance assessment, as well as developing an intervention plan in conjunction with the client. Furthermore, occupational therapists assist with referrals to appropriate resources and transitioning to other types of services, and eventually discontinuing occupational therapy services. Similarly, case managers identify the need for case management services and associated problems, plan and monitor the selected occupational therapy interventions, and evaluate the outcomes. Occupational therapists’ academic and clinical training in occupational performance assessments, task analysis, environmental evaluation, adaptation, compensation, and remediation further support their ability to practice as case managers or complete care coordination activities. There are few studies that have investigated the role of health professionals, such as occupational therapists in the role of care management, care coordination, or transitions of care and the impact on patient quality and safety. Therefore, the proposed study aims to explore occupational therapists’ current roles associated with care coordination. Occupational therapists facilitate discharge planning from the acute to the post-acute settings by participating in family conferences, assisting with self-management strategies, and advocating for the patient and necessary resources for discharge. By understanding and examining occupational therapists’ role in care coordination, therapists may understand and further advocate for patients during the transition from one setting to another, positively impact hospital quality metrics, and potentially decrease cost.

**Purpose**

The aim of this study was to survey a sample population of occupational therapists working within the acute and post-acute settings regarding their current practices related to care coordination. The study aimed to determine: (1) how occupational therapists currently utilize occupational
performance assessments (i.e., occupational profile, care tool, Barthel Index, Functional Independence Measure®, Kohlman Evaluation of Living Skills [KELS]); (2) interventions and strategies for addressing patient self-management; and (3) methods for communicating with patients, caregivers, and stakeholders across the continuum of care. Currently, there is limited evidence regarding occupational therapists’ role in care coordination and case management. Therefore, the findings aim to further support occupational therapists’ distinct value and contribution to interdisciplinary collaboration and expand their role in care coordination and discharge planning.

Methods

A brief 10-question survey was developed to assess occupational therapists’ role in care coordination. The closed-ended survey questions were developed based on the current literature and use of the Occupational Therapy Framework and Domain, as well as the Model Practice Act. Questions included occupational therapists’ use of occupational performance assessments, strategies and interventions related to patient self-management techniques, and communication with staff across the continuum of care. The content of the survey was developed by an occupational therapist with 7 years of experience in the acute and post-acute settings, responsible for care coordination and discharge planning. A pilot study was conducted on 4 occupational therapists who are also certified case managers to determine face validity. Face validity is the degree to which an assessment or evaluation appears to measure a specific construct. The survey was refined based on feedback from the pilot study. The survey was purposely short to encourage responses and data were collected utilizing SurveyMonkey, an online survey tool. The survey included a cover letter (Appendix 4-1) outlining the purpose of the survey and the requirements for participation.
Subject Recruitment

A purposeful sampling method was used to recruit respondents from multiple platforms, including occupational therapy related social media sites, as well as occupational therapy special interest groups/organizations. The survey (Appendix 4-2) was posted to the AOTA *CommunOT*, which is an online open discussion available to occupational therapists nationally. It is designed for practitioners who are members of AOTA to interact, engage, and share information, research, and resources in order to build a professional online community. The survey was also posted to professional and social media sites, including the *Occupational Therapy Association, Occupational Therapy Community, Occupational Therapists on Facebook*, and *OT Adding life to years*. The survey was posted for a total of three months. Participants were asked to review the cover letter and agree to the terms and conditions therein prior to completing the survey. Inclusion criteria for the OT participants included having an active license, currently living in the United States or surrounding territories, working in the acute and/or post-acute settings, and being older than 18 years of age. The survey was anonymous and excluded all identifiable information. The IP address tracking settings were disabled from SurveyMonkey to ensure confidentiality and anonymity.

Analysis

The data were exported from SurveyMonkey to Excel and analyzed utilizing descriptive statistics. The mean, frequency, and percentages were calculated for the closed-ended responses. Data were collected over 3 months beginning November 2019 and ending in January 2020. The study was considered exempt by the Western Michigan University Institutional Review Board (see Appendix C).
Results

Of the 144 surveys obtained, 128 were considered complete (88.8%). Table 4.1 shows the number of responses and the state in which participants practiced. Twenty-seven states were represented in the survey, as well as one United States territory. Responses were collected from November 2019 through January 2020; the largest number of responses occurred during the month of December of 2019.

Table 4.1. Survey Responses

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<td>California</td>
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<td>Colorado</td>
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<td>District of Colombia</td>
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<td>Florida</td>
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<td>Indiana</td>
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<tr>
<td>Oregon</td>
<td>1</td>
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<tr>
<td>Pennsylvania</td>
<td>4</td>
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<tr>
<td>Rhode Island</td>
<td>1</td>
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<tr>
<td>South Carolina</td>
<td>1</td>
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<tr>
<td>Tennessee</td>
<td>2</td>
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<td>Texas</td>
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<tr>
<td>Virginia</td>
<td>4</td>
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<tr>
<td>Washington</td>
<td>2</td>
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<tr>
<td>Wisconsin</td>
<td>2</td>
</tr>
</tbody>
</table>
Occupational Performance Assessment

Of the 128 respondents who submitted complete surveys, 107 or 83.5% reported utilizing an occupational performance assessment to assist with discharge planning. An occupational performance assessment evaluates the interaction between the client, context, and activity, enabling engagement in occupations or activities (e.g., occupational profile, FIM®, care tool, Barthel Index, PASS, etc.). Figure 4.1 depicts how the assessment was utilized for discharge planning, which included discharge recommendations and level of assistance, targeted treatment intervention, caregiver education/training, equipment recommendations, family meetings/telephone conferences, interdisciplinary team conference, and advocacy. Three participants provided comments on the additional or further use of occupational performance assessments, which included pet care and light cleaning, home assessments, or no use other than for reporting the results of the assessment.

Figure 4.1. The use of occupational performance assessments.
Self-Management and Instrumental Activities of Daily Living

One hundred and seventeen of the 128 (90.6%) occupational therapists stated they employed strategies and techniques to re-establish competence in the area of self-management. Interventions addressing self-management, or the skills necessary for managing one’s health, fell within the American Occupational Therapy Association (AOTA) defined construct of instrumental activities of daily living (IADLs). According to the AOTA *Occupational Therapy Framework and Domain*, IADLs are complex activities to support daily life within the home and community. Figure 4.2 depicts the type of IADLs addressed as an intervention.

![Figure 4.2. Instrumental activities of daily living.](image)

Table 4.2 outlines the type of intervention utilized prior to discharge. The majority of occupational therapists address medication management (89.7%), meal preparation (82.7%), and laundry management (72.4%). Other IADLs not listed but addressed by occupational therapists (provided in the comments/other) included pet care, light cleaning, home maintenance (indoor/outdoor), leisure participation, return to work, and knowledge of health and/or emergency situations. Education was the most utilized intervention to address IADLs, followed by activities...
and occupational based or preparatory methods. Preparatory methods are activities that prepare the client for occupational performance, such as strengthening or conditioning exercises.\textsuperscript{20}

Types of interventions, listed in Table 4.2, were selected from the \textit{Occupational Therapy Framework and Domain} and are not intended to be all-inclusive.\textsuperscript{20} Other interventions, as provided in the comments/other option, included community resources or outings and motivational interviewing or cognitive behavioral therapy.

Table 4.2. \textit{Interventions Used to Address Instrumental Activities of Daily Living (IADLs)}

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Number of responses</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education - Imparting of knowledge and information</td>
<td>109</td>
<td>93.97%</td>
</tr>
<tr>
<td>Occupation-based - Client-directed daily life activities that match and support or address identified participation goals (i.e., grocery shopping and meal preparation)</td>
<td>92</td>
<td>79.31%</td>
</tr>
<tr>
<td>Activities - Actions designed and selected to support the development of performance skills and performance patterns to enhance occupational engagement (components of occupations) (i.e., prepares a food list and practices using appliances)</td>
<td>101</td>
<td>87.07%</td>
</tr>
<tr>
<td>Preparatory methods and tasks – methods and tasks that prepare the client for occupational performance, used as part of a treatment session in preparation for or concurrently with occupations/activities to support occupational performance (i.e., home-based conditioning regimen or hand strengthening exercises)</td>
<td>92</td>
<td>79.31%</td>
</tr>
<tr>
<td>Self-Advocacy - Advocacy efforts undertaken by the client, which the practitioner can promote and support</td>
<td>46</td>
<td>39.66%</td>
</tr>
<tr>
<td>Groups - Functional groups, activity groups, task groups, social groups, and other groups that allow clients to explore and develop skills for participation, goal setting, and positive choice making (i.e., home safety group)</td>
<td>22</td>
<td>18.97%</td>
</tr>
<tr>
<td>Other (please specify)</td>
<td>5</td>
<td>4.31%</td>
</tr>
</tbody>
</table>

Communication and Time

When considering transitions of care, 80 (62.5%) occupational therapists communicated regularly with the therapy staff (OT/PT/SLP) when their patient/client was transitioning to the next level of care in the continuum (beyond documentation requirements). Figure 4.3 depicts the method for communication between staff across the continuum (acute to post-acute). In-person communication followed by telephone were the most widely used methods for communication across the continuum of care. Other methods not listed for communication include text messaging or facility communication devices, interagency forms or discharge documentation, or the involvement of other interdisciplinary team members (social services referral). Figure 4.4 represents the number of hours per week, not including required documentation, spent outside of patient care or billable hours on care coordination (e.g., equipment, family education and training, discharge planning, etc.). Of the 128 respondents included in the analysis, 123 completed the question (question #9) as requested; however, five did not and were therefore omitted from the analysis. Overall, the majority of responders spend approximately 1-3 hours outside of patient care or billable hours on care coordination related activities.

Figure 4.3. Communication with therapy staff at next level of care.
Figure 4.4. Number of unbillable hours spent on care coordination.

**Discussion**

Recent regulatory policies, such as the IMPACT Act, have highlighted a paradigm shift emphasizing the value of healthcare. In response to this shift, healthcare organizations have implemented a number of initiatives to decrease costs associated with readmissions, patient safety, and other modifiable risk factors.\(^2,^7,^{11,12}\) Care coordination, which includes individualized assessments and education for patients and caregivers as well as advocacy, has been shown to improve hospital outcomes.\(^7\) In a study by Claiborne,\(^21\) care coordination interventions reduced emergency room visits and improved appropriate use of outpatient primary care providers in patients diagnosed with a stroke. Furthermore, patients report care coordination decreases the duplication of medical tests and the potential for lack of follow up after a hospital or emergency visit discharge.\(^22\)

The findings from this study indicate occupational therapists participate in many care coordination activities including, but not limited to, advocacy, caregiver education/training, and equipment recommendations. This relates to the key functions of the occupational therapists within the acute and post-acute settings, which is to determine or facilitate the continuation of an appropriate discharge plan and include appropriate referrals or recommendations. These results
are similar to previously reported research. Govender, Christopher, and Lingah\textsuperscript{23} found a high percentage of occupational therapists in South Africa are also involved in advocacy and the coordination of services within the areas of return to work and vocational rehabilitation.

The results of this survey demonstrated the largest percentage of occupational therapists in this study utilize strategies and techniques to re-establish skills necessary to increase patients’ confidence in managing their health in relation to discharge. This suggests occupational therapists promote independence and the necessary skills for success within the home or community. According to the survey, a large percentage of occupational therapists reported utilizing an occupational performance assessment to assist with discharge planning. Although evaluation and assessment are expected within the acute and post-acute setting in order to develop a comprehensive plan of care, the results revealed the purpose or use of the assessment in relation to discharge planning varied among occupational therapists. Surprisingly, the results indicate that only a small number of therapists communicate with the therapy staff during a patient’s transition to the next level of care (acute to post-acute setting). This is an area for improvement as the electronic medical record (EMR) systems and their functionality continue to expand. Therapists and healthcare providers who function between settings and across multiple organizations should continue to communicate regarding patients’ goals and status in order to assist with quality of care. Barriers and reasons for lack of communication across settings continue to be an area for further research.

This study, exploratory in nature, highlights the current trends of occupational therapists’ role in care coordination or case management. According to the \textit{American Occupational Therapy Association Model Practice Act} and the \textit{Occupational Therapy Practice Framework: Domain and Process} (3\textsuperscript{rd} edition), occupational therapists understand the complex interplay
between client skills, activity demands, environments, and contexts. Occupational therapists are uniquely positioned to examine important function and socioeconomic factors while performing care coordination activities. According to the 2018 Accreditation Council for Occupational Therapy Education (ACOTE®) Standards, a graduate occupational therapist is expected to address safety and demonstrate knowledge of occupational performance and self-care as well as promote health and wellness. Furthermore, the accreditation standards for a doctoral or master’s level occupational therapy student includes care coordination, which is defined as the ability to “demonstrate, evaluate, and plan care coordination, case management, and transition services in traditional and emerging practice environments.” Additional educational standards associated with care coordination include interprofessional communication and consultation, evaluating access to community resources, referring to a variety of specialists and understanding reimbursement systems and funding mechanisms. Although the involvement and intensity in case management depends on the practice area, the ACOTE® standards include the skills required for care coordination and, therefore, occupational therapists should advocate for participation in interdisciplinary team conferences, and roles that require case management.

Although the survey was exploratory and demonstrated occupational therapists’ involvement in care coordination, several limitations exist. The questionnaire was created by an occupational therapist with experience in care coordination and validated by occupational therapists who are case managers; however, additional methods to ensure validity and reliability are recommended. There is a potential for response bias; participants may respond inaccurately or falsely to the survey questions. Furthermore, there may be data errors as a result of non-responses or unanswered questions or misinterpretation of the questions resulting in additional
bias. Although participants from a diverse number of states were represented, the use of a purposeful sampling method and online format may have limited the overall sample size and respondent availability.

**Conclusion**

The transition from acute care to the post-acute care setting (i.e., skilled nursing facility, outpatient services, etc.) is recognized as a critical period of a patient’s recovery, and one that must be optimized in order to achieve optimal outcomes. Emerging roles of health care professionals are being recognized as evidence continues to demonstrate the importance of care coordination during discharge planning. Rehabilitation personnel—specifically occupational therapists who understand the interplay between client skills and challenges, activity demands, and the environment—can assist with these services. The results from this study highlight occupational therapists’ participation in care coordination within the acute and post-acute settings. Further research is necessary to determine the number and to what extent occupational therapists are currently practicing in case management or care coordination roles and their impact on quality metrics across a variety of settings.

**References**


You are invited to participate in this research project titled "Occupational Therapists’ Role in Care Coordination"

STUDY SUMMARY: This consent form is part of an informed consent process for a research study and it will provide information that will help you decide whether you want to take part in this study. Participation in this study is completely voluntary. You may choose to not answer any question. The purpose of the research is to: explore occupational therapists’ role in care coordination including advocating and coordinating resources, assisting with self-management strategies, and discharge planning and will serve as Kelly VanKoevering’s dissertation research for the requirements of the PhD in Interdisciplinary Health Sciences. If you take part in the research, you will be asked to complete a brief online survey. Your replies will be completely anonymous, so do not put your name anywhere on the survey. Your time in the study will take approximately 5 minutes. Possible risk and costs to you for taking part in the study may be the time required to complete the survey and potential benefits of taking part may be contributing to the occupational therapy literature/body of knowledge as well as further understanding occupational therapists’ role in care coordination in the acute and post-acute settings. Your alternative to taking part in the research study is not to take part in it.

The de-identified (anonymous) information collected for this research may be used by or distributed to investigators for other research without obtaining informed consent from you.

Should you have any questions prior to or during the study, you can contact principal investigator, Linda Shuster at linda.shuster@wmich.edu or the student investigator, Kelly
VanKoevering at kelly.l.vankoevering@wmich.edu. You may also contact the Chair, Institutional Review Board at 269-387-8293 or the Vice President for Research at 269-387-8298.

This consent has been approved by the Western Michigan University Human Subjects Institutional Review Board (HSIRB) on November 13, 2019.
APPENDIX 4-2

1. Anonymous Online Survey Consent

Participating in this survey online indicates your consent for use of the answers you supply.

Add buttons to click:

I agree to participate in this research study (Survey following upon clicking)

I do not agree to participate in this research study (Browser closes)

The aim of the study is to explore current care coordination interventions used by occupational therapists in acute and post-acute settings to improve the discharge process, support patients and their families. This study is an attempt to validate occupational therapists’ role in discharge planning as it relates to health, behavior, and occupational performance. The researcher would like to acknowledge the use of the *Occupational therapy practice framework: Domain and process (3rd ed.)* in the questions and responses below.

2. Do you currently utilize an occupational performance assessment* to assist with your clinical decision making related to discharge planning (i.e. discharge to home, home health, skilled nursing, etc.)?

*An occupational performance assessment evaluates the interaction between the client, context, and activity; enabling engagement in occupations or activities (e.g. occupational profile, FIM®, care tool, Barthel Index, PASS, etc.) (yes/no)*

3. If so, how is the assessment utilized for discharge planning?
   a) Discharge recommendations and level of assistance
   b) Targeted treatment intervention
c) Caregiver education/training

d) Equipment recommendations

e) Family meetings/telephone conferences

f) Interdisciplinary team conference

g) Advocacy

h) Other (comment)

4. Do you employ strategies and techniques to reestablish competence in the area of self-management*; specifically, within instrumental activities of daily living (IADLs)?

*Self-management is defined as supportive interventions that increase patients’ skills and confidence in managing their health. (yes/no)

5. If yes, please select the following IADLs that you address prior to discharge?

a) Driving and/or alternative means for transportation

b) Meal Preparation

c) Medication Management

d) Laundry management

e) Financial Management

f) Shopping

g) Other (comment)

6. Which type of intervention(s) do you utilize to address the above?

a) Education- Imparting of knowledge and information

b) Occupation-based- Client-directed daily life activities that match and support or address identified participation goals (i.e. grocery shopping and meal preparation)
c) Activities- Actions designed and selected to support the development of performance skills and performance patterns to enhance occupational engagement (components of occupations) (i.e. prepares a food list and practices using appliances)

d) Preparatory methods and tasks – methods and tasks that prepare the client for occupational performance, used as part of a treatment session in preparation for or concurrently with occupations/activities to support occupational performance (i.e. home-based conditioning regimen or hand strengthening exercises)

e) Self-advocacy- Advocacy efforts undertaken by the client, which the practitioner can promote and support

f) Groups - Functional groups, activity groups, task groups, social groups, and other groups that allow clients to explore and develop skills for participation, goal setting, and positive choice making (i.e. home safety group)

g) Other (comment)

7. Do you communicate regularly with therapy staff (OT/PT/SLP) when transitioning your patient/client to the next level of care in the continuum (acute to post-acute options) beyond the documentation sent to the next level of care? (yes/no)

8. If yes, how?
   a) Telephone
   b) Email
   c) EMR messaging
   d) In person
e) Other (comment)

9. Approximately how many hours per week do you spend outside of patient care or billable hours on care coordination (e.g. equipment, family education and training, discharge planning, etc.)? *Does not include documentation.

10. Please list the state in which you currently practice.
CHAPTER 5

CONCLUSION

The purpose of this three-study dissertation was to examine potential methods for reducing modifiable risk factors associated with hospital performance and quality metrics from a rehabilitation perspective. In 2018, the United States spent 16.9% of its gross domestic product on healthcare, nearly twice the amount compared to other countries.\(^1\) Despite its spending on healthcare, the United States ranks poorly on many quality metrics and outcomes including 30-day readmission rates, the number of hospitalizations from preventable causes, and avoidable deaths.\(^1\) In an attempt to control cost and improve healthcare quality, there have been widespread efforts to reduce cost across the continuum of care. This dissertation examined two of the most researched methods for improving hospital performance and quality metrics within the acute and post-acute settings. The first method, predictive modeling, utilizes historical data to predict the probability of an outcome. The second, care coordination, is the act of organizing and managing information from multiple providers into a summative or single discharge plan. It has been suggested that utilizing a multidisciplinary approach, which includes members from the rehabilitation team, may improve health outcomes, hospital performance, and quality metrics.\(^2,3\) Current research has been limited regarding the role of rehabilitative professionals in influencing quality metrics, such as readmission rates and effective discharge planning.\(^2,3\) Therefore, this dissertation explored the role of rehabilitation therapists, specifically occupational therapists, in reducing modifiable risk factors associated with hospital performance and quality metrics through care coordination and predictive modeling. The major implications and findings are outlined below.
Study 1: Predicting Discharge Disposition from Inpatient Rehabilitation Use the FIM®

The purpose of study one was to determine which Functional Independence Measure ® (FIM®) subscales effectively predicted discharge disposition from inpatient rehabilitation facilities (IRFs). The FIM® subscales were classified based on the functional domains consistent with the IMPACT Act (self-care, mobility, and cognition). The study examined the three FIM® subscales according to discharge disposition (home, acute care, and skilled nursing facility). A discriminant analysis was performed and demonstrated statistically significant results for all three subscales, indicating the FIM® subscales are predictive of discharge location. The self-care subscale had the largest predictive power, followed by the motor and cognitive subscales.

Study 2: Predicting Discharge Disposition from Inpatient Rehabilitation

The second study aimed to determine which variables including individual FIM® items and patient demographics effectively predict discharge disposition from IRFs among the five most frequent primary diagnoses. A principal component analysis (PCA) was performed as a data reduction technique to examine the variation patterns within the dataset and generate a smaller number of uncorrelated variables or factors that share a common variance. The findings from the PCA identified the same three variables in each of the five impairment groups: FIM® motor subscale, FIM® cognitive subscale, and comorbidity tier. The results from the PCA were considered for the follow-up discriminant analysis to predict discharge location. The findings from the discriminant analysis demonstrated the admission FIM® motor subscale had the greatest predictive power among the five impairment groups followed by the admission FIM® cognitive subscale.
Study 3: Occupational Therapy’s Role in Care Coordination

The third and final study surveyed a sample population of occupational therapists working within the acute and post-acute settings regarding their current practices related to care coordination. A brief 10-question survey was developed to assess occupational therapists’ roles in care coordination and a purposeful sampling method was used to recruit respondents from multiple social media sites and occupational therapy special interest groups/organizations. The mean, frequency, and percentages were calculated for the closed-ended survey responses. The results of the survey highlighted occupational therapists’ role in care coordination interventions, including the use of occupational performance assessments for discharge planning and techniques that re-establish the skills necessary to increase patients’ confidence in managing their health.

Implications

The three-studies were aimed at addressing a gap in the literature regarding the role of rehabilitation professionals, specifically occupational therapists, in reducing modifiable risk factors associated with quality metrics. The findings from these studies highlight occupational therapists’ role in utilizing occupational performance assessments to evaluate a patient’s functional status across the healthcare continuum (i.e., acute to post-acute settings). Furthermore, the results indicate the importance of functional status in predicting discharge location within the post-acute settings. According to the survey results from study three, occupational therapists use occupational performance assessments, which evaluate and consider functional status (e.g., occupational profile, FIM®, care tool, Barthel Index, PASS, etc.) to assist with discharge planning. Study one also identified functional status as depicted by the FIM® self-care subscale, a predictor of discharge location. These findings suggest that occupational therapists play a role
in evaluating and addressing self-care tasks, including activities of daily living (ADL), for the use of discharge planning. This includes making recommendations, caregiver training, and education. This is consistent with the 2018 Accreditation Council for Occupational Therapy Education (ACOTE®) Standards, which states occupational therapists are trained in selecting and understanding the results of the occupational performance assessments as well as discharge planning, and thus understand the impact that a patient’s performance has in relation to discharge location.

The results from study two demonstrated the admission FIM® motor and cognitive subscales were the largest predictors of discharge location among the top five primary rehabilitation diagnoses (i.e., stroke, amputation, brain injury, neurological impairment, and orthopedic impairment). These findings, consistent across the five diagnoses, add to the current literature and highlight the role of occupational therapists during the interpretation of the occupational performance assessment. Knowledge and understanding of the impact of diagnoses, patient variables, function and the occupational performance assessment provides additional clinical insight and may further assist clinicians with preparing patients and caregivers with discharge needs earlier in the process.

The three studies highlight occupational therapists’ role in assisting with care coordination and discharge planning through the identification and interpretation of occupational performance assessments and evaluation of functional status. Furthermore, the ACOTE® standards include required skills for occupational therapists related to discharge planning and care coordination. As the healthcare context continues to evolve promoting quality, value, and patient experience, while emphasizing decreased cost, evolving roles for health care professionals are being recognized as vital to discharge planning and cost control. Therefore, rehabilitation personnel—specifically
occupational therapists who understand the interplay between client skills and challenges, activity demands, and the environment—should advocate for additional participation in inter-professional team conferences, and roles that require care coordination or case management.4-6

**Future Research**

Further research is necessary to further understand the role of rehabilitation professionals in improving hospital performance, thus impacting quality metrics and potentially reducing cost. Predictive modeling that incorporates additional patient variables and a variety of occupational performance assessments is needed as electronic healthcare systems become more advanced, allowing for more precise predictive models. Additionally, future research should examine how variables identified from the predictive models can be utilized to assist with informing clinical practice, care coordination, and potentially decrease associated healthcare costs.7 Future studies should also include examining new functional assessment tools, such as the IRF Quality Indicators, and the scores associated with discharge location in order to create a simple checklist to assist or notify rehabilitation professionals regarding potential risk factors associated with readmission rates and/or discharge location. As healthcare quality and cost continue to remain a priority, further research is necessary to determine the various roles occupational therapists are currently practicing in case management or care coordination and their impact on quality metrics across a variety of settings.

**References**


2. Falvey JR, Burke RE, Malone D, Ridgeway KJ, McManus BM, Stevens-Lapsley JE. Role


Appendix A

Western Michigan University HSIRB Letter of Approval – Study 1
Date: September 18, 2017

To: Linda Shuster, Principal Investigator
    Kelly VanKoevering, Student Investigator for dissertation

From: Amy Naugle, Ph.D., Chair

Re: HSIRB Project Number 17-09-01

This letter will serve as confirmation that your research project titled “Functional Predictors of Discharge Disposition Using Individual FIM Items from a Rehabilitation Perspective” has been approved under the exempt category of review by the Human Subjects Institutional Review Board. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the application.

Please note: This research may only be conducted exactly in the form it was approved. You must seek specific board approval for any changes in this project (e.g., you must request a post approval change to enroll subjects beyond the number stated in your application under “Number of subjects you want to complete the study.” Failure to obtain approval for changes will result in a protocol deviation. In addition, if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the HSIRB for consultation.

Reapproval of the project is required if it extends beyond the termination date stated below.

The Board wishes you success in the pursuit of your research goals.

Approval Termination: September 17, 2018
Appendix B

Western Michigan University HSIRB Letter of Approval – Study 2
Date: September 12, 2019

To: Linda Shuster, Principal Investigator
   Kelly VanKoeveing, Student Investigator for dissertation

From: Amy Naugle, Ph.D., Chair

Re: IRB Project Number 19-09-21

This letter will serve as confirmation that your research project titled “Functional Predictors of Discharge Disposition from a Rehabilitation Perspective” has been approved under the exempt category of review by the Western Michigan University Institutional Review Board (IRB). The conditions and duration of this approval are specified in the policies of Western Michigan University. You may now begin to implement the research as described in the application.

Please note: This research may only be conducted exactly in the form it was approved. You must seek specific board approval for any changes to this project (e.g., add an investigator, increase number of subjects beyond the number stated in your application, etc.). Failure to obtain approval for changes will result in a protocol deviation.

In addition, if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the IRB for consultation.

The Board wishes you success in the pursuit of your research goals.

A status report is required on or prior to (no more than 30 days) September 11, 2020 and each year thereafter until closing of the study. The IRB will send a request.

When this study closes, submit the required Final Report found at https://wmich.edu/research/forms.

Note: All research data must be kept in a secure location on the WMU campus for at least three (3) years after the study closes.
Appendix C

Western Michigan University HSIRB Letter of Approval – Study 3
Date: November 13, 2019

To: Linda Shuster, Principal Investigator
    Kelly VanKoeveering, Student Investigator for dissertation

From: Amy Naugle, Ph.D., Chair

Re: IRB Project Number 19-10-36

This letter will serve as confirmation that your research project titled “Occupational Therapists Role in Care Coordination” has been approved under the exempt category of review by the Western Michigan University Institutional Review Board (IRB). The conditions and duration of this approval are specified in the policies of Western Michigan University. You may now begin to implement the research as described in the application.

Please note: This research may only be conducted exactly in the form it was approved. You must seek specific board approval for any changes to this project (e.g., add an investigator, increase number of subjects beyond the number stated in your application, etc.). Failure to obtain approval for changes will result in a protocol deviation.

In addition, if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the IRB for consultation.

The Board wishes you success in the pursuit of your research goals.

A status report is required on or prior to (no more than 30 days) November 12, 2020 and each year thereafter until closing of the study. The IRB will send a request.

When this study closes, submit the required Final Report found at https://wmich.edu/research/forms.

Note: All research data must be kept in a secure location on the WMU campus for at least three (3) years after the study closes.