There is a paucity of research exploring Multiple Sclerosis (MS) patients’ perception of teamwork and satisfaction in multidisciplinary care models and no studies have evaluated the impact of a doctor of medicine (MD) neurology provider and a physical therapist (PT) assessing patients contiguously at one visit. The purpose of this project was to compare MS patient perception of provider teamwork and satisfaction in the multidisciplinary clinic (MD and PT) to standard care. MS is a complex neurological disease with deleterious impacts on both mental and physical functioning. Patient satisfaction has been linked to better MS outcomes such as fewer relapses and lower disability scores (Haase, Kullmann, & Ziemssen, 2016). While studies have also shown the benefit of adding rehabilitative interventions throughout the disease course, a study of MS patients by Finlayson, Plow, and Cho (2010) found only 36% utilized PT services. This descriptive comparative study used a convenience sample to compare MS patient satisfaction and perception of provider teamwork in two groups: one taking part in a multidisciplinary clinic (MD and PT), and another receiving standard care (MD only). A total of 36 MS patients completed the study; 18 in the multidisciplinary clinic and 18 in standard care. Patient perception of teamwork (using the Patient’s Insight and Views of Teamwork instrument), and patient satisfaction, were
significantly higher in the multidisciplinary clinic (Mann-Whitney $U = 10.5, p < .05$; $U = 81, p < .05$; respectively). There was also a strong positive correlation between patient perception of teamwork and satisfaction ($rs = 0.713, p < .05$). Based on these findings, it is recommended that MS patients receive care via multidisciplinary clinics. Further research is needed to explore patient perception of provider teamwork and satisfaction with more disciplines, such as nurse practitioners, urologists and occupational therapists involved in the multidisciplinary clinic.
ACKNOWLEDGMENTS

The author wishes to thank her thesis director, Dr. Ella Heitzler, for her support from the beginning to the end of this project; Dr. Robert Shin, for opening up his practice to make this project possible and serving as my champion; and Dr. Maureen Moriarty who was instrumental in pursuing my doctoral studies. Finally, to my family, whose support was felt every day of these past three years. I am forever indebted to these people and credit them for helping me complete this project.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td>II</td>
<td>Review of the Literature</td>
<td>16</td>
</tr>
<tr>
<td>III</td>
<td>Methods</td>
<td>30</td>
</tr>
<tr>
<td>IV</td>
<td>Evaluation Results</td>
<td>36</td>
</tr>
<tr>
<td>V</td>
<td>Discussion and Conclusions</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td>Bibliography</td>
<td>54</td>
</tr>
<tr>
<td></td>
<td>Appendix A: Participant Survey</td>
<td>68</td>
</tr>
<tr>
<td></td>
<td>Appendix B: Clinical Data Form</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>Appendix C: Agreement to Use Questionnaire in Research</td>
<td>71</td>
</tr>
</tbody>
</table>
LIST OF TABLES

Table 1: Search Methods Utilized and Number of Domains Included .........................17
Table 2: Sample Characteristic ....................................................................................52
Table 3: Clinical Characteristics ..................................................................................53
Chapter I

Introduction

Multiple sclerosis (MS) is a complex neurological disease with wide-spread effects on the brain and body. The disease course is unpredictable with accumulation of disability burden over time (National MS Society, 2015). In the past 20 years, MS treatment options have expanded to reduce relapses, reduce Magnetic Resonance Imaging (MRI) lesion load, and slow the disease progression. Although current attention is on pharmacologic therapies, a more comprehensive and integrated care model is needed. According to the National MS Society (2015), comprehensive MS care involves the expertise of a neurology provider, physical therapist (PT), occupational therapist (OT), speech language therapist (SLT), neuropsychologist, and a social worker. The multidisciplinary team includes a range of health professionals, from two or more disciplines, working together to deliver comprehensive patient care. The team works with patients, and families to improve outcomes, improve coordination and delivery of services, and enhance patient experience. This practice change project will provide a synthesis of the evidence in multidisciplinary programs and discuss the application of the evidence in the implementation of a MS multidisciplinary clinic.

Background/Significance of Problem

MS is characterized by inflammation and eventual demyelination due to the damage to the myelin in the central nervous system (CNS). Given both the high variability in clinical and pathologic features, this may also include axonal transection, rendering the nerve dead (National MS Society, 2015). While the incidence and prevalence rates are not consistently tracked in the United States (US), the National MS Society (2015) reports a figure of 400,000 people who live with MS. Although younger patients can be afflicted with the disease, it is
most common among adults between 20 to 50 years of age. MS is two to three times more common in women than in men. In terms of ethnicity, the incidence is higher among Caucasians or individuals with northern European ancestry, pointing to a latitudinal risk factor (Khan, Turner-Stokes, Kilpatrick, Ng, & Amatya, 2011). Interestingly, migration from one geographical location to another changes one’s risk of developing MS. “Those who move in early childhood tend to take on the new risk themselves. For those who move later in life, the change in risk level many not appear until the next generation” (National MS Society, 2015, p. 1).

**MS Impact on Quality of Life**

MS symptoms manifest in the physical, psychological, and social domains. A study of MS patients by Karatepe et al. (2011) found the most affected parts of quality of life scores were: (a) role limitation-related physical and emotional problems, and (b) physical and social functions. Depression was the most important predictor followed by disability, and fatigue. MS fatigue is considered a silent symptom and different from the fatigue experienced by non-MS individuals. It is daily, interferes with daily activities and responsibilities, worsens with time, and is not attributed to other comorbidities such as depression or sleep apnea (National MS Society, 2015). MS fatigue and related cognitive impairment is a major reason for reduced work-related productivity and even loss of employment (Braley & Chervin, 2010).

The exact etiology of MS is not known (Goodin, 2014). One theory that is most widely accepted is that the pathogenesis begins with an inflammation mediated by active lymphocytes, followed by microglial involvement, and eventual degeneration of the nerve (Compston, & Coles, 2008). Researchers are exploring the role of genetics, vitamin D, and a preceding infection in the development of MS (Mahon, Gordon, Cruz, Cosman, & Cantorna, 2003). There is debate in the MS research community whether an infection that precedes the onset of
the disease may have influence or promulgate the conversion to an autoimmune state. Specifically, the Epstein-Barr virus (EBV) has been implicated with MS risk. EBV is a double-stranded virus of the herpes family that infects 90% of the general population and has a long latent period, rendering the disease inactive, although the patient is considered seropositive (Correale, & Gaitan, 2015). According to Correale and Gaitan (2015), “. . . the prevalence of high titers of anti-EBV antibodies in patients with MS is significantly greater compared to those found in age-matched healthy individuals infected with EBV” (p. 51).

In addition to its benefits on calcium regulation in the body, vitamin D also plays a crucial role in the immune system, particularly in reduction of inflammation. A number of immunological studies on patients with MS lend support to the evidence that vitamin D has positive immunomodulatory and anti-inflammatory actions on T and B cells in both animals and humans (Pierrot-Deseilligny & Souberbielle, 2013). An early study by Mahon et al. (2003) explored the immunological effect of vitamin D in patients with MS. This was a controlled trial whereby one group was given vitamin D supplementation of 1000 international units per day for six months and the other group a placebo pill. The vitamin D supplementation group had higher levels of serum vitamin D level as well as increased tumor growth factor β1, a cytokine that has a multitude functions in the body, one of which is controlling the immune system by inhibiting T cells.

**Access, Benefits and Utilization of Rehabilitative Services**

Weakness and impaired gait are key features of MS (Beer, Khan, & Kesselring, 2012). There is increasing evidence supporting benefits of PT services in MS care. Multidisciplinary rehabilitation in the form of PT has been shown to provide benefit in terms of activity level and according to participation outcomes (Finlayson, Plow, & Cho, 2010). Physical therapy sessions include an initial assessment, followed by individualized care plan, and interventions
to either maintain or improve the patient’s current status. Improved balance and quality of gait have been reported with use of the Berg Balance Scale and the Rivermead Visual Gait Assessment scale as well as interviews (Smedal et al., 2006).

Despite favorable results with the utilization of PT services among MS patients, unfortunately, utilization of such services is not common in MS care. A study by Finlayson et al. (2010) found that only 33% of interviewed people with MS, aged 45 to 90 years, reported using PT services in the past year, 36% or respondents had never used PT services, and 31% recalled using PT over a year ago. Another study found only eight percent were currently receiving PT services, compared to 13% who had already completed therapy in the hospital, and another 20% who had received services by way of their primary care provider (Gottberg et al., 2008).

Organizational Needs Assessment

The practice site is a not-for-profit, acute-care teaching and research hospital with 609 beds located in the mid-Atlantic region, part of a hospital network. With a mission of serving patients, those who care for them and communities, the values espoused are patient first, integrity, respect, innovation, and teamwork.

Although a large department, the department of neurology is made up of numerous small sub-specialty departments. Understandably, caring for patients with neurological disorders has become complex in terms of underlying causes and scarcity in effective treatments. In August 2015, the main practice expanded to include a new satellite facility in a suburban location. This brand new satellite facility, dedicated to neurology and neurosurgery, opened as the department grew in number of new providers, auxiliary staff, and patients who were seeking care from the tri-state area. In the building where the satellite MS center is
located, there is also rehabilitation medicine, orthopedic surgery, urology, and internal medicine.

**Current Practice**

Patients receive exceptional care under the guidance of four neurologists and four nurse practitioners at the main facility and the satellite facility. The delivery of care is different depending on the physician. Each neurologist, with the exception of two newly hired ones, sees patients with the assistance of a nurse practitioner. Patients are evaluated holistically with patient and family collaboration. The goals of treatment are three-fold: (a) to reduce relapses, (b) decrease rate of lesion formation, and (c) slow disease progression (C. Tornatore, personal communication, April 13, 2015). The cornerstone of treatment is the initiation and maintenance with FDA-approved disease-modifying agents. A consensus paper drafted by the Multiple Sclerosis Coalition under the leadership of Consortium of MS Centers (CMSC) outlined treatment considerations (MS Coalition, 2014). The Coalition recommended treatment early in the disease course, and switching therapies in the presence of disease progression. This is to reduce the impact of inflammation and neurodegeneration on long-term disability. Since 1993, the FDA has approved 14 therapies, either formulated to modulate the immune system or suppress certain target immune cells (National MS Society, 2016).

The therapies vary in frequency, and route. They include interferon beta medications (Avonex, Betaseron, Rebif), glatiramer acetate (Copaxone), mitoxantrone (Novantrone), natalizumab (Tysabri), interferon beta-1b (Extavia), fingolimod (Gilenya), dimethyl fumarate (Tecfidera), teriflunomide (Aubagio), daclizumab (Zinbryta), and alemtuzumab (Lemtrada). Patients may choose to start with an injectable medication or an oral pill. Monthly or quarterly infusions are reserved for those patients who have failed the aforementioned modes. Although there is significant evidence in clinical trials with reduction of relapses and MRI lesion
formation, most of the therapies are less successful at reducing the rate of long-term disease progression (Katz & Krieger, 2012). With beta interferons, the injectable platform drugs, the clinical trials reported no statistical significance in mean change in Expanded Disability Status score (EDSS), a score card that quantifies a patient’s disability (Smith et al., 2010). For glatiramer acetate, there was no statistical significance in disease progression when compared to one of the beta interferons; however, there was a mean change in the score as a secondary outcome in another placebo-controlled trial. Smith et al. (2010) posit “. . . the clinical significance of such a difference is questionable” (p. 23). Natalizumab, also known as Tysabri, did reveal statistical significance in disease progression in two clinical trials when compared to placebo.

Practice at all the MS facilities within the hospital network is primarily focused on disease-modifying therapies in the form of pharmacology. Patients begin drug therapy and are monitored closely for any new or worsening neurological signs and symptoms. Therapy may be switched to another drug at the first sign of acute symptoms or disease progression. Seldom at the practice are patients referred to rehabilitative medicine although evidence is available to support the use of these services. Thirty charts reviewed of patients seen by one of the neurologists from January 01, 2015 to February 25, 2015, disclosed a total of six referrals to either a PT, OT, or SLT. This means only approximately 20%, or one-fifth of patients, were referred.

MS practice within the hospital network is similar to most non-affiliated outpatient practices whereby each provider assesses patients every half-hour for an established patient, and one full hour for new patients and consultations. The entire team consists of MS specialists with ancillary support from a nurse, MS coordinator, and administrative staff. Rehabilitative services are ordered for patients upon demand or part of clinical decision-
making. Although there is a rehabilitative department, the actual site is in an outpatient nearby facility.

The satellite MS center, where the practice change was implemented, opened in August 2015. There has been tremendous growth in the MS practice, and given the reduced number of dedicated MS centers in the region, the organization saw an opportunity to address unmet needs of the communities. Currently, only one neurologist who is an MS specialist is seeing patients at this location.

**Readiness for Implementing Evidence-Based Practice**

The healthcare system has been recognized for excellence in neurosciences, transplant, cancer, and gastroenterology. Within neurology, the Huntington and movement disorder specialty groups have established multidisciplinary clinics at the main facility that are very similar to the current project. Both sub-specialties collaborate and work together with rehabilitation medicine by first identifying high risk patients. These patients are then seen in a multidisciplinary clinic once a month.

Within the MS clinic at the main facility, a recent project is underway to transform the practice into a medical specialty home, called a patient-centered specialty practice (PCSP). The PCSP is “designed to improve quality and reduce waste and poor patient experiences that result from poorly coordinated care” (National Committee for Quality Assurance, NCQA, 2016, para. 1). This is akin to the patient-centered medical homes (PCMH), a primary care model that embodies evidence-based practices, but also strives to improve processes and delivery of care through multidisciplinary means (NCQA, 2016). With the implementation of the specialty home, the MS practice will be collecting data on how the model impacts MS specific metrics such as reduced emergency room visits, hospitalizations, and quality of life. The center will seek certification by the National Committee for Quality Assurance (NCQA), a
private not-for-profit organization dedicated to improving health care quality. The PCSP project is certainly a facilitator for the proposed multidisciplinary clinic as well as an opportunity to engage key stakeholders.

Leadership at the MS centers were very supportive of the MS multidisciplinary clinic. Other stakeholders, such as the rehabilitation department and its leadership, have embraced the MS multidisciplinary clinic. The MS multidisciplinary clinic development and implementation was reviewed and approved by the Chairman of the Department of Neurology. For this project, the multidisciplinary clinic site was at the suburban clinic site and the comparison site was at the hospital-based MS clinic.

**Research Questions/Aims**

The main question this project sought to answer was: In MS patients, how does receiving care through a multidisciplinary team, compared to receiving standard care, impact patient satisfaction and patient perception of healthcare provider teamwork? The specific aims of this project included: (a) comparing patient satisfaction in the multidisciplinary clinic to those in standard of care, (b) comparing patient’s perception of teamwork in the multidisciplinary clinic to those in standard of care, and (c) exploring the relationship of provider teamwork and patient satisfaction.

**Theoretical Framework/Evidence-Based Practice Model of Implementation**

An important framework to help guide both the synthesis, and translation of evidence into practice is The Johns Hopkins Nursing Evidence-Based Model (Newhouse, Dearholt, Poe, Pugh, & White, 2007). The foundation of the model rests on practice, education, and research. “The model directs both research and non-research evidence to form the basis for clinical decision-making” (Buchko & Robinson, 2012, p. 260). Moreover, the model addresses both the internal and external factors that may influence the proposed practice change. The internal
factors to be considered include the organizational culture, the setting or environment, resources, and allocation of those resources to the change and standards. The external factors include the implications of the practice change on core measures (Newhouse et al., 2007). Core measures from the Joint Commission on Accreditation of Healthcare Organizations, Center for Medicare and Medicaid, organizational accreditation, and licensing are examples of external factors.

Per the model, the process of translation is in three phases: (a) practice question, (b) evidence, and (c) translation (Newhouse et al., 2007). The first phase comprises the practice question that is answerable. There are several steps to the practice question that begin with identifying an answerable question, to the assembly of key stakeholders, and finally to convening a group discussion meeting. The aim of the meeting is to petition support for the proposed practice change as well as stir a sense of urgency to keep the change afloat.

Before the planning stages of the MS multidisciplinary clinic, the PI met with the rehabilitation medicine and MS practice leadership on several occasions identifying unmet patient needs such as limited access, and utilization of rehabilitation medicine. This led to collaboration between the PI and a neuro-physical therapist to raise the awareness of the problem in MS patients. One great exemplar of comprehensive care that was instrumental in shaping the clinical problem into an answerable practice question was the medical center movement disorder multidisciplinary clinic. This clinic is held once a month with multiple disciplines evaluating and treating high-risk movement disorder patients. As such, the PI began enlisting the support from the chairman of the neurology department. This was followed up with additional meetings to again raise the awareness, and practice change proposal to other MS providers and ancillary staff.
Evidence is the second phase, whereby both research and non-research evidence is conducted, collected, and appraised. This may include evidence-based practice guidelines, quality of improvement data, position statements from professional organizations, and community standards (Newhouse et al., 2007).

The translation phase deals with implementation and feasibility of the practice change as the setting is considered. It is crucial that ongoing feedback from leadership is sought to employ effective communication strategies to educate, inform others, and fend off any last minute complacency. The translation phase continues with evaluation of outcomes, both expected, and unexpected, and reporting the results to further secure support, cement the change internally, and finally disseminate to the practice community. The translation phase of this project was very challenging with the implementation of MS multidisciplinary clinic. The project envisioned a minimum of three disciplines’ involvement; however, it was reduced to the participation of two disciplines. This was partly because the services of one other discipline, OT, were not fully established at the satellite location. Furthermore, another discipline, urology, requested to join the MS multidisciplinary clinic at a later date given their backlog of appointments and procedures. Another challenge initially for the practice change was the physical space barriers at the main MS clinic. Space was very much limited given that most of the MS providers practice from this site. This could be an impediment to a future full practice change to the multidisciplinary care model.

**Definition of Terms**

**Teamwork in Healthcare**

According to the Merriam-Webster dictionary (2015), teamwork is defined as “work done by several associates with each doing a part but all subordinating personal prominence to the efficiency of the whole” (para. 1). According to Salas, Diaz Granados, Weaver, and King
teamwork is a set of interrelated set of specific knowledge (cognitive competencies), skills (affective competencies), and attitudes (behavioral competencies) required for an interprofessional team to function as a unit. The Institute of Medicine (IOM, 2003) defines teamwork as collaborative interaction among interprofessional team members to provide quality, individualized care for patients. Mosby’s dictionary (2002) defines team practice as professional group consisting of physicians, nurses, and number of allied health including physical therapists, social workers, and nutritionists who manage the care of a specified number of patients.

The complex nature of long-term chronic diseases has promoted a collaborative arena among healthcare providers, and led to goals to improve the health and wellbeing of patients, and improve health care service effectiveness. According to Mitchell et al. (2012), such complexities only raise the number of “. . . connections among healthcare providers and patients . . . and become more complicated” (p. 2). As noted by authors in the 2012 IOM paper, “Core Principles and Values of Effective Team-based Health Care”, each team member brings with them a different background, skills set, and knowledge as well as behaviors that are standard accepted practice from their respective disciplines. With the advent of the Affordable Care Act, there is strong support for team based care especially in primary care. Upon further literature analysis, team-based care was found to be very prevalent and deeply embedded in a number of settings that include critical care, hospice, and chronic care terms. Such teams, termed high functioning teams, provide high quality, coordinated care (Doherty & Crowley, 2013).

Team-based care is gaining momentum as the current care delivery is shifting from a soloist model (Doherty & Crowley, 2013). Professionalism, according to the authors, is for all providers –physicians, advanced practice nurses, physician assistant, and other healthcare
providers - to provide most optimal care in a multidisciplinary approach. The paper outlines principles of such professionalism which include: (a) assigning a team who is responsive to the needs of the patient, (b) assigning the patient to a physician who has experience in the care ‘whole person’ and has the appropriate leadership skills, (c) a dynamic team that is flexible to meet the patient’s goals, (d) a team composed of well-functioning highly trained members who are able to assume specific dimensions of care, and (e) a cooperative group of team members.

According to the National MS Society (2015), “the goal is comprehensive, coordinated care to manage the disease and promote comfort, function, independence, health and wellness” (p. 1). In what it calls partners in care, patients must have a full array of services delivered either at one facility or within a comprehensive care network in a coordinated manner by qualified professionals. The multidisciplinary team make-up can vary in number, and types of professionals, including either a MD or NP, a PT, a SLT, an OT, and depending on available resources, may include social work and neuropsychologists. To assess teamwork-related behaviors, this study used the definition of teamwork provided by the IOM.

**Patient Satisfaction**

Inclusion of patients’ opinions on care delivered and the relationship with their provider has gained importance in healthcare in the past two decades. The Institute of Healthcare Improvement (IHI, 2016) developed a framework to improve the quality of care, and health of individuals and communities. The IHI ‘s ‘*Triple Aim*’ includes the patient’s experience of care as fundamentally important and interrelated to the other three dimensions. The triad includes: (a) improving the patient experience of care, (b) improving the health the population, and (c) reducing the per capita cost of health care. There have been calls for expanding the triad to a ‘*Quadruple Aim*’ with the addition of the aim to improve work life of all healthcare providers (Bodenheimer & Sinsky, 2014). One of the key impediments to successfully achieving all
three aims is burnout at the work place. A survey of 68% family physicians and 73% of
general internists reported that they would choose a different specialty if given the opportunity
to start a new career (Kane & Peckham, 2014). Burnout according to Bodenheimer and Sinsky
(2014) can negatively affect clinical outcomes, drive down level of empathy, and possibly
compromise patient safety. By embracing the fourth aim which is improving the work life of
healthcare providers, the ‘Quadruple Aim’ is a better framework for improving healthcare for
those who not only receive care but those who also deliver care.

Patient satisfaction as a concept, and its meaning, is not only evolving with the increased
articles addressing the many facets of patient satisfaction, but also ill-defined. Despite
increased articles on patient satisfaction, there is little consensus on one standard definition of
the concept (Fitzpatrick & Hopkins, 1983). According to Palmer et al. (1991) patient
satisfaction can be defined as judgment made by a recipient of care as to whether their
expectations for care have been met or not. Donabedian (1988), a physician and expert on
health quality matters, explained the importance of patient satisfaction as an outcome measure.
Patient satisfaction in nursing is a major quality indicator in so far as Spence, Laschinger, and
Almost (2003) identified it as one of the nurse-sensitive outcomes. Mrayyan (2006) defined
patient satisfaction “as the degree to which nursing care meets patients’ expectations in terms
of art of care, technical quality, physical environment, availability and continuity of care, and
the efficacy/outcomes of care” (p. 226).

Many hospitals and outpatient setting facilities measure and report patient satisfaction
for internal use and to independent, membership-based, not-for-profit organizations such as
The Joint Commission. For the hospital or practice, patient satisfaction scores (or a score card)
have become the basis for improved quality initiatives. Gaining prominence is the reporting of
patient satisfaction as part of public reporting. Although a number of survey instruments exist,
The Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey is widely used by inpatient hospital settings and their ambulatory centers (Bourgault et al., 2008).

In 2002, the Center for Medicare and Medicaid services, and the Agency for Healthcare Research and Quality (AHRQ), joined forces to develop and test HCAHPS survey. The survey and its methodology was debated upon and vetted in the public domain. With the testing complete, the National Quality Forum (NQF) formally supported the use of the survey. The NQF is a national, non-partisan organization with members that include healthcare providers, professional associations, purchasers, federal agencies, consumer groups, and research organizations that was established to improve and standardize the quality of healthcare (National Quality Forum, 2016).

In the HCAHPS, there are 32 questions about a patient’s experience of care that are administered to random number of patients (AHRQ, 2016). Given the common metrics across hospitals and practices, since 2008, HCAHPS has allowed comparisons between hospitals regionally and nationally. The Center for Medicare and Medicaid Services (CMS) reports the results for public viewing on a website called ‘Hospital Compare’ (Medicare, 2016) to encourage consumers to make meaningful comparisons. With the passage of the Patient Protection, and Affordable Care Act in 2010 (CMS, 2014), HCAHPS performance was linked to acute care hospitals’ value-based purchasing programs beginning in the fiscal year 2013. The survey accounts for 30% of the Total Performance Score (TPS). Of note, via survey of patient experiences collected with HCAPS, the medical center was low in nine out of the 11 domains when compared to the national average score (Medicare, 2016).

Moreover, this standardized survey is having tremendous impact on hospitals’ QI initiatives. Hospitals across the nation have utilized the results of the HCAHPS to target new improvement projects, benchmarks for improved quality of care delivered, continual
performance evaluations, and monitoring measures. A study by Kennedy, Craig, Wetsel, Reimeis, and Wright (2013) demonstrated the impact of three nursing interventions on HCAHPS. A steady rise in scores was achieved with nurse manager rounding, post discharge phone follow-up, improved discharge counseling, and teaching of patients on an on a 28-bed surgical unit.

The RAND (2016) corporation developed a Patient Satisfaction Questionnaire III with a short-form version that contains only 18 questions. This is a Likert scale with response values from Strongly Agree (1) to Strongly Disagree (5) about a patient’s feelings on the care they received. The survey was designed to reflect high scores for both satisfaction, and dissatisfaction with each item response; however, satisfaction with medical care yields a high overall score when all item scores are computed. Dimensions of satisfaction are centered around medical care, and are divided into general satisfaction, interpersonal mannerisms, communication, financial aspects, time spent with doctor, accessibility, and convenience (Marshall & Hays, 1994). A number of studies in oncology, and quality improvement venues have used this short-form, particularly looking at overall care satisfaction, and a number of patient-reported outcomes such as financial burden, but the is limited information on the application of this questionnaire in studies exploring outcomes related to multidisciplinary efforts. For the purpose of the study, patient satisfaction was defined as overall satisfaction with the care received on the day of service.
Chapter II

Review of the Literature

An in-depth search and review of related studies and literature about multidisciplinary clinics was completed for the purpose of critiquing the body of the evidence, and forming a recommendation about the use of a multidisciplinary clinic that is supported by the evidence. The level of evidence for each study, and the strength of each recommendation was derived using the Strength of Recommendations Taxonomy (SORT) by Ebell et al. (2004).

Introduction to Search Criteria

The objective of the literature review was to explore the effectiveness of a multidisciplinary care model and to assess current evidence-based practice care in adults with MS. This included clinical trials or studies, clinical practice guidelines, best practice MS Centers in the U.S., and meta-analyses. Given the limited return when the literature search focused on MS, the search, and selection was expanded to include other neurological and non-neurological diseases such as Amyotrophic Lateral Sclerosis (ALS), movement disorders, Rheumatoid Arthritis (RA), and cancer. Search terms included: interdisciplinary, multidisciplinary, MS, ALS, RA, rehabilitation, patient satisfaction, neuro-rehabilitation, and teamwork. Initially, keywords and headings were combined using the Boolean operator and with more citation hits, each subheading was exploded to yield more citations. Finally, keywords were combined to narrow the search. The following combinations of keywords were utilized:

- {multiple sclerosis care} OR {rehabilitation} OR/AND {physical therapy}
- {rehabilitation} AND/OR {hospital-based home care service}
- {inpatient} AND {outpatient} OR {occupational therapy} OR {hand therapy}


- {social work} OR {nutrition} OR {neurologic gait disorder}
- {ALS} OR {home health care} AND/OR {multidisciplinary} OR {interdisciplinary}
- {speech} AND {multidisciplinary} AND {Multiple sclerosis} AND {physical therapy}
- {rheumatoid arthritis} and {occupational therapy} AND {multidisciplinary care}

Table 1. Search Methods Utilized and Number of Domains Included

<table>
<thead>
<tr>
<th>Domain</th>
<th>Number of Hits</th>
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<td>Pubmed (1990-present)</td>
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<tr>
<td>EMBASE (1990-present)</td>
<td>67</td>
</tr>
<tr>
<td>CINNAHL (1990-present)</td>
<td>398</td>
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<tr>
<td>Ovid (1990-present)</td>
<td>52</td>
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<tr>
<td>National MS Society</td>
<td>10</td>
</tr>
<tr>
<td>Consortium of MS Center</td>
<td>4</td>
</tr>
<tr>
<td>Reference List from published studies</td>
<td>17</td>
</tr>
</tbody>
</table>

Inclusion Criteria

The literature review was restricted to English only language with adults ages 18, and older. Research queries were primarily in the health, and nursing fields. Both males, and females were included. Journals included were peer reviewed, and expert peer reviewed journals. Desired publication dates of five years, and less were included, however in some instances, expanded to 10 years.

A total of 1,023 titles and abstracts were discovered by electronic searches that included the Ovid Medline, CINNAHL, Pubmed, and Google Scholar databases. Table 1 includes the search domains used for this project. Initial screening of the studies and articles led to 197 articles to be included for further analysis. Included studies were English-only, with
studies conducted between 1992 and 2015. Countries where the research was done included US, United Kingdom, Australia, Italy, and Denmark.

**Multidisciplinary Team**

Studies reviewed addressed multidisciplinary rehabilitation programs or team care approach multidisciplinary rehabilitation programs. The teams varied in the number of disciplines and consisted of a MD, PT, OT, and/or a SLT. Other team members that comprised some teams included social workers, nutritionists, and neuropsychologists. Patients were either seen by a neurologist, who then actively enrolled them into study, or patients were seen in a team-based approach. Therefore, the range of disciplines was up to eight, depending on the study. The multidisciplinary care program was delivered in various settings including inpatient, outpatient centers, and home-based therapies. Some of the studies had a control group for comparison, which consisted of either standard care or patients who were waitlisted.

The intensity of the rehabilitation programs was highly variable in terms of number of hours per day, days per week, and number of disciplines involved. Outcomes reported in the studies were classified according to three levels: (a) activity limitation, (b) impairment, and (c) participation (Khan, 2011). Studies by Difabio, Choi, Soderberg, and Hansen (1997), Difabio, Soderberg, Choi, Hansen, and Schapiro (1998), Guagenti-Tax, DiLorenzo, Tenteromano, LaRocca, and Smith (2000), and Patti et al. (2003), explored limitations with the following instruments: Functional Independence Measure (FIM), Incapacity Status Scale (ISS) fatigue severity scale (FSS), and Functional Assessment Scale (RIC FAS).

For the level of impairment, studies by Difabio et al. (1998), Guagenti-Tax (2000), and Patti et al. (2002) assessed the outcome by utilizing the following instrument scales: Amended Motor Club Assessment (AMCA), Expanded Disability Status Scale (EDSS), Functional
Assessment in MS (MSIS), Beck-Depression Inventory (BDI), and MS Symptom Checklist Composite Score.

Participants in the studies by Difabio et al. (1997, 1998), Guagenti-Tax et al. (2000), and Patti et al. (2002) were examined with the following scales: MS Quality of Life Questionnaire (MS QoL), MS Impact Scale (MSIS 29), General Health Questionnaire (GHQ 28), Sickness Impact Profile (SIP), Tempelar Social Experience Checklist (SET), and Short Form Health Survey Questionnaire (SF36).

Critique and Synthesis of Previous Evidence

Multidisciplinary MS programs (Outpatient)

A total of four studies were identified for review and synthesis with two of the studies from the same authors (Difabio et al., 1997, 1998; Guagenti-Tax et al., 2000; Patti et al., 2002, 2003). Patti et al. (2002, 2003) explored the effect of a comprehensive outpatient program followed by home exercise. Data was collected at baseline and 12 weeks. In the study by Guagenti-Tax et al. (2000), the multidisciplinary clinic met twice monthly for 12 months, and explored treatment effect on impairment and participation. This study was interesting, as caregivers were included as well. With the studies by Difabio et al. (1997, 1998), patients received low-intensity rehabilitation one day of the week for duration of one year.

Study design. Three of the four studies were randomized clinical control studies (Guagenti-Tax et al., 2000; Patti et al., 2002, 2003). Difabio et al. (1997) was a non-randomized controlled study. For all the studies, the participants and assessors were not blinded. The studies utilized convenience sampling in selection of participants. Patti et al. (2002, 2003) selected patients who were admitted to Poli-clinico of the University of Catania in Italy. Difabio et al. (1997) and Guagenti-Tax et al (2000) recruited participants from an MS Achievement Center, an adult day program where MS patients attend for a variety of
rehabilitative, and cognitive community services. Participants in each study were equal to or older than 18 years of age, and included both males and females. All subgroups of MS were included (relapsing forms, secondary, and primary). With the Guagenti-Tax et al. (2000) study, caregivers were included in the multidisciplinary program.

Outcomes. Patti et al (2003) revealed significant improvement in FIM motor scale in the areas of locomotion, self-care, and transfers when compared to the control group. Furthermore, the studies revealed improvement in quality of life, mood, fatigue, and social function. There was no change in cognitive and EDSS scores over time with the multidisciplinary care model. The study by Guagenti-Tax et al. (2000) evaluated EDSS, and ISS scores, of which both scores declined in both the treatment and control group. However, perceived health in the SF-36 was better in the treatment group in both patients, and caregivers, compared to the patients and caregivers in the control group. With Difabio et al. (1997), a small improvement in SF-36 was noted in a number of domains: energy/fatigue, bodily pain, general health, physical health, social function, and social support. In a continuation study by the same researchers, Difabio et al. (1998), showed significant reduction of symptoms, and fatigue when compared to the control group. However, there was no change in RIC FAS.

Strength of recommendation. Using SORT (Ebell et al., 2004), the level of the evidence for the individual studies was designated as limited quality patient-oriented evidence (level 2) with use of a multidisciplinary care model in the care of MS patients. The Patti et al. (2002, 2003) studies showed improvement at the level of participation, and activity limitation, however no change in EDSS and cognitive scores was seen. Guagenti-Tax et al. (2000) results revealed improvements at the level of participation in perceived health and decline in anxiety compared to the control group. The results of Difabio et al. (1997) were positively skewed with improvements at the level of participation, and reduction of symptoms related to fatigue.
Finally, Difabio et al. (1998) showed improvements at the level of impairment, however no change in activity limitations was seen between the two groups. These four studies have demonstrated significant positive change at the participation, activity limitation, and impairment levels for patient receiving care in a multidisciplinary care setting. Overall, the recommendation to utilize a multidisciplinary model of care with MS patients is based on limited-quality patient oriented evidence. The recommendation using the SORT is a grade B. This practice change is likely to be beneficial in the care of MS patients.

**Multidisciplinary MS Programs (on Relapses)**

An MS relapse represents either one or more symptoms, which may be new symptoms or worsening of old symptoms, lasting more than 24 hours, and separated from a previous attack by at least 30 days (National MS Society, 2015). Also, to be considered a true relapse, other secondary etiologies must be ruled out. These secondary causes are infection, vaccinations, stress, insomnia, surgeries, or change in core body temperature. In looking at published research, three studies were identified, and summarized on the effectiveness of rehabilitation interventions with MS patients currently experiencing relapse. Two of the studies were conducted in the inpatient setting, and the other was conducted in the outpatient setting. Participants selected for the studies were either experiencing a relapse or recovering from one.

**Study design.** The study by Craig, Young, Ennis, Baker, and Boggild (2003) was a randomized controlled study that included patients who were confirmed as having a MS diagnosis as well as relapse that needed treatment with intravenous methylprednisolone for three days, either outpatient or while hospitalized. The sample selection was through convenience sampling with Craig et al. (2003) identifying eligible participants through the Walton Center for Neurology, and Neurosurgery, and its affiliated satellite clinics. Twenty
participants completed the treatment program, and 20 participants were part of the standard care group. Both groups were comparable in terms of time to MS diagnosis, gender, and disability level. Average age of the participants was 38 years with mean time since diagnosis of 7.42 years. In terms of disability as measured by EDSS, six patients were mild, 10 participants had moderate EDSS scores, and four patients had severe EDSS scores. Patients were selected for either the treatment or control group through block randomization with 20 participants in each group. There was one participant who dropped out of the control group.

The treatment group received the IV methylprednisolone for the relapse followed by structured therapies through a multidisciplinary team that consisted of PT, OT, and a nurse. Outcome measures were evaluated at the time of admission, at one month, and three months following the first day of IV methylprednisolone.

Liu, Playford, and Thompson (2003) conducted a retrospective study of MS patients admitted to a Neuro-Rehabilitation Unit from the period 1993 through 2002 for either incomplete recovery of an MS relapse, or for requiring treatment of an MS relapse with IV steroids. The independent variable in this study was a patient-centered multidisciplinary rehabilitation. A sample size of 90 patients who had relapsing remitting MS was included in this study. The median age was 31 years, duration of disease of five years, and median interval of rehabilitation period of 18 days. At time of admission, a median disability level as measured by the EDSS was 6.5, which indicated constant bilateral use of assistance by either canes, crutches or braces required to walk about 20 meters without resting (National MS Society, 2006).

Kidd, Howard, Losseff, and Thompson (2013) conducted another pre-post cohort study that followed patients with MS who received a structured multidisciplinary rehabilitation program over a 16 month-period. This goal-oriented program included the disciplines PT, OT,
SLT, neurologist, and nurses. The sample included 79 patients, with a mean age of 49 years, duration of disease of 12 years, and mean length of stay in the program of 15 days.

**Outcomes.** In the Craig et al. (2003) study, the intervention’s effect on activity impairment was measured using Guy’s Neurological Disability Scale (GNDS), and the Amended Motor Club Assessment (AMCA). There was significant improvement in motor function as measured by AMCA compared to the control group ($p = .035$) and decrease in disability as measured by GNDS as well ($p = .03$).

Liu et al. (2003) evaluated the Expanded Disability Scale (EDSS), Barthel Index (BI), and Functional Independence Measure (FIM). EDSS, VAS, FIM scores improved at discharge compared to admission ($p < .0001$); effect sizes were -1.01, 0.97, and 0.86 respectively.

Kidd et al. (2013) clinically assessed patients upon admission then again at discharge on disability level (EDSS), Barthel’s Index (BI), and ESS scores. A statistical significance was noted with improvement of the BI, a measure that assessed an individual’s functional capacity in performing activities of daily living, as well as ESS, which was a broad measure of handicap. Overall, the body of evidence when these studies are evaluated together supports the addition of rehabilitative services to MS patients experiencing a relapse.

**Strength of the recommendation.** At the level of activity limitation, all three studies revealed patients did benefit from rehabilitative interventions. At the level of impairment, studies by Craig et al. (2003), and Liu et al. (2003) found favorable outcomes supported with the addition of multidisciplinary care team to IV methylprednisolone for those patients who are experiencing MS relapse. It is difficult to ascertain whether the significant improvements in disability, and motor function were a result of intense intervention at the time of admission (patients were only admitted for up to 3 days), or a culmination of both the inpatient intervention, and continued maintenance of therapy sessions in the outpatient setting. Liu et al.
(2003) was a retrospective study with a heterogeneous MS population. It is unclear how many
patients received IV steroids in the period before, and after the neuro-rehabilitation, which may
confound the outcomes reported. The Kidd et al. (2013) study included both relapsing
remitting, and primary progressive forms of MS. The significant impact was mostly in those
patients with the relapsing remitting form of MS. The role of a multidisciplinary care program
in the other forms other than relapsing remitting is less clear, and defined.

Each of the individual studies represented limited-quality patient oriented evidence
(Level 2). Overall the strength of the recommendation in favor of adoption of a
multidisciplinary care plan in patients who have experienced a relapse or recently experienced
a relapse is a SORT grade B (Ebell et al., 2004). These studies reveal a beneficial effect of a
multidisciplinary model from the time of admission of a relapse to the discharge from a
neurorehabilitation unit.

**Multidisciplinary Programs (Rheumatoid Arthritis)**

Two studies (Raspe, Deck, & Mattussek, 1992; Schned et al., 1995) compared out-
patient multidisciplinary Rheumatoid Arthritis (RA) care to standard care. The treatment
group for both studies received care from a multidisciplinary group that consisted of a
rheumatologist, OT, PT, social worker, dietician, and an RN. Schned et al. (1995) included
standardized interviews as well.

**Study design.** Schned et al. (1995) was an RCT, while Raspe et al. (1992) was a
prospective cohort study. Understandably, both the participants and assessors were not blinded
given the nature of the intervention. All patients had RA with functional class I, II, or III.
With Raspe et al. (1992), the treatment group had 121 participants, and the control group 141
participants. Mean duration of the study was 24 months. Attrition rates were 37% and 46%
respectively. The Schned et al. (1995) study had 57 participants in the treatment group, and the control group had 50 participants.

**Outcomes.** Study findings were inconsistent. The global assessment and depression scores improved in the treatment group in the Raspe et al. (1992) study. However, with the Schned et al. (1995) study, no significant differences were found between groups in measures of physical status, physical functioning, psychosocial status, or pain.

**Strength of recommendation.** While one experimental study (level 2) supported the use of a multidisciplinary care model in the care of RA patients, the other study did not show any difference (Ebell et al., 2004). Based on these findings, the strength of the recommendation is a B, with acknowledgement that the literature review was limited.

**Multidisciplinary Program (ALS)**

ALS is a neurodegenerative disease primarily affecting motor neurons with acute onset of paralysis. Given the poor prognosis, death typically ensues within three to five years (ALS Association, 2015). The vital communication needed for impulse transmission between the nervous system, and the muscles innervated by those same neurons is absent. Voluntary control of muscles is lost, and the muscles weaken with the muscles wasting away. Although the cause of ALS is not known, genetic mutations in certain genes that produce SOD1, and C9orf72 have been implicated in both familial and sporadic cases (National Institute of Neurological Disorders, 2015). In addition to FDA-approved drug therapies such as Riluzole, supportive care through multidisciplinary care teams is critical for symptom relief and to improve the quality of life (Vucic et al., 2013).

One study was identified that explored the impact of a multidisciplinary program on ALS. The study by Traynor, Alexander, Corr, Frost, and Hardiman (2003) specifically explored the impact of a multidisciplinary ALS clinic on survival among patients in Ireland.
The time period was from 1996 to 2000. The multidisciplinary care team consisted of a neurologist, registered nurse, PT, OT, SLT, pulmonologist, nutritionist, psychologist, and social worker. Representatives from the Irish Motor Neurone Disease Association (IMNDA) were also present. Equipment supplies were available to the patient at no cost. Patients in the terminal stages were seen at home with the same full array of services available to those who attended the clinic.

**Study design.** This was a prospective population-based study comparing multidisciplinary care to patients receiving standard care at general neurology clinics. Convenience sampling was used. Patients were drawn from the Irish ALS registry, a comprehensive repository of all patients diagnosed with ALS in Ireland (Traynor et al., 2003).

**Outcomes.** Mean survival of ALS in the multidisciplinary setting was significantly improved, 7.5 months longer than the control patients. The one-year mortality rate decreased by 29.7%, and prognosis of bulbar onset was also extended by 9.6 months in patients who received care in the multidisciplinary program (Traynor et al., 2003).

**Strength of recommendation.** The experimental study (level 2) supports the use of a multidisciplinary care model in the care of ALS patients. The strength of the recommendation is B (Ebell et al., 2004).

**Rationale for Project**

The above literature review detailed the effectiveness of a multidisciplinary approach in a number of populations. Although, the studies were quite heterogeneous in terms of study participants, settings, intensity, and make-up of the programs, there is evidence to support the use of a multidisciplinary care model in the management of patients with MS. Applying the evidence was appropriate for a number of reasons. First, a number of advances in the management of MS have shifted the treatment paradigm from minimizing symptoms to
reducing disease activity and progression (Trojano et al., 2007). Since 1993, more pharmacological therapies for MS have been approved by the FDA with targeted outcomes such as delay in disease progression, delay in brain volume loss, reduction in annualized relapse rate, and reduction in MRI lesion load.

Furthermore, research on the benefits of rehabilitation on functional status in MS patients has been well documented in the literature. Leading MS organizations such as the National MS Society and CMSC have called for a more comprehensive care model with various disciplines collaborating, and working together to enhance the care of MS. Effective cooperation, and coordination, along with shared decision-making with the patient and their families, offers promise for improving MS related outcomes, decreasing duplication of services, and improving patient experience and satisfaction.

There are a number of patient satisfaction surveys reported in the literature, however they are single-discipline focused (Kamo et al. 2010; Laschinger, Hall, Pederson, & Almost, 2005; Soliman, Kassam, & Ibrahim, 2015). One such survey found in the literature used to measure quality of nursing care in the hospital is the Patient Satisfaction with Nursing care Quality Questionnaire (PSNCQQ) by Laschinger, Hall, Pederson, and Almost (2005). Another patient satisfaction questionnaire cited in the literature is the Patient Satisfaction Survey (PSS) developed by Kim (1991). It is a Likert scale (1 = very satisfied, 4 = very satisfied) inquiring about a patient’s satisfaction with nursing care. The impact of multidisciplinary care on satisfaction has not been evaluated.

In reviewing the literature, various validated instruments existed to measure teamwork both quantitatively, and qualitatively (Frankel, Gardner, Maynard, & Kelly, 2007; Hull, Arora, Kassab, Kneebone, & Sevdalis, 2011; Taylor, Atkins, Richardson, Tarrant, & Ramirez, 2012). However, there was a gap in the literature of the patient’s perception of the teamwork, and
behaviors. In existing literature, both the teamwork behaviors, and perception of such behavior was from the perspective of a professional group or individuals, rather the patient. In pursuit of best practices to enhance teamwork, programs such as the Teamwork Effectiveness Assessment Module (TEAM) by the American Board of Internal Medicine is commonly used by organizations. This is a both self-assessment and interprofessional assessment performed using a web-based survey (Chesluk et al., 2012). The aim is to provide constructive criticism on teamwork behaviors, and through reflection, identify what constitutes good interprofessional teamwork as a basis for future improvements. According to the authors, by participating in this program, both the experience and knowledge gained can impact patient care and safety positively.

A joint effort between Department of Defense’s Patient Safety Program and the AHRQ lead to the development of the program Team Strategies and Tools to Enhance Performance and Patient Safety (TeamSTEPPS), a program that enables groups of individuals or units in healthcare to promote teamwork behaviors (Baker, Beaubien, & Holtzman, 2003; Baker, Gustafson, Beaubien, Salas, & Barach, 2003). Many military treatment settings, and healthcare institutions have implemented TeamSTEPPS to optimize teamwork among professionals. The core curriculum begins with an introduction of the concept of team, and why teamwork is important in healthcare. Phase one deals with organizational readiness, followed by the identification of unit or group of interest to implement the program. Phase two is the planning, training, and implementation of the program. Designated change agents within the organization begin training with case studies, simulation, and scenarios augmenting the skills and strategies needed for effective teamwork. Finally, phase three is sustaining the change through integration into daily practice, and continual surveillance for the purpose of improvement, and promotion of such behaviors throughout the institution or other units.
One tool was identified that captures a patient’s perception of health provider behaviors in a team. This tool is the Patient Insights and Views on Teamwork (PIVOT) questionnaire by Henry, Rooney, Eller, Vozenilek, and McCarthy (2014). The PIVOT questionnaire spans areas of care coordination, communication amongst team members, team dynamics, and consistency of information. Through web-based survey of providers, educators, patients, and their advocates and cognitive interviewing of a select number of patients seen in an emergency room, the initial 21-item questionnaire was revised to a 16 questions that capture a patient’s perception of teamwork behaviors, and interactions.
Chapter III

Methods

Information pertaining to the design of the study, cost/benefit analysis, and institutional review board (IRB) approval will be presented. The selected population, procedures of the study, and instruments used to measure the outcomes are discussed.

Design

This was a descriptive comparative study with data collected from two groups who completed surveys once. The two groups compared were: (a) one group taking part in a multidisciplinary clinic at the satellite clinic and (b) another group receiving standard care at the main facility. The participants of this study were recruited from patient populations at both MS centers. Convenience sampling was used to select participants and the sample was further narrowed based on the inclusion criteria.

Human Subjects Review

With the direct involvement of patients, this study adhered to Georgetown University’s IRB procedures for human subject studies and was approved by the IRB. The PI was not involved in the direct care of the patients. Privacy and confidentiality of the data was protected, and informed consent was utilized. Patient information was locked in an area separate from the list of participant numbers, and identities. Electronic health records and computers were password protected with information only being shared between the PI and her mentor. Information will be retained for three years after completion of study. The study was not sponsored by any companies or federal entities.
Population

Participants were either newly referred or established patients at either site. In order to participate, participants must have had a diagnosis of MS. The sample was a convenience sample, with patients who were already scheduled on Mondays and Wednesdays referred to the multidisciplinary clinic at the satellite facility, and patients scheduled on any of the other days of the week designated as standard care clinic patients at the main facility. Given both facilities’ schedule, the study anticipated enrolling six patients into each group per week. For the multidisciplinary clinic at the satellite site, the neurologist, and the PT saw the participants contiguously. For the standard of care, another neurologist saw participants alone at the main MS facility.

Inclusion criteria for the study were participants who were 18 years of age or older, and able to speak, and read English. Eligible participants had to have a confirmed diagnosis of MS and be receiving care at an MS clinic. Additionally, eligible participants needed to understand, and be able to give informed consent. Exclusion criteria excluded participants who were less than 18 years of age or were not able to speak or read English. Participants who did not have a diagnosis of MS or were not receiving care at either MS clinic were excluded, as well as participants who were not able to give informed consent. Finally, women who were pregnant were excluded as well.

Sample Size

It was not possible to perform a power analysis to determine the needed sample size before beginning the study due to the lack of previous research comparing patient perception of teamwork and satisfaction in two different models of care. Without previous research, the anticipated effect size was not known. Therefore, power analysis was performed after data collection to determine achieved power. All potential participants who met inclusion criteria,
and who participated in the study were included in the analysis. The study’s level of significance was set at an alpha level of .05.

**Procedures**

Patients at either location made appointments as per usual, and based on their appointment day, were either assigned to the multidisciplinary care group or the standard care group. Patients were called by the PI 1-2 days prior to their appointments, and given brief information on the study. Their appointment was also confirmed. On the day of their appointment, they were invited to participate.

**Multidisciplinary Clinic Group**

The MS multidisciplinary clinic at the satellite facility was in effect on Wednesday afternoons. The clinic consisted of a neurologist, and a PT. The limited number of disciplines involved is acknowledged as a limitation to this project, however plans are underway to continue this project to work towards the inclusion of disciplines such as social work, urology, neuro-cognitive therapy, and OT.

The multidisciplinary clinic on Wednesdays began at 12:30 pm when patients arrived. Soon after, the informed consent process began. Patients were given 30 minutes for the process, which provided an opportunity to have their questions, and concerns addressed. At approximately 1:00 pm patients who consented to becoming participants were placed in examining rooms, whereby a medical assistant began taking their vital signs, and updating their medical chart in the electronic health record keeping platform. Once that was completed, a neurologist, and PT began seeing the participants contiguously at 45 minute to one hour intervals. Once their evaluations were completed, the providers switched rooms while the participants remained in the same room. The assessment and evaluations were tailored to meet the participant’s unique needs. Following clinical evaluations by both providers, as short
The informal meeting concluded with recommendations for prospective care plans for each participant that included both pharmacology, and rehabilitation services as deemed appropriate. Before leaving, participants completed the surveys (PIVOT, satisfaction score, and demographics), and the PI collected further clinical data through the treating neurologist. Data from the surveys completed by the participants is in Appendix A and the specific clinical data is included in Appendix B.

At the discretion of the neurologist, pharmacological measures may have included remaining on the current disease-modifying therapy, along with adjunct medications, as part of maintenance of the illness. The rehabilitation services recommendation by PT varied depending on the clinical status of the participant. Therapy was deferred for those who were stable and not exhibiting decline in function and strength. Others who clearly demonstrated a need with either subjective reporting of a decline, or clinical decline, were referred to formal PT sessions at either the clinic site or another therapy location of their preference.

Control/Standard Care Group

A separate group of patients that were part of standard care at the main facility site were included in the project to compare patient satisfaction and perception of teamwork in a standard care clinic to that of patients receiving care in the multidisciplinary clinic. Standard care consisted of a care model whereby patients were seen by their neurologist. Upon arrival for the appointment, informed consent took place, and participants were given opportunity to ask questions before signing the consent. When the neurologist determined a need for evaluation, and intervention to rehabilitative medicine, the neurologist provided referrals to disciplines such as PT. Contrary to the multidisciplinary clinic group, it was left up to the patients in the control group to locate and initiate contact with rehabilitation medicine. Prior to the end of the visit, control group participants completed the demographic questions along with
the survey on perception of teamwork, and the one-question survey on patient satisfaction. The PI was able to gather current clinical data from the treating neurologist. Appendix A details the surveys the participants were asked to complete while Appendix B illustrates the clinical data collected by the PI.

**Instruments/Tools/Validity and Reliability**

Following their appointments, both groups were asked to rate their perception of teamwork through completing the PIVOT questionnaire by Henry et al. (2014). The survey in the original instrument development study was intended to capture both patient and caregiver perception of healthcare teams. There were a total of 16 questions with each question having a range of responses from *not at all* to *all the time*. In previous studies the validity through Rasch item outfit statistics were all positive and ranged from .28 to .57 (Henry et al., 2014). The internal consistency Cronbach alpha has been shown to be .87 with an inter-rater reliability of .85 (Henry et al., 2014).

At the end of their appointment, participants were also asked about their satisfaction with the care they received that day. The range of response options was from *quite dissatisfied* to *very satisfied* as was operationalized by Thind, Liu, and Maly (2011). In this study, the one question asked of patients was, ‘Overall, how satisfied have you been so far with your MS care?’

As the final part of the survey, participants were asked to complete a socio-demographic form. Appendix A discloses the survey and socio-economic data participants completed. This was followed by the collection of clinical data by the PI from the neurologist regarding participant’s clinical history, and status. Appendix B illustrates the clinical data form.
Outcomes Measurements

There were two dependent variables in this study: (a) patient perception of provider teamwork, and (b) patient satisfaction. Patient perception of provider teamwork was measured using a well validated instrument evaluating teamwork-related behaviors among healthcare team members (Henry et al., 2014). Permission was granted to use the PIVOT survey and is included as Appendix C. Patient satisfaction with the care they received during the appointment, was assessed via one question related to patient satisfaction. The independent variable was the type care delivery model: either multidisciplinary or standard care at MGUH.

Data Analysis

The main research question this project sought to answer was: In MS patients, how does receiving care through a multidisciplinary team compared to receiving standard care, impact patient satisfaction and patient perception of healthcare provider teamwork? Therefore, PIVOT and patient satisfaction scores were compared in the two groups (multidisciplinary care and standard care). It was anticipated that the independent t-test would be used to compare the two groups on each dependent variable at one point in time because parametric tests are typically stronger, and more robust that their non-parametric equivalents (Sullivan & Artino, 2013). This is especially true in smaller samples. However, as the parametric assumption of normality was not met, the Mann-Whitney U test for non-parametric testing was used. The secondary aim of exploring the relationship of provider teamwork and patient satisfaction was accomplished via Spearman’s rho correlations due to the non-normal distribution of data.
Chapter IV

Evaluation Results

The PIVOT tool’s Cronbach alpha in this study was .911. Given the sample size of 36 participants, alpha level of .05, and effect size of 1.24 (Cohen's d), the observed power in this study was 93.9% (Faul, Erdfelder, Lang, & Buchner, 2007).

Sample Demographic Data

A total of 36 patients participated in this study. The majority of participants were female (92%). In terms of race, the make-up was 52% white, 39% black/African American, 2% Asian, 2% Hispanic or Latino, and another 2% reported as other. Overwhelmingly, participants were non-Hispanic or Latino (97%). Mean age was 45 years (range = 28 to 73 years, SD 13.3). No significant differences were found between the standard care and the multidisciplinary care groups for any of these demographic characteristics. See Table 2 for full demographic data of the two groups.

Sample Clinical Characteristics

The majority of participants were diagnosed as having the relapsing-remitting form of MS (92%) with the remaining having primary progressive MS (8%). The majority of participants (58%) were receiving a FDA approved disease-modifying therapy, while 42% of participants were not receiving such therapy. Just under half of the participants (47%) were diagnosed with MS during the past three years, 17% were diagnosed 4-7 years ago, 6% were diagnosed 7-10 years ago, and 31% were diagnosed over 10 years ago. No significant differences were found between the standard care and the multidisciplinary care groups for any of the clinical characteristics. See Table 3 for full clinical characteristics of the two groups.
Research Aim One

The first objective of this study was to compare patient satisfaction in the multidisciplinary clinic to those in standard care. Participants in the MS multidisciplinary clinic group scored patient satisfaction higher ($M = 4$, $SD = .000$) than those in standard care ($M = 3.33$, $SD = 0.767$). A Mann-Whitney U Test revealed a significant difference in the satisfaction scores of the two groups ($U = 81$, $z = -3.384$, $p = .001$, $r = .56$).

Research Aim Two

The second goal of this study was to compare the patient perception of teamwork in the multidisciplinary clinic to those in standard care. Per the PIVOT scale, participants in the MS multidisciplinary clinic group had a more favorable perception of provider teamwork ($M = 77.33$, $SD = 4.03$) compared to those in standard care ($M = 62.11$, $SD = 7.92$). A Mann-Whitney U Test revealed a significant difference in the PIVOT scores of the two groups ($U = 10.50$, $z = -4.834$, $p = .000$, $r = .81$).

Research Aim Three

The third and final objective of this study was to explore the relationship between patient perception of provider teamwork and patient satisfaction. The Spearman rank order correlation test revealed a strong positive statistically significant correlation between patient perception of provider teamwork and patient satisfaction ($rs = 0.713$, $p = .000$).

Summary of Findings/Outcomes

This study found that participants in the multidisciplinary clinic, whereby participants were seen by a neurologist and PT contiguously in the same visit were more satisfied with their care than those seen by a neurologist alone at the comparison site. Similarly, participants in the multidisciplinary clinic group had a more favorable perception of provider teamwork when compared to standard care participants. Finally, the findings revealed a strong positive
relationship between perception of provider teamwork, and patient satisfaction. The higher the scores for perception of provider teamwork, the more participants were satisfied with their overall care.
In this study, 90% of the total sample was female. The female preponderance in both prevalence and incidences of MS is well known (Ahlgren et al., 2011; Gajofatto et al., 2013; Hurwitz, 2009). In fact, females of all races hold a greater risk of MS than Caucasian males (Kurtze, 2005). According to the National MS society, the prevalence of MS is possibly two to three times more common among females than males. In a study estimating the annual prevalence of MS among US commercially insured individuals from 2008 to 2012, the authors found a threefold increase in females compared to males (Dilokthornsakul et al., 2016).

MS is more common in the Caucasian population, particularly those individuals with western European ancestry (WHO, 2008). Ecological and prevalence studies have eluded to less prevalence and incidences of MS in the black population, especially in the western hemisphere (Kurtzke, 2005; Rosati, 2001). For this study, in terms of race, 52% were non-Hispanic whites, whereas 39% were black or African-American. The race and ethnic distribution of the study reflects the area serviced by the two practices where there is a higher African-American preponderance compared to other race groups. Similarly, higher prevalence rates among non-Hispanic white individuals has been cited in the literature (Noonan et al., 2010). Interestingly, a study exploring the incidence of MS in a diverse ethnic groups through chart review of newly diagnosed patients at Kaiser Permanente Southern California between the years 2008 to 2010 found higher incidence among blacks compared to other ethnic groups (Langer-Gould, Brara, Beaber, & Zhang, 2013). The study found higher incidence of MS in blacks, especially women, than in Caucasians, and a lower incidence of MS in Hispanic and Asian patients. Another nationwide study looking back at the incidence of MS among veterans
by review of medical records and data from the Department of Defense and Department of Veterans Affairs between 1990 to 2007 also supports the findings of higher incidence rate of MS in African-Americans (12.1 per 100,000) than Caucasians (9.3 per 100,000) (Wallin et al., 2012). Overall, prevalence among minority groups such as African-Americans in western regions of the world is certainly higher post-immigration (Khan et al., 2015). An epidemiological study by the WHO (2008) reported lowest incidence rates in South East Asia, and Africa, although the report cautions the reader to keep in mind the limited resources in accurate diagnosing and reporting of MS cases in these continents. This lends credence to the thinking behind change in one’s risk of developing MS due to migration from one geographical location to another. According to the National MS Society (2015), older individuals who migrate to countries in the western hemisphere may not change the risk level for themselves, but increases the risk of MS increases for the next generation.

Over 90% of participants in the study were between the ages of 25 and 55 years, and the average age was 45 years. Similarly, peak prevalence of MS reported by Dilokthornsakul et al. (2016) was 45 to 49 years of age.

All the participants in the multidisciplinary clinic were classified as having the RRMS form of MS, whereas 83% of the participants in the standard care group had the RRMS form. This is similar to the literature which reveals up to 85% of all MS cases are RRMS (Gajofatto et al., 2013; Hurwitz, 2009; Milo & Kihana, 2010). Despite the disease’s heterogeneity, and complexity, the role of exacerbations followed by remissions, as with RRMS, typifies the early course of the disease.

Approximately 58% of all participants in the study were on a disease-modifying therapy. Despite the variable clinical course of MS, the benefits from the approved FDA disease-modifying therapies have been fruitful in terms of slowing down the disease
progression, and lessening the accumulation of disease burden by either modulating or suppressing the immune system (Gajofatto & Benedetti, 2015; National MS Society, 2016).

Similar to this study, in spite of repeated calls for early, and ongoing treatment, only 57% of MS patients are on treatment (National MS Society, 2008). A number of factors have been identified for the suboptimal rate of FDA-approved therapies taken by patients: (a) barriers from insurers in approving the therapy, (b) suboptimal adherence due to patient preference and side effect profile of the drug, and (c) lack of positive effect from the medication (Halpern, Agarwal, Dembek, Borton, & Lopez-Bresnahan, 2011; National MS Society, 2008).

All the patients in the multidisciplinary group reported a time-to-diagnosis of 10 years or less, which represents an age range of 20 to 55 years at the time of diagnosis. Sixty-seven percent of participants in the standard group had time-to-diagnosis of 10 years or less, and another 33% had time-to-diagnosis of over 10 years; given the patients’ ages, they were diagnosed between the ages of 20, and 60. This is similar to what is reported elsewhere with an age of first symptom onset between 20 to 50 years of age (NINDS, 2016). Mayr et al. (2003) reported a median age at time of diagnosis 37.2 for men, and 35.4 years for women among all MS cases from 1985 to 2000 in the Mayo Clinic and Rochester Epidemiology Program Project. From a global perspective, the WHO (2008) reported that the average age of onset in the Americas (29.4 years) is similar to Europe (29.2 years), Africa (29.3 years), and South-East Asia (29.5 years), and while higher than Eastern Mediterranean (26.9 years).

Information on how long a patient has had a MS diagnosis is noteworthy, and worth collecting, as this sheds light onto whether disability has ensued, and what impact such disability has had on a patient’s quality of life. An observational study that looked at the relationship between clinical risk factors, and long-term outcomes 10 years after disease onset (Bsteh et al., 2016) found a significant negative predictor of severe disability in those patients whose MS
transitioned from RRMS to SPMS. “A patient developing SPMS has 500-fold higher risk of being severely disabled within 10 years after MS onset as compared to a patient remaining relapsing-remitting” (Bsteh et al., 2016, p. 10).

The actual EDSS score of participants was also collected in this study. EDSS is an objective measure of level of disability. The scale of one to 10 is quantified from a neurological examination. The lower the number, the lesser degree of disability, and the higher the degree of ambulatory abilities. Higher numbers denote higher degree of disability, and lower ambulatory abilities (Tarver, 2015). Both the pace of the disability, and the score, are important markers for MS prognosis. Seventy-two percent of the total sample in this study had an EDSS of three or less. The median time from onset of MS to disability measured using an EDSS is highly variable in the literature. One study found patients reaching an EDSS of six (the point at which a patient begins to require assistive devices such as a walker or cane) was 27.9 years (Tremlett, Paty, & Devonshire, 2006); two other studies estimated mean time to an EDSS of six was between 18 to 20 years (Kremenchutzky et al., 2006; Leray et al., 2010).

Unlike many of the studies evaluating EDSS milestones, this study had over 50% of participants on FDA-approved DMT regimen which has been shown to have a positive impact, however small, on the onset and progression of disability in MS. This may explain the lower EDSS scores recorded for study participants in this study.

**Perception of Provider Teamwork**

This study found patients seen contiguously by a neurologist, and a PT had better perception of provider teamwork than those patients seen by only a neurologist. This was an expected finding. Although, there were no previous studies looking at patients’ perception of provider teamwork in MS care, the results of this study are similar to what has been reported in non-MS populations. One previous study evaluated whether patient perceptions of
interprofessional collaboration (IPC) among team members was inherently important in the overall care of patients. IPC was defined as working with one or more healthcare individuals for the common goal of optimal patient care (Cheng, Szumacher, & Di Prospero, 2014). The survey completed by both breast, and prostate cancer patients tapped into two domains: patient perspective, and patient perception of the IPC. In terms of patient perspective, all patients (100%) reported that they either “mostly agree” or “strongly agree” to the question, “collaboration between different healthcare professions is important to me” (Cheng et al., 2014, p. 376). As for patient, perception, 100% of the prostate cancer patients and 84% of the breast cancer patients reported ‘mostly agree’, and ‘strongly agree’ to the statement, “the different healthcare professions involved in my care work well as a team” (Cheng et al., 2014, p. 377). Finally, with the statement, “in regards to my cancer treatment, I feel part of the healthcare team”, 82% of breast cancer patients, and 92% of prostate cancer patients in the study checked “mostly agree”, and “strongly agree” on the Likert scale (Cheng et al., 2014, p. 377).

A number of studies examining teamwork have revealed favorable clinical outcomes with healthcare providers’ teamwork. Some of the strongest, and most consistent evidence on the effect of teamwork has been in the domain of critical care. A study by Boyle (2004) found units reporting a higher level of collaborative participation had lower rates of pressure ulcers, falls, pneumonia, and shorter length of stay compared to units with lower scores of collaboration. Teamwork is integral in the Program of All-Inclusive Care for the Elder (PACE) where scope of care is embedded in multidisciplinary professionals. Specifically, the effect of team performance from program enrollment to death, and on functional status at three and 12 months, and deterioration in urinary incontinence, was reported in the study (Mukamel et al., 2006). Team members included were physicians, nurses, therapists, nutritionists, and
aides. With team members’ perception of performance, the study showed better team performance was associated with improvements in patient functional status at three months, and 12 months, and less deterioration in urinary incontinence at 12 months. There was no difference in mortality found.

Further, other studies have found multidisciplinary to have a positive impact on patient outcomes (Difabio et al., 1997, 1998; Patti et al., 2002, 2003). The multidisciplinary model is not merely a representation of a number of disciplines, but the make-up of the team is also important. A study by Spinewine et al. (2007) illustrated how adding pharmacy to one of the multidisciplinary teams positively impacted the appropriateness of prescribing in a geriatric population. The geriatric evaluation program, known as Geriatric Evaluation Program (GEP) consisted of a multidisciplinary team of providers, geriatricians, residents, nurses, PT, and care coordinators. Added to one of the GEP groups was a dedicated pharmacist. Data was collected at time of admission, discharge, and three months’ post-discharge. Outcomes were medication appropriateness using the Medication Appropriateness Index (MAI), and the Assessing Care of Vulnerable Elders (ACOVE). With the addition of a pharmacist to one of the GEP groups, patients benefited from an improved appropriateness of use of medications compared to the control group. Similarly, PT was the chosen discipline in this study because PT has been deemed critical in the overall care of MS patients.

Patient Satisfaction

Patients seen in the multidisciplinary clinic reported higher satisfaction with overall care compared to those in standard care. Similarly, in a past study, patients reported improved satisfaction in a multispecialty care model approach to prostate cancer treatment (Gomella et al., 2010). In a study by Guagenti-Tax (2000), patients attending an adult day care center for MS patients, which included care and educational workshops provided by a variety of
providers (physicians, nurses, PT, OT, social work, seating, and positioning clinics, psychology, urologist, and nutritional providers), reported an increased perception of their cognitive deficits, less anxiety, and better perceived their decline in health status when compared with control subjects.

In evaluating both patient and provider satisfaction in a hospital-based multidisciplinary clinic, both groups reported a high level of satisfaction with the care received (Litton et al., 2010). This was a hospital-based model with an array of cancer specialists, nursing, and allied practitioners. Following a weekly tumor conference whereby team members acquiesced on appropriate treatment modalities, the multidisciplinary clinic began with each cancer patient being assessed by a nurse navigator. At the clinic appointment, patients met with specialty providers including a social worker, a dietician, a genetic counselor, a lymphedema specialist, or a PT. Once all the visits were complete, the nurse navigator reviewed the visit and plan of care with the patient. Patient satisfaction was rated as excellent by 98% of the clinic attendants on a Likert scale. Even though many disciplines were presented in this model, physicians were the only discipline to be surveyed to evaluate provider perspective. Objective data on the physician satisfaction was not included in the paper, however authors reported physicians giving “high marks” on the multidisciplinary care model (Litton et al., 2010, p. e35). Further, the physicians provided statements crediting the model to strengthening communication, and elevating level of care. An important determent to the generalizability of findings was expressed by some of the physicians surveyed in the study. Those physicians indicated the real time interactions between team members, and readily available information would be a challenge to replicate outside the hospital setting.
Relationship Between Provider Teamwork and Patient Satisfaction

In this study, a positive relationship was found between patients’ perception of provider teamwork, and patient satisfaction. Similarly, an organizational culture emphasizing teamwork has been shown to have a positive impact on patient satisfaction for inpatient care (Meterko, Mohr, & Young, 2004). The study by Meterko et al. (2004) assessed whether patient satisfaction with care received was correlated with particular types of culture. Type of organizational culture was assessed in 125 Veteran Health Administration (VHA) hospitals using four dimensions (teamwork, entrepreneurial, bureaucratic and rational). Of note, teamwork was viewed as engagement in collaborative practice between departments, and employees. An aggregate of scores revealed patient satisfaction with the care received was significantly positive in a teamwork culture environment. Moreover, there was evidence linking collaboration between disciplines, and other patient-reported outcomes.

In an integrative review, self-perceived health, life satisfaction, and increase in social activities was better in multidisciplinary care models that incorporated bio-psycho-social assessments, evidence-based treatment plan, coordination of care, and coaching strategies (Martin, Ummenhoer, Manser, & Spirig, 2010). As patient satisfaction becomes the forefront topic of interest in healthcare, teamwork culture may translate into increased patient satisfaction.

Furthermore, a study by Lyu, Wick, Housman, Freischlag, and Makary (2013) explored whether patient satisfaction was independent of quality surgical care. The study compared the performance of 31 U.S. hospitals listed on the HCAPS survey, the CMS Surgical Care Improvement Program (SCIP), and the employee Safety Attitudes Questionnaire (SAQ). The findings indicated that patient satisfaction was not associated with performance of hospital processes, appropriate hair removal, deep vein thrombosis prophylaxis, overall hospital safety,
employee job satisfaction, working conditions nor perceptions of management. However, a noteworthy significant finding researchers discovered was that patient satisfaction was associated with employees’ perceptions of teamwork.

Communication is a key aspect of teamwork. An important insight into a patient’s perception of teamwork is communication. The PIVOT survey completed by patients regarding perception of provider teamwork contains numerous items addressing communication. Effective communication has been reported elsewhere as a significant predictor of patient satisfaction (Potiriadis et al., 2008).

No other setting other than the emergency room has seen trials of team-based activities to improve work flow, provider, and staff morale, and patient outcomes. Patel and Vinson (2005) studied the effect of a team assignment system consisting of a physician, nurse, and medical technician on time from arrival to physician assessment, percentage of patients who were not seen by physicians, and subsequently left the ED, and patient satisfaction. Comparing data from pre-intervention, the researchers found less mean time to physician assessment, reduced number of patients leaving before assessment, and improved patient satisfaction after team-based activities were implemented.

Similarly, a study by Wetmore et al. (2014) also found improved patient satisfaction with access and continuity of care in a multidisciplinary family medicine setting. The Family Medical Center was a multidisciplinary in nature with physicians, nurses, social work, laboratory services, and shared mental health program. Although the majority of patients were satisfied with the care, 40% of patients reported being dissatisfied with access to care because of clinic hours, and access to the physicians in the practice. Conversely, dissatisfaction to due to limited access to physicians was not reflected in this study’s findings. This may be because
participants in the multidisciplinary group spent the same time with the neurologist as those who were not part of the study.

**Limitations**

There are number of limitations specific to this study. First, the sample size of 36 is small, and does pose a substantial challenge to the generalizability of this study’s findings to other populations and settings. The study was prepared to enroll at least 30 participants in each group initially, however constraints with location, time, and data collection did impact the study. Second, the move of the multidisciplinary clinic pushed back the anticipated start date of the study as well impacted the type and number of disciplines that would be represented. The reason for the move was that the main facility location was not able to accommodate the multidisciplinary clinic due to lack of space and parking issues. Moreover, the PT, OT, SLT professionals were not available to take part of the multidisciplinary clinic on a weekly basis, but rather were only able to commit to a monthly participation.

As mentioned previously, the multidisciplinary clinic in this study was limited to a physician and a PT. Although multidisciplinary in the literature has a myriad of definitions which are not confined to a specific number of disciplines, findings may have been different had there been more types of providers included in the multidisciplinary clinic. The initial proposal included the disciplines PT, OT, SLT, neurology, urology, and nursing. The satellite facility did not have an established OT nor SLT presence. Most patients needing an OT or a SLT evaluation were referred to another location or at a location near their residence. As for nursing, the change in location of the intervention site precluded inclusion of the nursing discipline. Although the PI is both a registered nurse and certified nurse practitioner, it was decided that her participation as a member of the multidisciplinary clinic health care team would not be appropriate because of risk of influence, and study coercion.
Another limitation to consider is the selection of only patient satisfaction and patient perception of provider team as outcomes of measures. Study findings on these measures may not necessarily impact clinical outcomes in MS. A number of studies looking into MS multidisciplinary clinic critiqued for this study were able to describe both clinical outcomes, and patient-reported outcomes, such as patient satisfaction.

**Implications for Practice, Education, Research, and Policy Dissemination**

Comprehensive care in MS is not only appropriate, but critical in slowing the disease progress, and overall disability burden to patients. Multidisciplinary care models are well established in oncology care, and have shown improved patient satisfaction and benefits in patient outcomes. Every study that included patient satisfaction as an outcome measure revealed either favorable responses or high scores. This study imparts similar findings with higher patients’ perception of provider teamwork and patient satisfaction for those who were cared for in a multidisciplinary care setting. This supports the wide-spread adoption of the MS multidisciplinary clinic model and the need to further expand the team to include other pertinent disciplines such as urology, OT, and SLT.

There are multiple implications for practice. First, it is necessary to sustain the current multidisciplinary clinic at the satellite facility on either Mondays or Wednesdays of each week. Second, the clinic should be expanded by including urology, and nursing in the team. Conveniently, urology is already located on the same floor of the practice. Similarly, it is suggested that the multidisciplinary care model be replicated in the practice with the collaboration of the rehabilitative medicine team located in the main facility. There is a strong element of readiness and willingness among the rehabilitative medicine team to work closely with the MS team as expressed through personal interviews, and presentations to the MS practice by PT, OT, and SLT.
Education begins with the introduction of the multidisciplinary clinic at the new MS Patient Education Day, which is held each year at the main facility. This is a one-day symposium highlighting overall MS management and specific topics selected for enhanced patient awareness on the disease. This would represent an effective channel in disseminating research findings as well as educating the public, target audience, and other healthcare providers who are in attendance on the role of multidisciplinary care in MS.

Policy implications include creating guidelines supporting the use of multidisciplinary care models in MS care throughout the healthcare system. To reach such a status requires the engagement of administrative and physician leadership and champions who can help facilitate such a wide-spread organizational change. The study findings support the adoption of MS multidisciplinary clinic in the overall care and management of MS patients.

**Recommendations for Nursing Practice and Further Study**

One of the recommendations for practice is raising the awareness and education of providers who care for MS patients by outlining the important role a multidisciplinary care model can play in MS care. It is not sufficient to refer patients in the hopes that rehabilitative services will be rendered and accept the loosely-tethered communication, and coordination that exists. In an internal document, the organization discussed the opening of a multispecialty care center; a center focused on comprehensive care for all services patients would need under one roof. The MS multidisciplinary clinic can help facilitate effective ways of assessing patients, and aid in greater collaboration, and consensus among stakeholders including the patient, family, and providers vested in the best possible outcomes for patients.

Finally, from a research standpoint, this study affirms the need for additional research studies looking at the clinical impact of multidisciplinary care on challenging symptoms such as weakness, bladder dysfunction, gait, and mobility difficulties. This study was focused on
the patient-reported outcomes of patient satisfaction, and patients’ perception of provider teamwork. A number of studies reviewed examined patients who already presented with deficits, and had higher EDSS scores. Research focusing on early assessment, and intervention by a multidisciplinary team may shed light on whether early onset of disability can be reversed, and improvements gained sustained over time. Also, an advantage to a MS multidisciplinary clinic is the access to multiple disciplines who may offer additional therapeutic options to those patients who for one reason or another fail the approved therapies and are willing to participate in phase three research trials of certain investigational therapies.

Additional research on a larger scale to evaluate the impact of a multidisciplinary clinic with more disciplines in the care of MS is also needed. Although patient-reported outcomes are important, prioritizing studies with strong methodological designs and larger sample sizes that evaluate the impact of multidisciplinary clinics on target clinical measures such as balance, ambulation, bladder dysfunction, spasticity, and better quality of life in the face of a progressive, disabling disease would be beneficial.

The National MS Society advocates for multidisciplinary care as a means to improve outcomes, coordination and delivery of services, and enhance patient experience. This study has supported the latter with improved patient satisfaction and patients’ perception of provider teamwork.
<table>
<thead>
<tr>
<th>Variable</th>
<th>MS MD (MD/PT)</th>
<th>Standard Care (MD only)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>17 (94%)</td>
<td>16 (89%)</td>
</tr>
<tr>
<td>Male</td>
<td>1 (6%)</td>
<td>2 (11%)</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>9 (50%)</td>
<td>10 (56%)</td>
</tr>
<tr>
<td>Black or African-American</td>
<td>7 (39%)</td>
<td>7 (39%)</td>
</tr>
<tr>
<td>Hispanic or Latino</td>
<td>1 (6%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Asian</td>
<td>1 (6%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Other</td>
<td>0 (0%)</td>
<td>1 (6%)</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Hispanic or Latino</td>
<td>17 (94%)</td>
<td>18 (100%)</td>
</tr>
<tr>
<td>Hispanic or Latino</td>
<td>1 (6%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25-35 years</td>
<td>5 (27%)</td>
<td>2 (11%)</td>
</tr>
<tr>
<td>36-45 years</td>
<td>6 (33%)</td>
<td>6 (33%)</td>
</tr>
<tr>
<td>46-55 years</td>
<td>4 (22%)</td>
<td>9 (50%)</td>
</tr>
<tr>
<td>56-65 years</td>
<td>1 (6%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>over 65 years</td>
<td>2 (11%)</td>
<td>1 (6%)</td>
</tr>
</tbody>
</table>

Total percentages are not 100 for every characteristic because of rounding.
<table>
<thead>
<tr>
<th>Variable</th>
<th>MS MD (MD/PT)</th>
<th>Standard Care (MD only)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td>MS form</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relapsing-Remitting</td>
<td>18 (100%)</td>
<td>15 (83%)</td>
</tr>
<tr>
<td>Secondary Progressive</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Primary Progressive</td>
<td>0 (0%)</td>
<td>3 (17%)</td>
</tr>
<tr>
<td>Primary Relapsing</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Disease-modifying therapy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>10 (56%)</td>
<td>11 (61%)</td>
</tr>
<tr>
<td>No</td>
<td>8 (44%)</td>
<td>7 (39%)</td>
</tr>
<tr>
<td>Time to Diagnosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-3 years</td>
<td>9 (50%)</td>
<td>8 (44%)</td>
</tr>
<tr>
<td>4-7 years</td>
<td>4 (22%)</td>
<td>2 (11%)</td>
</tr>
<tr>
<td>7-10 years</td>
<td>5 (28%)</td>
<td>2 (11%)</td>
</tr>
<tr>
<td>Over 10 years</td>
<td>0 (0%)</td>
<td>6 (33%)</td>
</tr>
<tr>
<td>EDSS Score</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-3</td>
<td>13 (72%)</td>
<td>13 (72%)</td>
</tr>
<tr>
<td>4-6</td>
<td>4 (22%)</td>
<td>3 (17%)</td>
</tr>
<tr>
<td>7-9</td>
<td>1 (6%)</td>
<td>2 (11%)</td>
</tr>
</tbody>
</table>

*Note.* EDSS = Expanded Disability Status Scale. Total of percentages are not 100 for every characteristic because of rounding. Total percentages are not 100 for every characteristic because of rounding.


doi: 10.1097/01.NUMA.0000340814.83152.35


doi:10.1371/journal.pone.0158978.


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297 – 311.


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The following questions are about your perception of healthcare provider teamwork, level of satisfaction and demographic questions. Please give us your honest response to each question. You may leave any question on the survey blank.

### I. Patient Insight and Views on Teamwork
From your perspective, please tell us about the team of people providing patient care here today. These individuals may have worked directly with you or worked on the team in other ways. Fill in the response option that best fits each statement. If you really feel that you have no basis for judgment, you may leave that item blank.

<table>
<thead>
<tr>
<th>Question</th>
<th>Response Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I thought the team worked together well</td>
<td>○ Not at all ○ Rarely ○ Sometimes ○ Often ○ All the time</td>
</tr>
<tr>
<td>2. I thought team members enjoyed working together</td>
<td>○ Not at all ○ Rarely ○ Sometimes ○ Often ○ All the time</td>
</tr>
<tr>
<td>3. I thought the team coordinated patient care well</td>
<td>○ Not at all ○ Rarely ○ Sometimes ○ Often ○ All the time</td>
</tr>
<tr>
<td>4. I thought team members kept each other informed</td>
<td>○ Not at all ○ Rarely ○ Sometimes ○ Often ○ All the time</td>
</tr>
<tr>
<td>5. I felt as if team members talked in front of me as if I wasn't there</td>
<td>○ Not at all ○ Rarely ○ Sometimes ○ Often ○ All the time</td>
</tr>
<tr>
<td>6. I felt that team members told me conflicting things</td>
<td>○ Not at all ○ Rarely ○ Sometimes ○ Often ○ All the time</td>
</tr>
<tr>
<td>7. I thought team members supported each other to get the work done</td>
<td>○ Not at all ○ Rarely ○ Sometimes ○ Often ○ All the time</td>
</tr>
<tr>
<td>8. I felt team members were considerate of one another</td>
<td>○ Not at all ○ Rarely ○ Sometimes ○ Often ○ All the time</td>
</tr>
<tr>
<td>9. I saw team members treating each other with a lack of respect</td>
<td>○ Not at all ○ Rarely ○ Sometimes ○ Often ○ All the time</td>
</tr>
<tr>
<td>10. I heard arguments between team members, inside or outside the room</td>
<td>○ Not at all ○ Rarely ○ Sometimes ○ Often ○ All the time</td>
</tr>
<tr>
<td>11. I was told the names of the people who worked on the patient care team</td>
<td>○ Not at all ○ Rarely ○ Sometimes ○ Often ○ All the time</td>
</tr>
<tr>
<td>12. I was told how the team worked as a whole</td>
<td>○ Not at all ○ Rarely ○ Sometimes ○ Often ○ All the time</td>
</tr>
</tbody>
</table>
II. How satisfied are you with the care you received today?

○ Quite dissatisfied  ○ Indifferent or mildly dissatisfied  ○ Mostly satisfied  ○ Very satisfied

III. Please give us some background information about yourself.

Your gender:  □ Male  □ Female  □ __________________

Please specify your race? Check all that apply:
☐ American Indian or Alaska Native  ☐ Asian  ☐ Black or African American
☐ Hispanic or Latino  ☐ Native Hawaiian or other Pacific-Islander  ☐ White
☐ __________________________________________

Please specify your ethnicity.
☐ Hispanic or Latino  ☐ Non-Hispanic or Latino

How old are you? _____ years
Appendix B  
Clinical Form Data  
(Information will be obtained from participant’s neurologist)

Please specify multiple sclerosis type:  
☐ Relapsing Remitting  ☐ Secondary Progressive  ☐ Primary Progressive  
☐ Progressive Relapsing

Is Participant on an FDA-approved disease modifying therapy for the multiple sclerosis  
☐ Yes  ☐ No

Time from multiple sclerosis diagnosis  
☐ 0-3 years  ☐ 4-7 years  ☐ 7-10 years  ☐ more than 10 years.

Expanded Disability Status Scale (EDSS)  
☐ 0-3  ☐ 4-6  ☐ 7-9
Appendix C

Date: January 18, 2016

AGREEMENT TO USE QUESTIONNAIRE IN RESEARCH

Permission to use the “Patients’ Insights and Views Observing Teams” is being granted to Safia Abdillahi MSN to investigate team effectiveness at [name omitted]. Modification of the tool for other participant populations is also granted. In doing so, Safia agrees to the following:

1. Acknowledge the original authorship of the tool in any paper/poster presentation, even if the tool is modified.

2. Share psychometric analysis conducted on the tool with the author, Beverly Henry.

Provide a copy of the abstract of the completed research report to Beverly Henry.

Signature

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