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Provider Referral of Patients with Acute Low Back Pain to Physical Therapy: Implications for Outcomes and Costs

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Table of Contents

Abstract

Because most patients with an acute episode of low back pain (LBP) enter the health care system through primary care, it is important primary care providers consider the effects of their decisions on patient outcomes and costs. Although guidelines for primary care management of acute LBP do not place emphasis on physical therapy, they have not been updated since 2007, and more recent evidence supports the use of timely physical therapy in acute LBP patients without "red flags." Additionally, many studies indicate specialist or surgical consultation is over-utilized, inflating costs and delaying physical therapy. The aim of this project was to determine if the type of provider referring acute LBP patients to physical therapy effects outcomes and costs, comparing referrals of three groups: primary care physicians, primary care nurse practitioners and physician's assistants, and specialists. To do so, the project leader obtained data collected over twelve months by a large physical therapy organization through an outcomes-tracking program [Focus on Therapeutic Outcomes (FOTO)]. FOTO provided demographic information, referring physician, and outcomes data. Outcomes were determined by the change in functional score, which was a score computed by the FOTO survey. Cost data was estimated using the new Centers for Medicare & Medicaid Services (CMS) standardized payment information from the physician fee schedule search. A total of 342 patients fit the inclusion criteria of the project of the 2,070 patients seen with acute low back pain between October 1, 2015 and September 30, 2016. After outlier analysis, data from 329 patients was included in statistical analysis. One-way ANOVAs were used to compare mean change in functional score and mean cost between the three groups. All groups showed improvement at completion of physical therapy. There was no statistically significant difference in change in functional score between the three groups; however, there was a statistically significant

difference in mean cost between the three groups. More specifically, the mean cost for patients referred by specialists was higher than both primary care physicians and primary care nurse practitioners and physician's assistants. There was no statistically significant difference in mean cost between primary care physicians and primary care nurse practitioners and physician's assistants. After further analysis through incremental cost-effectiveness ratios, the project leader determined the most cost-effective pathway for patients with acute LBP is direct referral from primary care nurse practitioners and physician's assistants to physical therapy. The findings support the need for updated guidelines for primary care management of acute LBP to include referral to physical therapy and support the role of nurse practitioners and physician's assistants in primary care.

Keywords: acute low back pain, primary care management, physiotherapy, guidelines, cost-effectiveness

Introduction and Background

Low back pain (LBP) is a problematic issue in the United States, accounting for significant health care expenditures estimated between 85 and 238 billion dollars annually (Childs et al., 2015). This problem is evidently on the rise, with a reported 65% increase in LBP costs from 1997 to 2005 (Fritz, Childs, Wainner, & Flynn, 2012). For this reason, health care providers must be cognizant of their role in lowering costs associated with LBP. The costs can be substantial because they are not solely direct costs, but also include indirect costs such as loss of productivity from missed work.

Because most patients seeking care for a new episode of LBP enter the health care system through primary care, decisions made at the primary entry level can affect patient outcomes and costs. If new episodes of acute LBP are not managed appropriately, not only can patients go on to experience decreased quality of life and debility, but also incur significant long-term health care costs and loss of the ability to work. Therefore, early management of LBP is important.

Problem Statement

Acute LBP is a problem which, if not managed properly at the primary care level, can lead to chronicity. Primary care providers are not following available guidelines appropriately, and the guidelines available are outdated. New evidence points to physical therapy as a cost-effective option, and the cost-effectiveness needs to be further validated through research.

Purpose

The purpose of this project was to determine the effects of the type of provider referral to physical therapy on patient outcomes and costs. The project aimed to answer the question: In patients ages 18 to 65 referred to physical therapy with acute LBP, are outcomes better and costs less for those referred by primary care physicians, primary care nurse practitioners/physician's

assistants, or specialists? The objectives were to determine, for the current episode of back pain, which patients had the greatest improvement in functional score, and which patients had the least direct health care expenditures. Ultimately, the project leader hypothesized outcomes are better and costs are less for those patients referred directly to physical therapy by primary care providers than for those referred to specialists and subsequently referred to physical therapy.

Review of Evidence

Guidelines

The most common guidelines for management of acute nonspecific LBP are the European guidelines and the American College of Physicians. The most recent clinical guidelines were released jointly by the American College of Physicians and the American Pain society in 2007. They include recommendations for diagnosis and treatment which are in line with those previously published in the European guidelines (van Tulder et al., 2006). Providers should only order diagnostic imaging for those with severe or progressive neurologic symptoms and when serious underlying conditions are suspected (Chou et al., 2007). Specifically, MRI and CT should only be ordered when patients are possible candidates for surgery or epidural steroid injections (Chou et al., 2007). For those with nonspecific acute LBP, providers should recommend patients remain active and use acetaminophen or nonsteroidal anti-inflammatory medications for pain management first (Chou et al., 2007). For patients who do not respond to self-care, providers should then consider recommending nonpharmacologic interventions such as spinal manipulation, interdisciplinary rehabilitation, exercise therapy, acupuncture, massage, yoga, cognitive behavioral therapy, or relaxation (Chou et al., 2007). None of the guidelines recommend referral for surgical consultation.

Unfortunately, observation of the management of acute low back pain in primary care has shown variation despite guidelines being available. Three studies have investigated the compliance of the guidelines for primary care management of nonspecific acute LBP, and all have found actual practice in primary care is not in alignment with guidelines (Piccoliori et al., 2013; Shaheed et al., 2016; & Fullen et al., 2007). In addition, Fullen, Maher, Bury, Tynan, Daly, and Hurley (2007) also found when guidelines are followed, patient outcomes improve and costs are reduced. Their findings may indicate many providers are not making the most cost-effective decisions for their patients and would be doing so by adhering to recommended guidelines more stringently.

Many primary care providers who are not following guidelines are unnecessarily ordering imaging and surgical consultation, despite the lack of "red flags" (Shaheed et al., 2016 & Fullen et al., 2007). Haswell, Gilmour, and Moore (2015) define "red flags" as those symptoms which would indicate serious pathology; the "red flags" they identified are pain unresponsive to conservative management or progressive or severe paresis. They recommend patients be referred for surgical consultation if they have a score of less than a grade three out of five on the Medical Research Council's scale for muscle strength (Haswell et al., 2015). Leerar, Boissonnault, Domholdt, and Roddey (2007) also list "red flags" which would potentially indicate conditions such as cancer, infection, or fracture: 50 years of age or older, bladder dysfunction, cancer history, immune suppression, rest/night pain, trauma, saddle anesthesia, lower extremity neurological deficit, weight loss, recent infection, and fever/chills. Since surgical consultation and radiological imaging are costly, they should be reserved for these patients.

Several studies address the utilization of these costly routes and study the effects of them. Two studies found a majority (up to 80%) of primary care referrals for MRI were unjustified

(Huang, et al., 2008; Haswell, et al., 2015); and Webster, Bauer, Choi, Cifuentes, and Pransky (2013) found early MRI had iatrogenic consequences, leading to lower rates of full recovery and increased health care costs compared to those who had no MRI. Also, two studies found most surgical consultations from primary care for LBP are unjustified (Huang, et al., 2008; Haswell, et al., 2015). Their findings may indicate primary care providers do not feel confident in their ability to treat nonspecific acute LBP. Since the most recent guidelines recommend against surgical referral and against ordering imaging, primary care providers should consider physical therapy for those who do not present with "red flags" but are at risk for further debility or chronicity.

As previously mentioned, guidelines include physical therapy as an alternative if other conservative management does not work, but do not emphasize it as a first-line recommendation (Chou, et al., 2007). Updated guidelines may factor in more recent research, which include a stratified approach for nonspecific acute low back pain, the effects of early physical therapy (PT) on utilization of health care resources and costs, and the effectiveness and cost-effectiveness of PT.

Stratification of Nonspecific Acute Low Back Pain

A need for stratifying care of patients with nonspecific acute LBP was identified due to the variation in prognosis and treatment options. Currently, three approaches to stratification exist: based on mechanism, based on treatment responsiveness, and based on risk.

Stratification based on mechanism matches patients to a treatment based on the underlying condition (Foster, Hill, O'Sullivan, & Hancock, 2013). Several approaches using the stratification method exist, including the Pathoanatomic Based classification, Mechanical Diagnosis and Treatment, and the multi-dimensional classification system of O'Sullivan;

however, as of 2013, no impact analysis or cost-effectiveness data is available for stratifying care based on mechanism (Foster, et al., 2013).

Stratification based on treatment responsiveness uses the patient's history, physical exam findings, and test results to match him to a treatment (Foster, Hill, O'Sullivan, & Hancock, 2013). This type of stratification typically uses clinical prediction rules (CPRs); however, very few CPRs have been tested in randomized controlled trials (Foster, et al., 2013). In one study, Apeldoorn, Bosmans, Ostelo, de Vet, and van Tulder (2012) found a modified version of Delitto's stratification approach was not cost-effective compared to usual physical therapy in patients with sub-acute and chronic low back pain.

Stratification based on prognostic risk uses information about a patient's risk of persistent disability to match him to a treatment (Foster, Hill, O'Sullivan, & Hancock, 2013). An example is the Keele StarT Back screening tool, which was created for use in primary care. It has been tested in a randomized controlled study and has been studied for impact analysis. The tool places patients in one of three groups: low risk, medium risk, or high risk. Patients determined to be low-risk are treated with assessment, reassurance, medication advice, self-management advice, and explanation to legitimize symptoms; over-treatment or -investigation is discouraged (Foster, et al., 2013). Patients at medium risk are treated with physiotherapy, including manual therapy and an exercise regimen, and patients at high risk are treated with psychologically-informed physiotherapy (Foster, et al., 2013). Hill, et al. (2011) compared the STarT Back tool to current best practice and found use of the STarT Back tool was associated with significantly lower disability and significantly lower costs. Whitehurst, Bryan, Lewis and Hay (2015) determined stratified care for low back pain usiFng the STaRT Back tool was cost-effective for patients in the high-risk category only. The IMPaCT Back Study determined the long-term

effects of the STarT Back tool to be significant improvements in disability, half the time off work, and no increase in health care costs (Foster, et al., 2014). General Practitioners who were presented with the STarT Back tool felt positively towards it overall, mostly due to its brevity and ease of scoring; however, the providers questioned the ability of physical therapists to manage the high-risk patients (Karstens, Joos, Hill, Kung, Szecsenyl, & Steinhauser, 2015). Despite general practitioners questioning physical therapists' abilities to manage high-risk patients, the STarT Back tool has evidence to support it as a cost-effective option for managing acute LBP.

In summary, stratified care for nonspecific acute low back pain based on prognostic risk has demonstrated changes in clinician's behaviors, patient outcomes, and cost savings (Foster, Hill, O'Sullivan, & Hancock, 2013). Specifically, the STaRT Back tool is being recommended in clinical practice and is proving physical therapy is a cost-effective treatment pathway for patients presenting to primary care for nonspecific acute low back pain.

Effectiveness and Cost-Effectiveness of Physical Therapy

Physical therapists are trained in detecting contraindications to physical therapy (Swinkles, et al., 2014). Piccoliori, Engl, Gatterer, Sessa, in der Schmitten, and Abholz (2013) found physical therapists have adequate knowledge and can make appropriate decisions for and recommendations to patients about medications, imaging, and referrals. Learman, Ellis, Goode, Showalter, and Cook (2014) found 92.7% of physical therapists make appropriate referrals with failed progress; however, they also found only 55.9% made appropriate decisions regarding imaging, 54.7% for medications, and 62% for advice to stay active. Physical therapists are also trained in detecting "red flags." Leerar, Boissonnault, Domholdt, and Roddey (2007) found 96% of physical therapists documented at least 64% of "red flags," which is comparable to the amount

detected by physicians; specifically, seven of the eleven red flags were documented 98% of the time. Per this evidence, primary care providers may be able to refer patients to physical therapy and know physical therapists are trained to not continue therapy and refer patients appropriately if "red flags" are present or if progress is failing.

Of greatest importance is the substantial evidence supporting physical therapy as a cost-effective method of treatment for nonspecific acute low back pain. Support for physical therapy as a cost-effective method began well before the 2007 guidelines were created. In 1993, Hackett, Bundred, Hutton, O'Brien, and Stanley more generally found physical therapy from general practice is cost-effective for joint and soft tissue injuries. In 1999, Moffett, et al. found an exercise class led by a physiotherapist was more clinically effective and cost-effective than primary care management after one year. Additionally, many studies have been published more recently supporting the claim physical therapy is more cost-effective for acute LBP than primary care management or referral for surgical consultation (Whitehurst, et al., 2007; Fritz, et al., 2008; Fritz, et al., 2013; Fitzsimmons, et al., 2014; Hussenbux, et al., 2015; Fritz, et al., 2016). More specifically, in 2008, Fritz, Cleland, Speckman, Brennan, and Hunter found in patients with acute low back pain, adherence to recommendations for physical therapy resulted not only in improved outcomes and more cost-effective care, but also led to a decrease in prescriptions for medications and a decrease in MRIs and epidurals. In 2015, one of the studies found physical therapy improved patient outcomes, resulted in appropriate referral and management, reduced waiting times, and improved patient satisfaction (Hussenbux, Morrissey, Joseph, & McClellan, 2015). Although it did not assess costs, the study was a systematic review which reviewed twenty-three studies and provided strong evidence for the clinical effectiveness of physical therapy. Chou, et al. (2009) further supported the clinical effectiveness of physical therapy

finding patients who had radiculopathy with herniated lumbar disc or symptomatic spinal stenosis, spinal fusion was no better than intensive rehabilitation for improved pain or function.

As evidenced by the studies which have been reviewed so far, a need has been identified for updated guidelines for the primary care management of acute low back pain, including physical therapy as a clinically effective and cost-effective method of acute nonspecific LBP management, particularly for those at medium to high risk for persistent disability. Next, it is important to understand the effects of the timing of referral to physical therapy on outcomes and costs.

Timing of Physical Therapy on Utilization of Health Care Resources and Costs

Two studies have observed the effects of early referral to physical therapy. Pinnington, Miller, and Stanley (2004) found in patients who had prompt referral to physical therapy within three to four days, costs were less, time off work was less, improvement was comparable to other interventions, and patients and general practitioners were in favor. Fritz, Childs, Wainner, and Flynn (2012) and Childs et al. (2015) also found earlier referral to physical therapy resulted in decreased utilization of subsequent health care resources and decreased costs.

Nurse Practitioner/Physician's Assistant Management of Acute LBP

No evidenced based literature is currently available exploring the management of acute LBP by nurse practitioners or physician's assistants in primary care. Considering the increasing role of nurse practitioners and physician's assistants in primary care, this gap in literature needs to be filled. Comparing management of acute LBP by primary care nurse practitioners/physician's assistants and primary care physicians could have implications for education of nurse practitioners and physician's assistants in primary care.

Based on the evidence presented, a need for updated guidelines has been identified, which place emphasis on early physical therapy for nonspecific acute low back pain, and continuing education for more consistent conformance to guidelines. Also identified is a need for data related to the management of acute LBP by primary care nurse practitioners and physician's assistants.

Theoretical Framework

Since decisions made for a patient depend on the teamwork and collaboration of the healthcare system, Jody Gittell's Relational Framework Theory provided a framework for the scholarly project. The Relational Coordination Framework fits the project objective because it stresses the importance of relationships and teamwork between providers on quality and efficiency of care (McDonald et al., 2007).

Knowing the origins of Gittell's Relational Coordination Theory, as well as her personal background, provides insight to understand the efficacy of the theory. Jody Gittell grew up on a farm where she saw the importance of teamwork in creating organizational synergies, which established a foundation for her framework (Gittell, November 4, 2015). She went on to apply the foundational principles by studying teamwork during her evaluation of airlines while working on her PhD in human resources management and industrial relations (Gittell, November 4, 2015). Through her observations of the airlines, Gittell realized communication should not be mechanical; it should be relational (Gittell, November 4, 2015). She clarifies she does not mean a person knows each individual within an organization, but a person respects the roles of others and is working towards shared goals (Gittell, November 4, 2015). Her discovery was the foundation for her Relational Coordination Framework.

The purposes of Jody Gittell's Relational Coordination Framework are to understand the dynamics of teamwork and to look at the relationships between people with different roles within an organization or system who are working towards common goals (Shojania, McDonald, Wachter, & Owens, 2007). The Relational Coordination Framework has three main concepts, which will be defined: high performance work practices, relational coordination, and performance outcomes (Gittell, 2012). An organization which facilitates relational coordination has high performance work practices, leading to positive outcomes because of achieved goals (See Figure 1). The theory explains how people with different areas of expertise work together and, through relationship, integrate tasks successfully (Gittell, October 1, 2015). Integration occurs through a network of people, and in health care, the people in the network are connected to each other with the patient as the reason for decision making.

The Relational Coordination Framework has three main concepts: high performance work practices, relational coordination, and performance outcomes, which include both quality outcomes and efficiency outcomes (Gittell, 2012). An organization which supports relational coordination has high performance work practices and leads to positive outcomes with goals met (See Figure 1).

Work practices are processes or policies an organization or a leader of an organization puts in place. Gittell (November 4, 2015**)** explains those practices which fall under the category of high performance work practices can lead to relational coordination. High performance work practices include such processes as shared accountability and rewards, shared conflict resolution, leader and supervisor roles, team meetings, shared protocols, shared information systems, and spatial design (Gittell, November 4, 2015). If an organization includes such practices, it is working towards employing relational coordination.

If relational coordination is achieved, a mutually reinforcing cycle can occur (See Figure 2). The mutually reinforcing cycle contains shared goals, shared knowledge, and mutual respect, which can result in communication which is frequent, timely, accurate and problem-solving (Gittell, 2011). Frequent, timely, accurate, and problem-solving communication will further improve the shared goals, shared knowledge and mutual respect. On the other hand, if those in an organization have functional goals, exclusive knowledge, and a lack of respect, the organization will have an atmosphere of communication which is infrequent, delayed, inaccurate, and blaming (Gittell, 2011). Infrequent, delayed, inaccurate, and blaming communication will cause further functional goals, exclusive knowledge, and lack of respect.

The final concept, performance outcomes, is the result of relational coordination. Performance outcomes include both quality outcomes and efficiency outcomes (Gittell, 2012). Performance outcomes are measured by quality and safety, efficiency and finance, worker engagement, client engagement, and innovation and learning (Gittell, November 4, 2015). Therefore, if an organization supports high performance work practices, the culture is set up to be one in which shared knowledge, shared goals and mutual respect occur, which then leads to improved communication, further improving shared knowledge, shared goals and mutual respect, thus leading to improved outcomes. In the case of healthcare, improving patient outcomes and providing cost-effective care are the intended outcomes.

The Relational Coordination relies on a few assumptions, which Jody Gittell refers to as contingency factors. The first assumption is interdependence, of which Gittell defines three types: pooled, sequential, and reciprocal. Relation coordination works best with organizations which rely on reciprocal work processes, meaning for two tasks, each relies on the completion of the other (Gittell, 2012). The second contingency factor is uncertainty. Relational coordination

has a greater impact on organizations which have higher levels of uncertainty because they have higher levels of information processing capacity; as uncertainty increases, so do information processing requirements (Gittell, 2012). The third contingency factor is time constraints. The assumption is relational coordination works best in organizations with higher levels of time constraints because it increases the need for responsiveness (Gittell, 2012). Relational Coordination will most likely see effects in organizations which do not have these qualities; however, the assumption is relational coordination will see the greatest impact on organizations with reciprocal interdependence, uncertainty, and time constraints.

For a project looking at cost-effectiveness of different pathways to physical therapy in patients with non-specific acute low back pain, the Relational Coordination Framework works well because decisions made for a patient depend on the teamwork and collaboration of all those involved in the health care system. The Relational Coordination Framework fits the project objective because it stresses the importance of relationships and teamwork between providers on quality and efficiency of care (McDonald et al., 2007). Although the providers and physical therapists may be working for different organizations, they are all working together for the same goal: the patient's well-being. Ideally, primary care providers, specialists, and physical therapists would understand the limitations of their abilities or scope of practice, have respect for the knowledge of each other, and know when to refer patients to each other. According to the Relational Coordination Framework, if mutual respect exists across the three groups, the outcomes for the patients will be better than if each group works independently.

To further adapt the theory for the project, the framework has been adjusted to work in a large system made up of many organizations rather than a single organization (See Figure 3). Data for the project comes from one physiotherapy organization, but referrals come from a multitude of

providers in different organizations with different cultures and protocols. Therefore, to see a change in outcomes and costs, the high-performance practices need to be adopted across a large portion of the healthcare system. Practices such as team meetings, rewards programs, and shared protocols are not possible across such a large system. However, practices such as disseminating information to providers on the roles of different disciplines, offering interdisciplinary training and continuing education, and encouraging cultures of respect for different disciplines could foster relational coordination across the disciplines. If interdisciplinary relational coordination is achieved, the project leader theorizes patient outcomes will improve and healthcare costs will be lessened. Improved outcomes would consist of decreased length of illness and improved patient satisfaction, and decreased costs would include both direct and indirect health care costs. Ultimately, the relational coordination framework works well across an interdisciplinary health care system based on the assumptions of the theory; health care has reciprocal interdependence, high levels of uncertainty, and time constraints. Therefore, if the assumptions are accurate, using relational coordination as a framework for this project has a probability of having a great impact.

Project Design

The Belmont University Institutional Review Board granted the project IRB approval with exempt status. This retrospective chart review was a between-subjects design and used secondary data collected by Results Physiotherapy. The project leader determined the independent variable to be 'type of referral' at the nominal level. Patients were placed in one of three categories: primary care physician, primary care nurse practitioner/physician's assistant, or specialist. The dependent variables were outcomes and costs. Outcomes were measured by change in functional score at the interval level. Costs were measured using the Centers for Medicare & Medicaid Services' standardized payment amounts.

Project Setting

This project used data from a large physiotherapy organization, Results Physiotherapy. Results, founded in 1996 with its first location in Nashville, TN, now has 111 locations in the southeastern United States, including Alabama, Georgia, Indiana, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, and Texas. Traditionally, physiotherapy solely focuses on exercise regimens; however, Results Physiotherapy has taken a more hands-on, manual approach, which consists of joint manipulation, in addition to the traditional exercise therapy (Results Physiotherapy, 2016).

Project Population

Results Physiotherapy treats patients of all ages, children to geriatrics, with a variety of private insurance as well as Medicare, Medicaid, and Workers' Compensation (Results Physiotherapy, 2016). In the last twelve months, they have treated 58,777 patients at all the locations, 17,652 of which were treated specifically for lumbar back complaints. Of those, 2,070 were seen for acute LBP and completed their course of physical therapy as recommended by the treating physiotherapist.

The population sampled was comprised of de-identified records of patients with acute LBP, ages 18 to 65. Using a sample size calculator, the project leader determined a sample size of about 375 was needed. A sample size of 375 allows for a confidence level of 95% and a margin of error of 5%. To compare those of a similar health profile, only patients with zero to one comorbidities were included in the sample. So outcomes were accurately represented, only those patients who completed their recommended physiotherapy course were included. The project leader excluded patients who had surgery for the current episode of back pain, those who had two or more comorbidities, those with subacute or chronic LBP, and those younger than eighteen

and older than 65. Also excluded were those who were referred by chiropractors, pain management, gastroenterology, rheumatology, women's health, and urology.

Data Source

Results Physiotherapy subscribes to a program called Focus on Therapeutic Outcomes (FOTO), a physical therapy database which tracks the outcomes of patients and compares the outcomes to all other patients in the database from all physical therapy organizations subscribing to the program. To collect data in FOTO, patients complete an iPad survey at intake, at every fifth visit, and after the treatment course. The intake survey includes questions assessing the functional level of the body part or impairment which needs treatment, risk-adjusted questions, and fear avoidance. Follow up surveys ask questions about functional level of the body part or impairment. At the conclusion of therapy, the final survey asks questions about the functional level of the body part or impairment and satisfaction with their therapy. The portions of the FOTO survey which ask functional questions are adaptive; therefore, each patient answers different questions based on his answers to previous questions (See Appendix A). After the completion of each survey, FOTO calculates a functional score determined by the answers to the survey questions. The patient can see his or her current functional score, the FOTO average functional score, and the predicted score improvement, which is the average amount of change similar patients in the database have achieved. The functional score is on a scale of zero to 100; a score of 50 means the body part has 50% of the ability of a healthy one. It is compared to the functional scores of other similar patients in the FOTO database, or those patients in the same risk-adjusted group. Risk-adjusted criteria include age, BMI, activity level prior to the onset of the condition, prescription medication information, number of surgeries for the condition being treated, time of onset, and comorbidities (See Appendix B). Using this comparison, physical

therapists and Results Physiotherapy can track the progress of their patients to determine if they are progressing within close range of the mean.

FOTO has been validated as a tool to track outcomes in physical therapy patients (Hart, Mioduski et al., 2006, Hart & Wright, 2002; Swinkels et al., 2007, & Deutscher et al., 2008). Also, several studies have supported the use of FOTO as a source of data, further validating its ability to measuring outcomes (Resnik & Hart, 2003; Hart et al., 2005; Hart, Cook et al., 2006; Rone-Adams et al., 2009; Hart et al., 2008; & Swinkels et al, 2008).

Data Collection Process

Upon request, FOTO provided the project leader with an excel spread sheet which contained data for all acute and subacute low back pain patients from the last twelve months who had no surgery for the current condition and had completed their physical therapy course, as evidenced by completing the final survey. FOTO considers a patient to have acute LBP if the episode began less than twenty-two days prior. For each patient, the data included an identifier, the acuity, age, gender, BMI, the number of comorbidities, the fear avoidance score, the change in functional score, the predicted change in functional score, duration of therapy in calendar days, the predicted duration of therapy in calendar days, the number of visits, the predicted number of visits, the satisfaction score, and the name of the referring provider.

After receiving the dataset, the project leader used excel to filter the data. All patients listed as "subacute," all patients under the age of 18 and over the age of 65, all patients with two or more comorbidities, and all patients listed as "direct access" under the referring physician column were removed from the dataset. Next, to determine whether the referring physician was a primary care physician, a primary care nurse practitioner or physician's assistant, or a specialist, the project leader conducted a search using a search engine. Referrals from

chiropractors, pain management, gastroenterology, women's health, rheumatology, and urology were removed from the dataset. After filtering the data, the project leader had a sample of 342 patients meeting the criteria. Finally, pivot tables were created in excel to determine counts for referring physician types, age groups, gender, and BMI groups.

The project leader was unable to collect cost data through the FOTO database or Results Physiotherapy's electronic health records. Normalizing cost data presents a challenge to any cost-effectiveness study due to variations in geographic locations and variations in insurance policies. Although accounting for variations in insurance was not possible for this project, the new Centers for Medicare & Medicaid Services (CMS) standardized payment information accounts for variations in costs based on geographic location (O'Donnell et al., 2013). For this reason, the project leader determined the best source of cost data was the CMS's standardized payment amounts using the physician fee schedule search. CMS cost data has been used in several studies, validating its use to estimate costs for this project (Senekjian et al., 2016; Lin et al., 2016; & Forde et al., 2016).

The CMS physician fee schedule search requires the user to enter the year and the Healthcare Common Procedure Coding System (HCPCS) code to view a list of Medicare reimbursement prices based on the geographic area, or MAC locality (Centers for Medicare & Medicaid Services, 2013). The project leader used the search to find the costs of each of the services provided for the current episode of back pain for each of the states served by Results Physiotherapy (See Appendix C). Next, the costs for each service were averaged to reach a representative cost of the service for the patients of Results Physiotherapy.

In order to code the data, the project leader grouped the data based on referring physician. Group 1 was primary care physicians, group 2 was primary care nurse practitioners and

physician's assistants, and group 3 was specialists. Patients were identified in one column as 1-329, and next to each was a column for its referral group, a column for its cost, and a column for its change in functional score. The dataset was then transferred to SPSS for statistical analysis. The project leader used two separate one-way ANOVA tests to determine statistical significance; one to determine if a significant difference in cost between the three referral types existed and the other to determine if a significantly different effect on outcomes between the three referral types existed.

Results

During the twelve-month period, 2,070 patients between the ages of 18 and 65 were seen with acute low back pain at Results Physiotherapy. After excluding those with two or more comorbidities and those who were referred by obstetrics, gastroenterology, rheumatology, urology, gastroenterology, pain management, and chiropractic, 342 patients were left in the dataset. Mean age was 40.9 years, 46.8% were female, and 53.2% were male. Of the 342 patients, 152 had zero comorbidities, and 190 had one comorbidity. 57.6% of the sample were either overweight or obese. Primary care physicians referred 203 of the patients, primary care nurse practitioner or physician's assistant referred 88 of the patients, specialists referred 51 of the patients after a consultation. Table 1 provides demographic characteristics.

After completing outlier analysis using SPSS stem-and-leaf and box plots, the project leader excluded thirteen patients due to extreme cost values. After outlier analysis of the functional score change, three outliers were removed and the results were no different; therefore, the three patients were included in the dataset. To test for homogeneity of variance, the Levene statistic yielded a significance of .507 for functional score change and a significance of .072 for cost; therefore, the assumption of homogeneity of variance is met. Since the ANOVA becomes more

robust as *n* increases, the outliers in functional score change and moderate variability in cost did not have as much of an impact on the results in a dataset of 329 as compared to the dataset of 342.

Mean functional score change for patients referred to physical therapy by primary care physicians was an improvement of 25.91 points. Mean functional score change for patients referred by primary care nurse practitioners and physician's assistants was an improvement of 30.52 points. Mean functional score change for patients referred by specialists was an improvement of 29.90 points. Using an α value of .05, no statistical difference was found between the three groups in regards to functional score change. The moderate significance of .079 is worthy of further investigation.

The mean overall cost associated with primary care referral to physical therapy for acute LBP was $679.85. The mean cost associated with primary care nurse practitioner and physician's assistant referral to physical therapy was $730.79. The mean cost associated with specialist referral to physical therapy was $1071.19. Costs were statistically different at ≤ .001 using an α value of .05. More specifically, specialist referrals to physical therapy were associated with significantly higher costs than primary care physician referrals ($p \leq .001$) and significantly higher costs than primary care nurse practitioner and physician's assistant referrals ($p \leq .001$). No statistical difference in costs was found between primary care physician referrals and primary care nurse practitioner referrals to physical therapy ($p = 0.388$). Table 2 presents mean functional score change, mean costs, and related statistics at completion of physical therapy. Table 3 presents multiple comparisons of functional score change and costs.

Discussion

Effectiveness of Physical Therapy

The mean functional score change for each group showed improvement without significant difference, which indicates physical therapy is a clinically effective strategy for managing acute LBP no matter which type of provider orders the referral. This supports evidence presented in other studies looking at the clinical effectiveness of physical therapy (Pinnington, et al., 2004; Fritz, et al., 2012; Childs, et al., 2015; & Hussenbux, et al., 2015). Since physical therapy is a clinically effective strategy for the management of acute LBP, updated guidelines should be produced which place an emphasis on referral to physical therapy.

Management of Patients with Acute LBP

Cost-effectiveness was determined using an incremental cost-effectiveness ratio (ICER). Using an ICER to further interpret the data is recommended by Sidora-Arcoleo and Frick (2012) and has been used in many cost-effectiveness studies (Fritz, et al., 2016; Suman, et al., 2015; Aboagye, et al., 2015). To calculate the ICER for this project, the differences in mean costs between each two groups was divided by the differences in mean change in functional score. See Appendix D for ICER calculations.

The ICER comparing specialists to primary care nurse practitioners and physician's assistants indicates for each one point decrease in functional score, specialists still cost $1,065.65 more. This finding infers costs are much higher for patients with acute LBP referred to physical therapy through specialists than those referred to physical therapy by primary care nurse practitioners and physician's assistants, and the patients do not show as much improvement. Of note is the difference in functional score change between the two groups was not statistically significant. The ICER shows an inverse relationship between cost and effectiveness, which is atypical for ICER scores. The noteworthy point from this calculation, however, is costs are significantly

greater when patient with acute LBP see specialists without a significantly better functional score at the conclusion of physical therapy.

In comparing primary care nurse practitioners and physician's assistants to primary care physicians, primary care physicians cost $6.76 more for each one point improvement in functional score. Finally, in comparing specialists to primary care physicians, specialists cost $128.87 more than primary care physicians per one point improvement in functional score.

Analysis of the ICERs indicates primary care referral of patients with acute LBP directly to physical therapy is more cost-effective than referral to specialists first, which supports findings from several studies (Hackett, et al., 1993; Moffett, et al., 1999; Whitehurst, et al., 2007; Fritz, et al., 2008; Fritz, et al., 2013; Fitzsimmons, et al., 2014; Hussenbux, et al., 2015; Fritz, et al., 2016). As supported by previously discussed literature, primary care providers should refer patients to specialists when certain "red flags" are apparent or when the patient has not responded appropriately to conservative treatment (Haswell, et al., 2015; Leerar, et al., 2007). Otherwise, specialist referrals lead to unnecessary costs which are significantly more than the alternative with no greater improvement in outcomes.

The ICERs also suggest referral of patients with acute LBP to physical therapy is the most cost-effective when accomplished through primary care nurse practitioners and physician's assistants. This supports the role of primary care nurse practitioners and physician's assistants in the management of acute low back pain and could mean their management of other conditions is worthy of further cost-effectiveness investigation. Since no literature currently exists which examines primary care nurse practitioner and physician's assistant management of acute LBP, more support is needed to confirm this finding.

Interdisciplinary Relational Coordination

The findings of this project support the interdisciplinary relational coordination framework, an adaptation of Jody Gittell's relational coordination (Gittell, 2012). The roles of each of the different types of providers as well as the role of physical therapists are all important for the improvement of the patient's condition. When disciplines share goals and have mutual respect for each other, communication between them is effective leading to improved patient outcomes and lower health care costs. Physicians, nurse practitioners, and physician's assistants in primary care can appropriately manage acute LBP. Specialists are effective for managing back pain accompanied by "red flags" or back pain which is not responding to conservative treatment. Physical therapists are effective at treating most episodes of acute low back pain and know when referral is indicated. As well as offering support for the adapted Interdisciplinary Relational Coordination Framework, the findings from this project also support Gittell's hypothesis, which was outcomes are better when different disciplines have respect for each other and work together toward common goals (Gittell, 2012).

Strengths and Limitations

A strength of the project is the clinical effectiveness data. Since FOTO is a strongly validated tool, the measurements of functional score and change in functional score are reliable. Another strength of this project is the sample size. Since the sample size is large, the ANOVA is robust and can be relied on as an accurate measure of statistical significance.

One limitation of the project is the cost estimation. The project leader did not have access to direct health care costs of each patient individually, and, although CMS cost data has been used in other studies, the costs are still only estimations. Another limitation of the project is the assumption that all patients referred to physical therapy by specialists had both a lumbar x-ray and lumbar MRI. A third limitation of the project is the uneven distribution of the sample among

categories; however, the distribution may be an accurate representation, considering more people are seen by primary care than specialists.

Conclusion

Primary care management of acute episodes of LBP can have a great impact on cost. In this project, direct primary care referral to physical therapy without imaging or specialist referral was associated with significantly lower health care costs. The large difference in costs related to referral source while achieving similar functional recovery despite referral source demonstrates not only physical therapy is effective, but also provides support for updated guidelines for primary care management to include referral to physical therapy. Further, the most cost-effective pathway for patients with acute LBP was referral from primary care nurse practitioners and physician's assistants directly to physical therapy. This supports the roles of the nurse practitioner and physician's assistant in primary care and provides suggestion for future research on the cost-effectiveness of their roles in primary care.

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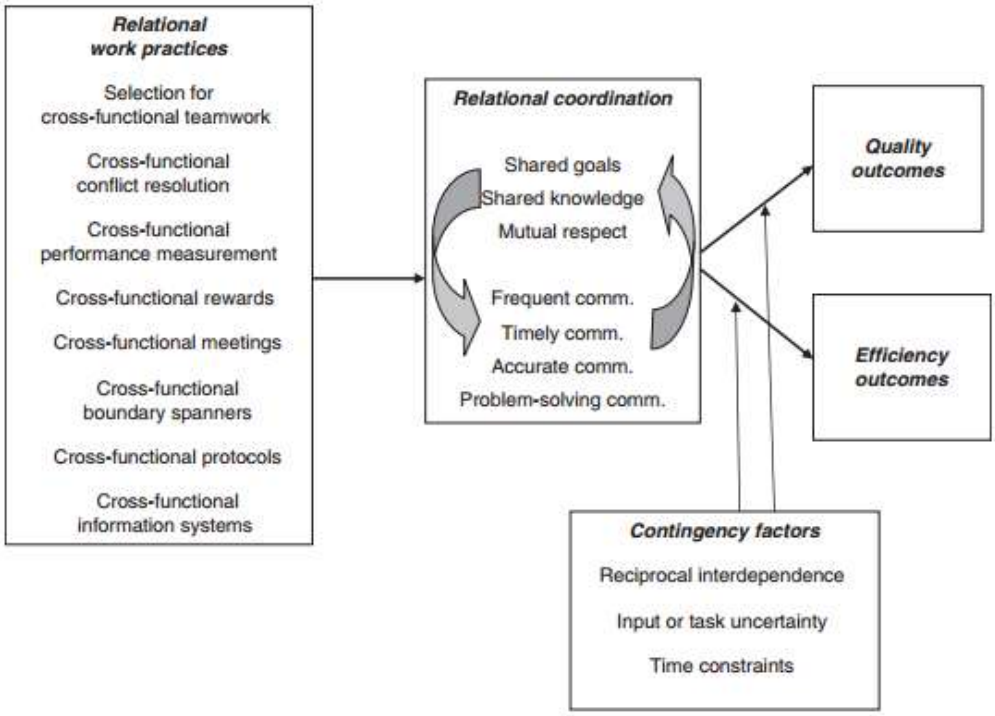

Figure 1. Jody Gittell's Relational Coordination Framework (Gittell, 2011)

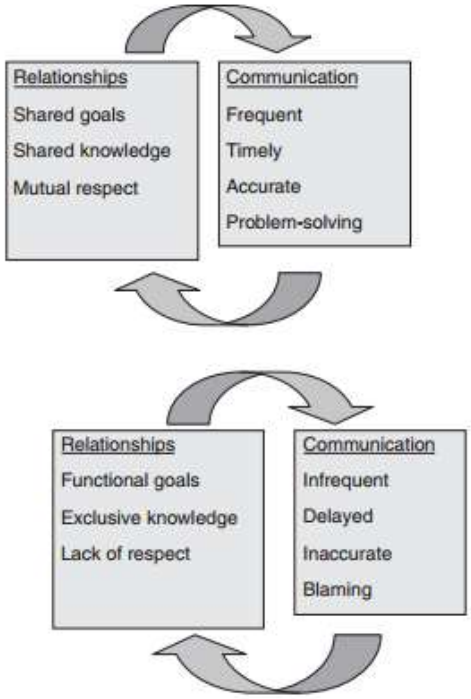

Figure 2. Relational Coordination Concept (Gittell, 2011)

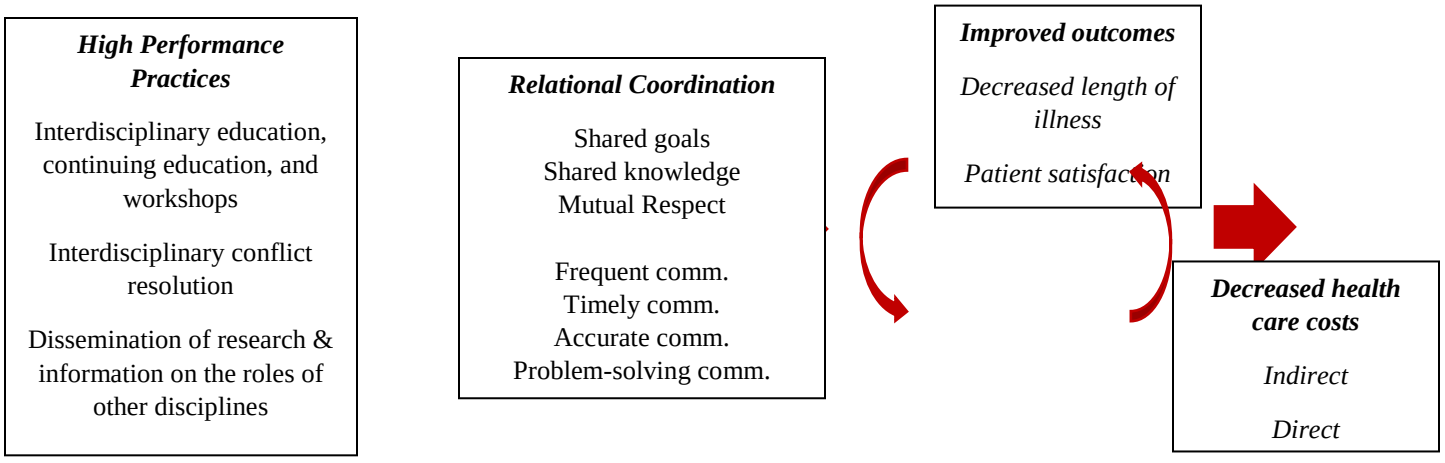

Figure 3. Adapted Interdisciplinary Relational Coordination Framework

Table 1

Patient characteristics at rehabilitation intake (n = 342)

Characteristic		Value [n(%)]
Gender		
Female		160 (47)
Male		182 (53)
Age (mean (SD), min, max in years)	(40.9 (12.27), 18, 64)	

18-25	45 (13)
26-35	80 (23)
36-45	88 (26)
46-55	74 (22)
56-65	55 (16)
# Comorbidities	
None	152 (44)
One	190 (56)
BMI	
Underweight <18.5	2 (1)
Normal Weight 18.5-25	142 (41)
Overweight 25-30	153 (45)
Obese >30	44 (13)
Referring Physician	
Primary Care Physician	203 (59)
Primary Care NP/PA	88 (26)
Specialist	51 (15)

Table 2

Overall ANOVA - Functional score change and costs and related statistics at completion of physical therapy

	n = 329	FS Change	Cost $
PCP	Mean	25.91	679.85
	SD	16.58	261.45
	95% CI	23.58, 28.22	643.30, 716.40

NP/PA	Mean	30.52	730.79
	SD	18.98	289.01
	95% CI	26.50, 34.54	669.55, 792.02
Specialist	Mean	29.90	1071.19
	SD	17.53	192.38
	95%CI	24.44, 35.36	1011.24, 1131.14
	p-value	.079*	≤ .001***

*significant p ≤ 0.1; ** p ≤ 0.05; *** p ≤ .001

Table 3

Post hoc - Multiple comparisons of functional score change and costs

Provider Type		**FS Change**		**Cost**	
A	B	Mean Difference (A-B)	*p*-value	Mean Difference (A-B)	*p*-value
PCP	NP/PA	-4.61	.117	-50.94	.388

NP/PA	Specialist	.62	1.000	-340.41	≤ .001***
Specialist	PCP	3.99	.530	391.35	≤ .001***

*significant p ≤ 0.1; ** p ≤ 0.05; *** p ≤ .001; Bonferroni adjustment

Appendix A

Adaptive questions assessing the functional level of low back conditions

LOW BACK PROBLEM Limits:
Getting in and out of a CHAIR
WALKING around a room?
Getting in and out of BED?
Getting down to and up from the floor?
Changing positions quickly like sitting to standing?
Using a broom?
Performing your usual hobbies, recreational or sporting activities?
Performing any of your usual work, housework, or school activities?
Attending SOCIAL EVENTS?
Going on VACATION?
Participating in RECREATION?
LIFTING OVERHEAD to a cabinet?
BATHING or DRESSING?
WALKING one BLOCK?
WALKING several BLOCKS?
WALKING more than a Mile?
Climbing one flight of STAIRS?
Climbing several flights of STAIRS?
LIFTING or CARRYING items like groceries?
MODERATE ACTIVITIES like moving a table, pushing a vacuum cleaner, bowling, or playing golf?
VIGOROUS ACTIVITIES like running, lifting heavy objects, participating in strenuous sports?
Difficulty at all driving for 1 hour?
Going up or down 2 flights of stairs (about 20 stairs)?
Standing for 1 hour?
Lifting a box of groceries from the floor?
Putting on your shoes or socks?
Bending or stooping?
Performing heavy activities around your home?

Appendix B

Risk-Adjusted Factors

Birth Date
How often have you completed at least 20 minutes of exercise such as jogging, cycling, or brisk walking prior to the onset of your condition?
Have you ever received treatment for this condition before?
Are you taking prescription medication for this condition?
How many surgeries have you had for the problem for which you are being treated?
How many days ago did your condition begin?
Height
Weight

Comorbidities
Arthritis
Osteoporosis
Asthma
Chronic Obstructive Pulmonary Disease (COPD), Acquired Respiratory Distress Syndrome (ARDS), emphysema
Angina
Congestive Heart Failure or Heart Disease
Heart Attack (Myocardial Infarction)
High Blood Pressure
Neurological Disease (such as Multiple Sclerosis or Parkinson's)
Stroke or TIA
Pacemaker
Seizures
Peripheral Vascular Disease (or claudication)
Headaches
Diabetes Type I or II
Gastrointenstinal Disease (ulcer, hernia, reflux, bowel, liver, gallbladder)
Visual Impairments (such as cataracts, glaucoma, macular degeneration)
Hearing Impairment (very hard of hearing, even with hearing aids)
Back pain (neck, low back, degenerative disc disease, spinal stenosis)
Kidney, Bladder, Prostate, or urination problems
Previous accidents
Allergies
Incontinence
Anxiety or Panic Disorders
Depression
Hepatitis, Tuberculosis, HIV, AIDS, or other blood-borne condition
Prior surgery
Prosthesis/Implants
Sleep Dysfunction
Cancer
Other conditions
None of the Above

Appendix C

Costs determined by the Centers for Medicare & Medicaid Services' standardized payment amounts based on geographic area or MAC locality (using the physician fee schedule search)

State	MAC Locality	PCP	NP/PA	Specialist	PT Evaluation	Therapeutic Exercise	Manual Therapy
Alabama	1010200	$48.95	$41.61	$450.67	$71.66	$30.51	$28.30
Georgia, rest of	1020299	$49.87	$42.39	$460.95	$72.59	$30.92	$28.59
Indiana	0810200	$49.47	$42.05	$462.70	$72.76	$31.06	$28.81
Kentucky	1510200	$49.21	$41.83	$447.98	$71.55	$30.42	$28.17
Mississippi	0730200	$48.64	$41.34	$443.17	$70.98	$30.16	$27.99
North Carolina	1150200	$49.97	$42.47	$467.51	$73.31	$31.31	$28.99
South Carolina	1120201	$49.58	$42.14	$460.74	$72.65	$30.99	$28.71
Tennessee	1030235	$48.90	$41.57	$453.77	$71.88	$30.63	$28.44
Texas- Austin	0441231	$51.24	$43.55	$497.91	$76.08	$32.71	$30.26

Appendix D

ICER calculations using differences between means

$$\text{ICER} = \frac{\text{Cost of Group A} - \text{Cost of Group B}}{\text{Change in Functional Score of Group A} - \text{Change in Functional Score of Group B}}$$

$$\frac{\text{Specialist \$ - NP/PA \$}}{\text{Specialist FS}\blacktriangle\ \text{- NP/PA FS}\blacktriangle} = \frac{\$1{,}220.99 - \$730.79}{30.06 - 30.52} = \frac{\$1{,}065.65}{\text{- 1 point FS Change}}.$$

$$\frac{\text{NP/PA \$ - PCP \$}}{\text{NP/PA FS}\blacktriangle\ \text{- PCP FS}\blacktriangle} = \frac{\$730.79 - \$700.35}{30.52 - 26.02} = \frac{\$6.76}{\text{1 point FS Change}}$$

$$\frac{\text{Specialist \$ - PCP \$}}{\text{Specialist FS}\blacktriangle\ \text{- PCP FS}\blacktriangle} = \frac{\$1{,}220.99 - \$700.35}{30.06 - 26.02} = \frac{\$128.87}{\text{1 point FS change}}.$$

ICER = Incremental cost-effectiveness ratio
NP/PA = Primary care nurse practitioner / physician's assistant
FS▲ = Functional score change
PCP = Primary care physician