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Using multi-faceted validated tools to evaluate the functional outcomes and quality of life in patients undergoing elective spine surgery and associated referral patterns for post-hospital rehabilitation: A quality improvement project

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DOCTOR OF NURSING PRACTICE (DNP) PROGRAM

A DNP PROJECT

Using multi-faceted validated tools to evaluate the functional outcomes and quality of life in

patients undergoing elective spine surgery and associated referral patterns for post-hospital

rehabilitation: A quality improvement project

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Table of Contents

Abstract

Background/Significance: A lack of validated multi-facet assessment tools to assess postoperative patients' functional ability and quality of life may result in untimely or no referrals to rehabilitation.

Objective: The objective of the DNP project was to introduce the use of validated multi-facet questionnaires in assessing patient-reported outcomes and to assess effect on the time in generating prescriptive rehabilitation therapies and the type of therapies following elective spine surgery evaluated in the outpatient neurosurgery clinics.

Methods: This was a quality improvement (QI) project comprising of 100 patients (50 pre and 50 post the intervention). After the introduction of baseline data, the ODI and EQ-5D-5L were used in all eligible patients to collect their functional status and quality of life. The time in generating prescriptive rehabilitation therapies and the type of therapies following elective spine surgery were compared before and after the new evaluation methods.

Findings: Our findings have shown that the introduction of the ODI and EQ-5D-5L to patients undergoing elective spine surgery has not resulted in differences in the number of referrals at the first post-operative visits, the timing and type of prescriptive rehabilitative therapies referrals generated when compared to baseline care.

Conclusion: Although there was no significant difference in referral timing and types, this DNP project added value to the current processes by standardizing the post-operative assessments of elective spine patients using validated tools to improve outcomes. Future studies with longer observation period and including patient outcomes are suggested.

Key words: functional outcome, quality of life, spine, ODI, EQ-5D-5L, post-op.

Introduction

Nurses play an integral role in assessing and evaluating patients undergoing spinal surgery, such as spinal fusions, effectively and efficiently during the perioperative phase (Lall, 2017). Neuroscience registered nurses, and advance practice registered nurses (APRNs) have a greater responsibility to evaluate and monitor neurological functions and implement nursing care and other medical treatments to promote healing and recovery in patients presenting with spine pathologies in the perioperative phase (American Association of Neuroscience Nurses, 2014).

Patients recovering from elective spine surgeries may often find navigating the health care system daunting, as such, APRNs and other clinicians are pivotal in orchestrating appropriate referrals while serving as a guide for care-coordination for multidisciplinary care. APRNs evaluating post-operative patients undergoing elective spine surgeries are able to assess patients with the use of validated assessment tools and ensuring these patients are able to return to their optimal neurological function. Obtaining data from patient-related outcomes can guide neurosurgical clinicians in the integration of pertinent evidence-based care and clinical guidelines to improve the functional outcomes and quality of life in spine patients undergoing elective surgeries.

The use of a shared decision-making approach between clinicians and patients in generating timely multidisciplinary treatments, centered on patient preferences, availability, consideration of associated costs may help improve pain and function when compared to baseline care (Qaseem, Wilt, McLean & Forciea, 2017).

Background/Significance

There is a need for enhancing the population health and patient experience of patients undergoing elective spine surgery at the outpatient neurosurgery clinics, in the South-Eastern USA, where the DNP student practices. However, the current use of subjective, categorical assessments of patient outcomes post-surgery does not provide the full information about patient recovery, thus may

cause a delay in generating referrals. Introducing the use of validated questionnaires in evaluating the functional outcomes and quality of life in patients undergoing elective spine surgery can offer healthcare providers cogent information that leads to the timely generation of prescriptive physical therapy referrals post-operatively, which improve patient outcomes and decrease healthcare-associated costs (Burchhardt & Anderson, 2003).

Neurosurgery nurse practitioners within the DNP's student clinical practice site play an integral role in evaluating patient outcomes while working in multidisciplinary teams, developing, and attaining patient-centered goals. The QI project introduced two standardized assessment tools to neurosurgery nurse practitioners within the DNP's student clinical practice site to evaluate patients' functional status and quality of life post elective spine surgery. Data obtained can yield pertinent information to assist healthcare providers in developing treatment plans for this population (Snowdon & Peiris, 2016). In addition, when filling out the assessment tools, patients will be empowered with the knowledge about their recovery, which can facilitate their communication with clinicians to ensure that they receive the optimal care to help them return to their neurological baseline and fully optimizing their health upon the initiation of prescriptive rehabilitative referrals (Rushton et. al., 2014).

The DNP project is an inexpensive proposition that can also permeate other departments within the organizational health system (orthopedic surgery, sports medicine, rehabilitation and physical medicine) in learning about the functional outcomes and quality of life of their patient population, ultimately leading to improved population health (Institute for Healthcare Improvement, 2018c). The QI project will also contribute to the organization by facilitating a good learning environment for advanced practice providers in focusing on population health (Institute for Healthcare Improvement, 2018c). This project is significant in improving patient experience, reducing health care cost, and advancing nursing practice.

Patient Experience. Patient satisfaction quarterly scores provided by Press Ganey in 2018, demonstrated the need for the neurosurgery clinics to adopt innovative strategies in improving the patient experience (Press Ganey, 2018). Improved functional outcomes and quality of life can be attained when prompt prescriptive physical therapy referrals are generated in post-operative patients undergoing elective spine surgical interventions (Institute for Healthcare Improvement, 2018b). The use of standardized, evidenced-based questionnaires aligns with providing patient-centered care, improved communication between patients/providers, adequate pain management and the likelihood of referring other patients to our organization for care (Press Ganey, 2018).

Reducing the Per Capita Cost of Healthcare. The prompt generation of prescriptive outpatient physical therapy will promote interventions that leads to improved functional outcomes and reduced physical deconditioning, decreased disability and dependence on opioid medications and overutilization of resources (frequent emergency room visits due to inadequate pain control). These lead to decreased costs of care (Madera et. al., 2017).

Advancing Nursing Practice. Advancing nursing practice at the local, state and national levels entails the dedication, total commitment and passion of nurses and advanced practice registered nurses (APRNs) that are gritty. Grit is the inherent drive and passion high achieving individuals possess that consistently thrusts them in making significant strides (Lee and Duckworth, 2018). Grittiness fuels the drive that leads nurses and APNs in indisputably sound practice and exerting positive influences in their various practice settings. At the local level, results obtained from this project will be presented at grand rounds held at the department within the organization. Currently, there is a local paucity of neurosurgery nurse practitioner mentors available in modeling and sharing evidence from clinical practice given the uniqueness of the sub-specialty. The QI project will serve as a precursor in creating mentorship opportunities within the DNP's student clinical practice location, championing several meetings at the

grass root level, and collaborating with the local chapter of the American Association of Neuroscience nurses in Tampa Bay by involving other neurosurgery nurse practitioners in facilitating the advancement of nursing practice. The QI project will serve as the spinal column within the department by creating opportunities in serving as a resource in developing appropriate rehabilitation referral protocols and establishing a coalition of neurosurgery nurse practitioners within the local region to help advance nursing practice. At the state level, collaborating with other neurosurgery nurse practitioners in sharing patient outcomes will impact the advancement of nursing practice. At the national level, this QI project will add more to the body of evidence in the neurosciences from a nursing perspective.

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Problem Statement

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Patients with spine pathologies often present to us with progressively worsening cervical or lumbar pain affecting their quality of life. These patients tend to have poor functionality and focal or motor neurological deficits that may improve with neurosurgical intervention and continued rehabilitation post-operatively. There is a scarcity of evidence in the literature showing spine post-operative care models with a clear-cut approach in screening or referring patients for post-operative rehabilitation in the outpatient settings (Skolasky, Maggard, Li, Riley & Wegener, 2015).

A recent needs assessment conducted by the DNP student within the neurosurgical clinical practice site revealed the lag in utilizing a standardized approach in assessing the post-operative quality of life and functional outcomes in patients undergoing elective spine surgery. The current practice entail providers documentation of patient reported outcomes in progress or post-operative notes with terms such as "improving, better, okay, good, fair." This assessment and documentation tend to be provider subjective, biased and primarily centered on the pain domain only. Approximately 40% of the post-operative spine population has a delay in the timely initiation of prescriptive physical therapy post-operatively based on a review of medical charts.

The current method of assessment and documentation does not address the various categories of post-operative functional outcomes and quality of life of our patients, which creates a delay in the timely generation of prescriptive rehabilitation or therapeutic services. This delay may potentially affect the post-operative outcomes. To address these issues, the first step is to introduce the use of reliable, valid, standardized assessment tools to assess patients' functional outcomes and quality of life post-operatively. These comprehensive multifaceted data including the domains of pain intensity, personal care, lifting, walking, sitting, standing, concentration, reading, headaches, sleeping, sex life, social life and travelling can elucidate problem areas and guide healthcare providers to develop individualized or patient-centered treatment/care plans.

Purpose Statement

The purpose of this QI project was to introduce the use of validated multi-facet questionnaires in assessing the post-operative functional outcomes and quality of life in neurosurgical patients undergoing elective spine surgeries at outpatient neurosurgical clinics. Clinical outcomes such as the generation of prescriptive rehabilitation therapies and the types of therapies following elective spine surgery was assessed.

The following PICOT question was asked: In patients undergoing elective neurosurgical spine surgeries, does the use of validated multi-facet functional outcomes and quality of life questionnaires as assessment tools at the first post-operative visit change the timing of the generation of prescriptive rehabilitation therapies and the type of therapies when compared to baseline care?

Population: Adult – Gerontology (18 or older).

Intervention: Introduce validated multi-facet assessment tools; Oswentry Disability Index (ODI) (Fairbank & Pynsent, 2000) and EuroQOL-5D-5L (Euro Qol, 2017) for standardizing assessment in patients undergoing elective spine surgeries at the first post-operative visit.

Comparison: Standard assessment method.

Outcomes: Type of therapies, timing of the referral of therapies.

Time: Ninety days for data collection and analysis.

Inclusion Criteria: Adults ages 18 years or older with degenerative disc disease, spondylosis, spondylolisthesis, stenosis, scoliosis, facet arthropathies who undergo laminectomies, total disc replacements, fusions/instrumentation, corpectomies, foraminotmies and/or anterior cervical discectomies.

Exclusion Criteria: Patients under age 18 years, patients undergoing cranial neurosurgical interventions, patients undergoing emergent spine surgery, patients with implantable spinal cord stimulators, patients with active medical or workers compensation lawsuits, and patients who experienced immediate complications after surgery (infection).

Specific Aims

The overall aim was to standardize the neurosurgery clinicians' assessment of post-operative patient outcomes by introducing validated multi-facet tools that may enhance the time in generating prescriptive rehabilitation therapies and the types of therapies post-operatively.

1. Introduce the ODI and EQ – 5D-5L questionnaires to assess the functional outcomes and quality of life in patients undergoing elective spine surgeries.

2. Compare the time of generating prescriptive therapies before and after the introduction of the questionnaires.

3. Compare the type of prescriptive therapies before and after the introduction of the questionnaires.

Objectives

The specific, measurable and attainable objectives of the quality improvement, DNP

project were:

1. Introduce the ODI and EQ – 5D-5L.

2. Educate the neurosurgery providers on the benefits and use of validated tools in assessing spine

   patients post-operatively.

3. Assess the time of generating prescriptive rehabilitation therapies and the type of therapies

   before the introduction of ODI and EQ – 5D-5L.

4. Assess the time of generating prescriptive rehabilitation therapies and the types of therapies after

   the introduction of ODI and EQ – 5D-5L.

5. Compare the time of generating prescriptive rehabilitation therapies and the type of therapies

   before and after the introduction of ODI and EQ – 5D-5L

Identifying and Defining Project Variable

The independent variable for the QI project was the new assessment tools measuring functional

outcome and quality of life (pre/post). The dependent variables are the change in timing of the

generation of prescriptive rehabilitation therapies and type of therapies. Demographic variables include

age, race and gender.

For this QI project, functional outcome is defined as "a measurable goal that helps a patient

perform specific activities of daily living" (Medical Dictionary, 2009). Health-related quality of life

(HRQL) is defined using the Centers of Disease Control and Prevention's (CDC) definition "on the

individual level, HRQOL includes physical and mental perceptions (e.g energy level, mood) and their

correlates – including health risks and conditions, functional status, social support and socio-economic

status," (CDC, 2018, p. 4).

Prescriptive rehabilitation therapy is defined as an official communication between the health care provider, patients and disciplines such as physical, occupational, speech therapy for the purpose of establishing clearly defined rehabilitation goals to improve functional outcomes after the comprehensive evaluation of patients by their providers (Centers for Medicare & Medicaid Services, 2006).

The following clinical questions were evaluated:

Primary Question

1. Does the use of ODI and EQ-5D-5L at the first post-operative visit in patients undergoing elective neurosurgical spine surgeries lead to a change in the timing of generating prescriptive rehabilitation therapies when compared to baseline care?

   DV: Time of prescriptive rehabilitation therapies, measured as the weeks patient received the prescribed referral to rehabilitation therapies.

   IV: The implementation of the new assessment tools (pre versus post).

2. Does the use of ODI and EQ-5D-5L at the first post-operative visit in patients undergoing elective neurosurgical spine surgeries lead to a change in the type of therapies when compared to baseline care?

   DV1: Change in the type of therapies prescribed, measured as yes or no.

   DV2: Type of therapies

   IV: The implementation of the new assessment tools (pre versus post).

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Literature Review

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In introducing ODI and EQ-5D-5L questionnaires in standardizing assessments for post-operative patients undergoing elective spine surgery, it was important to gain a good understanding of the available evidence to support this change. A comprehensive literature search was conducted by the DNP student between February – March 2019 of all English language published studies within the last

ten years. CINAHL, MEDLINE, and PubMed were queried with search terms "quality of life," "spine surgery," "functional outcomes," "Oswentry Disability Index," "physical therapy," "sexual function," "and" "after," "or." The selection and assessment process were performed; 350 titles and abstracts were reviewed for appropriateness. Twenty-five articles were found to be appropriate and read in full. Articles not meeting the inclusion criteria (n = 17) were excluded after applying the criteria. Eight articles were critically appraised (using the Johns Hopkins Evidenced-Based Practice Model Guideline, analyzed and synthesized. The Johns Hopkins rating rank for the level of research evidence are: Level I, experimental study, level II, quasi-experimental and level III quantitative nonexperimental (Dearholt & Dang, 2018). Additionally, the research evidence quality rating using the Johns Hopkins appraisal tool consisted of grade A, high; grade B, good; and grade C, low or major flaw (Dearholt & Dang, 2018). Please see Appendix B for findings presented in a table and narrative format.

Chotai et al. (2015) performed a prospective longitudinal study to examine the quality of life and general health after elective surgery for cervical spine pathologies. These researchers used the EQ-5D and SF-6D in examining the validity and responsiveness of the quality of life in 420 adult patients for a period of two years. Their results showed that 66% (227) patients reported relief after surgery (meaningful improvement). The researchers reported the SF-6D (meaningful versus non-meaningful) yielded a more accurate response when compared with the EQ-5D for cost-utility analysis secondary to the formulation of questions geared towards disease-specific disability scores. Chotai et al. (2015) recommended the use of the SF-6D tool for studies focusing on cost-effectiveness and quality adjusted life; however, the EQ-5D can also be used in spine patients undergoing elective surgery in learning about their reported health related quality of life. Although the findings from this study are not generalizable due to the small sample size and non-existent gold standard in thoroughly assessing patient reported outcomes, this study offers the DNP student and project team members information on the

benefits of introducing the EQ-5D in assessing patient reported outcomes post-operatively. This study can also enlighten neurosurgical providers in understanding patients outcomes, have an objective report from patients to guide clinical decision making and ultimately eliminate provider biases during patient assessment of functional outcomes and quality of life.

Ilves et al. (2017) conducted a randomized controlled trial to investigate the effectiveness of a post-operative 12-month exercise program on disability and health related quality of life in patients undergoing elective lumbar spinal fusion when compared to standard care. This study consisted of 104 adult patients. Results from this study demonstrated a decrease in ODI scores and improvement in the health-related quality of life in the exercise group (physical therapy) versus non-exercise group during the intervention. Additionally, the ODI showed one-fourth of the study participants reporting at least moderate disability at their 12-month follow up indicating the need for individualized interventions. This study is valuable to this DNP project as it provides evidence on the usefulness and effect of the ODI and RAND-36 questionnaire in the assessment and development of subsequent treatment plans geared towards the timely generation of physical therapy exercises post-operatively in patients undergoing elective spine surgeries.

Sexual function is a vital aspect of quality of life in patients across the spine spectrum. Neurosurgical providers routinely do not perform dedicated assessments of this paramount aspect of quality of life post-operatively. The lack of a standardized approach in evaluating sexual function post-operatively has led to the delay in generating prescriptive sex therapy referrals. Malik, Jain, Kim, Khan and Yu (2018) conducted a systematic review in examining the effect of spine surgeries on sexual activities and function. They evaluated 81 articles published between 1999 – 2017 which included all levels of evidence from both the United States and other countries. A myriad of surgical approaches, accesses and gender were utilized in the studies performed under review. Multiple patient reported

outcomes were assessed via a plethora of tools such as ODI, changes in sexual function questionnaires (CSFQ-14), and brief self-administered questionnaires (BSFI) assessing three functional sexual domains in men (sexual drive, erectile function and ejaculatory function). Results showed improvement in patient reported outcomes of sexual function after lumbar surgeries. Although the evidence was not specific to patients undergoing cervical spine surgeries as recommended by Dearholt and Dang (2018), the DNP student and team members can cautiously apply the data from this systematic review comprising of mainly level IV evidence in introducing the assessment of sexual functions/dysfunction via administered ODI, which has one section assessing sex life.

There is a paucity of data in literature addressing specific timeframes for referring patients for post-operative physical therapy after elective spinal surgery. Madera et al. (2017) performed a systematic review of studies focused on post-fusion rehabilitation. They reviewed 21 level I or II articles following a rigorous procedure. Data from the systematic review showed improvement in patient reported activities of daily living using ODI and Dallas pain questionnaires scores six months post-surgery. These authors recommend formal outpatient rehabilitation for 2 -3 months after spine surgeries to correspond with the healing and bony fusion process post-operatively.

Snowdon and Peiris (2016) conducted a systematic review evaluating comprehensive physiotherapy rehabilitation starting within four weeks of the post-operative period in spine patients undergoing surgery when compared to base line care. Data from this systematic review revealed a moderate-quality evidence of a decrease in pain by both moderate and significant amount at 12 weeks post-operatively. Based on the evidence, these authors recommended patients receive early physiotherapy started within the first four weeks after spine surgery.

Nayak et al. (2019) conducted a systematic review and meta-analysis to assess patient-reported outcomes measures (pre-operative and post-operative health related quality of life) after spine surgery.

They included studies involving patients who had undergone surgery for degenerative cervical and lumbar spinal pathologies between 2000 and 2014. Findings revealed statistically significant differences in post-operative scores for the EQ-5D and SF-D tools for health-related quality of life. This systematic review is invaluable to the DNP project, showing multiple factors such as psychometric validation, simplicity, readability, professional acceptance that was considered with the selection of assessment tools.

Wibault et al. (2018) conducted a randomized controlled trial to compare the results of structured post-operative physiotherapy combining neck-specific exercises with a behavioral approach to a standard post-operative approach in patients with cervical disc disease with radiculopathy undergoing surgery after a six-month period. They randomized 101 patients to receive structured postoperative physiotherapy pre-operatively and 100 patients to standard postoperative approach. Outcome measures were focused on patient-reported neck disability measured with the neck disability index (NDI), intensity, frequency of neck/arm pain, global outcome of treatment, expectation fulfillment and enablement. Results revealed patients who underwent post-operative physiotherapy reported improvement in their symptoms, higher expectation fulfillment and the need for ongoing physiotherapy after cervical surgery.

Devin and McGrit (2015) completed a comprehensive literature review evaluating common medications used during the multimodal management of pain in post-operative spine patients. They evaluated the evidence regarding effectiveness of pain control with the use of validated measures such as the ODI, neck disability index, McGill pain questionnaire and Roland-Morris disability questionnaires administered in the inpatient and outpatient setting. The North American Spine Society's (NASS) clinical guideline for multidisciplinary spine evidence-based care served as a guide to the two independent reviewers grading the level of evidence for the individual study. Results from the literature

review highlighted the good quality evidence supporting the decreasing use of opioid with emphasis on multimodal non-opioid medications in obtaining post-operative pain control. This study provides supporting data for clinicians within the DNP student's clinical practice site to embrace the use of validated tools in assessing functional outcomes. Pain plays an important role in post-operative patient's functionality, as such, it is important to provide non-pharmacological and pharmacological therapeutic treatments. Evidence gap in the literature include a scarcity of randomized controlled trials focusing on clear-cut guidelines on the timeframe to begin outpatient physical therapy after elective spine surgery.

This literature review offers multifaceted and consistent evidence to support the DNP student's aim of introducing validated multi-facet assessment tools to evaluate post-operatively the functional outcomes and quality of life in patients undergoing spine surgery within the department of neurosurgery, with an end goal of ultimately initiating timely prescriptive referrals for rehabilitation services. Rehabilitation services include physical, occupational and speech therapies, interventional pain management specialists and multi-modal pain medications for post-operative symptomatic relief and for optimal neurological health. The evidence summary is presented in Appendix A.

Evidenced Based Translation Model

The IOWA evidenced based practice model (Iowa Collaborative, 2017) was used to guide this QI project. This model is comprised of seven steps that offer guidance in clinical decision making within a system or organization.

Topic Selection

The first stage of selecting a meaningful and useful project topic was performed by the DNP student and internal stake holders. There were several avenues to help lead and effect change within the outpatient neurosurgery clinics: however, prioritization of quality improvement projects demonstrated the utmost need to standardize clinicians' post-operative assessment of patients undergoing elective

spine procedures by using validated questionnaires to assess functional outcomes and quality of life. Other factors considered during the selection of the project topic included the potential benefits in enhancing a totally driven patient centered-approach, the opportunity to provide high quality care utilizing multidisciplinary resources and a myriad of other modalities and data available in literature to support the QI project.

Forming a Team

A team was formed by identifying the key individuals that are instrumental in current care delivery from an administrative and clinical standpoint. Obtaining buy-ins from the clinics administrators, clinicians and clinical staff occurred in 2018. Since the QI project is in alignment with the organization's strategic goals and department's vision, the team members were highly motivated to be a part of the QI project. This was important to achieve success and sustainability.

Evidence Retrieval

The third stage which began with the initial query of the databases, was performed in 2018 by the DNP student to search for guidelines and validated questionnaires focused towards the assessment of the functional outcomes and quality of life in spine patients. Keeping the research question and associated variables at the forefront, retrieving strong evidence from literature was paramount. The ODI and EQ – 5D-5L questionnaires were identified and reviewed thoroughly to ensure they covered all the domains that may elucidate areas for individualized therapies or additional treatment. For the actual literature review, CINAHL, MEDLINE, and PubMed were queried to examine the latest evidence in spine care and provider assessments.

Grading the Evidence

We reviewed, appraised and graded the evidence using the Johns Hopkins nursing evidence-based practice research evidence appraisal tool (Dearholt & Dang, 2018). This tool is simplistic and user

friendly in performing the appraisal of research studies to address the practice gap and answered the PICOT question. As discussed in the literature review section, evidence supports the use of the two assessment tools.

Developing an Evidenced Based Standard

The fifth stage was to develop a standard to introduce the ODI and EQ-5D-5L to the DNP student's clinical practice site. Several steps were planned: 1) educating the clinicians about the information generated from the questionnaires and how to use the information to guide referrals. 2) designing when and how to approach patients to fill out the questionnaire, and 3), designing the methods of handling the data obtained.

Implementing the EBP

The sixth stage of implementation comprised of ongoing dialogue between internal stakeholders, clinicians, administrative staff and patients. Clear and effective communication during the implementation phase occured. Lunch and learn sessions, and department sponsored dinners were additional avenues to ensure feedbacks were obtained from the team. Daily huddles were leveraged in honing information needed for seamless implementation of the tools during chart preparation for the post-operative visits.

Evaluation

The seventh stage of evaluation allowed the DNP student to see the results of the DNP project and potential effects on patients. A chart review was completed to assess baseline data and current trends. Evaluation was on an ongoing basis to study the structure, process and outcomes of this new practice. Appendix B shows the type of referrals evaluated.

Methodology

Design

This was a QI project comprising of 100 patients (50 pre and post the intervention).

Setting

Two of the outpatient clinics housing the neurosurgery department comprised of 17 exam rooms.

Patient Population

All adult patients who met the inclusion criteria were included. The inclusion criteria included: 1) post elective spine surgery, 2) 18 years or older with a diagnosis of degenerative disc disease, spondylosis, spondylolisthesis, stenosis, scoliosis, kyphotic deformities, fractures, subluxation, facet arthropathies; patients undergoing laminectomies, fusions/instrumentation, corpectomies, foraminotmies or anterior cervical discectomies.

The exclusion criteria included patients who had cranial neurosurgical interventions, patients undergoing emergent spine surgery, patients with implantable spinal cord stimulators, patients with active medical or workers compensation lawsuits, and patients who developed immediate complications after surgery (infection). Patients who were cognitively impaired and unable to answer the questionnaires were excluded.

Sample Size

There are no standard sample size guidelines for QI projects. A free interactive power analysis calculator available online was used in estimating the sample size needs (Free Statistics Calculator, 2019). Calculation was based on Cohen's power analysis. For a medium effect size; Cohen's d of 0.50, power of 80%, alpha of 0.05, we need 64 patients per group (128 total). However, there were estimated 55 available elective surgeries based on a review of spine surgical cases performed over the last ninety days within the neurosurgery clinics. Due to the time constraints of the DNP project, a reduced sample size was used for this study (about 50 patients pre and 50 for post).

Patient Recruitment

The introduction of the ODI and EQ-5D-5L tools was standard practice during the QI project, as such, obtaining consents was not indicated. The patient's demographics form were updated at the time of checking in for the appointment to ensure the most accurate contact information was on file, which was used in contacting the participants one week prior to their scheduled surgery by the DNP student or designee (office manager), serving as a first reminder. When the project participants were discharged from the hospital, the medical/administrative assistants ensured the initial post-operative visits were scheduled within 7 – 14 days after surgery. The project participants were contacted via telephone and reminded by the medical assistants 24 – 48 hours prior to surgery of their initial post-operative visit to arrive at least thirty minutes before their scheduled appointments to complete the questionnaires.

Risks/Harms

The QI project posed minimal risk or harm to the project participants. Risks related to the study are likened to the same risk faced daily by the project participants.

Subject Costs and Compensation

There was no additional cost to patients who took part in this QI project, other than the routine medical costs associated with their conditions regardless of if they were included in this project or not. The project participants received no compensation for their involvement in the project.

QI Intervention

The QI project proposal was submitted to the Institutional Review Board (IRB) of the DNP student's clinical practice organization and it was deemed to be a quality improvement project. The intervention was the introduction of the ODI and EQ-5D-5L questionnaires. Post-operative patients were provided with the questionnaires to complete during their initial post-operative visits.

The ODI is a widely used questionnaire for assessing the functional outcomes in patients with spine pathologies (Fairbank & Pynsent, 2000). It can also be used to assess response to treatment. It is

sensitive for patients demonstrating improvement in comparison to patients with no changes, focuses on patient reported complaints and monitors the effectiveness of therapy or intervention (Vianin, 2008). The internal consistency Crobach's alpha ranged from 0.71 – 0.87; test and retest reliability ranged from r of 0.83 – 0.99; intraclass coefficient ranged from 0.84 – 0.94 as reported by Vianin in 2008. There are ten questions in the questionnaire, taking approximately five minutes to complete and less than one minute to score. The scores from the questionnaire ranges from 0% to 20% (minimal disability); 21% to 40% (moderate disability) 41% to 60% (severe disability), 61% to 80% crippled and 81% to 100 %, bed bound or exaggerating (Vianin, 2008). Authorization to use the ODI questionnaire was granted by Dr. Jeremy Fairbank (creator of the ODI questionnaire, spinal surgeon, division of spinal surgery, Oxford University). The questionnaire is in Appendix C.

The EuroQol-5 Dimension assessment tool was created in 1990 and is considered an acceptable standardized tool to measure the health-related quality of life in patients with chronic diseases (European Quol, 2017). It is comprised of two versions. The first version, The EQ-5D-3L which has five main questions on mobility, selfcare, pain, usual activities and psychological status, has only three potential answers for each question (1 = no problem, 2 = moderate problem, 3 = severe problem). The second version EQ-5D-5L consists of five domains (mobility, selfcare, usual activities, pain/discomfort, anxiety/depression) and five potential answers for each of the domain (1 = no problem, 2 – slight problems, 3 = moderate problems, 4 = severe problems, 5 = extreme problems). Due to the ceiling effect of the EQ-5D-3L reported by many authors, the EQ-5D-5L was created in 2011 to address this limitation and has been tested and retested (Janseen et. al. 2012).

For this QI project, the EQ-5D-5L questionnaire was used. Both the Cronbach's alpha and interclass coefficient have been reported to be greater than 0.7 (Cheung et al. 2016), indicating acceptable

reliability. Permission was obtained to use the EQ-5D-5L assessment tool from the EuroQol

organization. Please see Appendix D.

Outcomes

Whether or not the patient received a referral during the 3-month post-surgery (yes/no), the time

the initial referrals are prescribed (weeks), and the type of referrals (frequency for each type) was

assessed. In addition, the percentage of APRNs using the standardized assessment tools and the

percentage of patients that have documentation of the ODI/EQ-5D-5L scores in their charts at the first

post-op visit were assessed. Details are in the evaluation plan section.

Evaluation Plan

The structure, process and outcomes were evaluated (Appendix E).

Structure

1. The percentage of available personnel to administer the new assessment tools in patients

    undergoing elective neurosurgical spine surgeries.

2. Three lunch-and-learn meetings/dinner held in May/June/July 2019 with the APRN/physician

    colleagues and support staff reviewing the aspects of the methodology and reiterated their

    required roles during this project and familiarization of the APRN post-op checklist.

Process

1. The rate of APRNs that use the new assessment tools in post-operative spine patients undergoing

    elective neurosurgical spine surgeries.

2. The percentage of post-operative patients undergoing elective spine surgery that have

    documentation of functional outcome/quality of life scores using standardized multi-facet

    validated assessment tools (ODI, EQ-5D-5L) on the date of face-to-face encounter and

documentation of a care plan by the nurse practitioners based on patient-reported findings from these tools.

Outcomes Measured

The percentage of post-operative patients undergoing elective spine surgery received referrals for prescriptive rehabilitative services during a 12-week period immediately after surgery (yes divided by all eligible patients) was measured. Time for referral is the time of the initiation of the referral measured as weeks post-surgery. We created an APRN spine post-operative checklist/boarding pass that served as a guide for the APRNs in ensuring the time for referrals are indicated and generated (Appendix F). This APRN checklist/post-operative boarding pass was stored on the department's shared drive for easy access and printed by the medical assistants during their APRN chart preparation for post-operative elective spine patients. The APRN checklist/post-op boarding pass included the components as outlined in Appendix I. This checklist served as a form to ensure consistency/reliability in monitoring the time for generating referrals. The goal was to enhance recovery after surgery in elective spine patients and also ensure referrals/therapeutic treatments are generated starting by the two weeks post-op appointment in order to promote patients return to optimal neurological baseline.

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Data Collection Procedure

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Chart Review Procedure and Inter-Rater Reliability

All pre-implementation data were obtained by chart review. For pre-intervention data, patients with initial clinic visits between January – April 2019 were included. Post-intervention data was collected by the DNP student 12 weeks post-surgery. For both the pre and post data, the same data collection tool was used (Appendix G).

To check the inter-rater reliability, one of the APRNs within the student investigator's department reviewed the same charts to extract information regarding the time of referrals and type of referrals. Inter-rater reliability was calculated. The goal was a 90% (high agreement).

Data Analysis, Maintenance and Security

The data was de-identified by assigning a four-digit code to each patient. Data from the assessment tools was entered into a Microsoft Excel spread sheet, analyzed with the use of the IBM statistical software (SPSS V25) and stored in a password-protected computer by the DNP student. The data definition codes are in Appendix H. Descriptive statistics and Chi-Squares tests were used to examine all study variables. Please see Appendix I

Ethical Consideration

This was a QI project, thus all patients who met the inclusion/exclusion criteria were included. The two validated questionnaires are considered as standard practice. Patient information/data was secured in password protected computers. HIPPA laws served as a guide in ensuring information were upheld confidentially.

Evaluation and Planning

What gets measured allows for proper management and the abilities to make data driven decisions to enhance patient care. Standards play a very important role in guiding the selection of performance metrics while ensuring safe, effective practice, improved patient experience and a reduction in per capita cost (Institute for Healthcare Improvement, 2018a). The American Physical Therapy Association recommends the utilization of standardized tests in creating baseline data for patients in order to categorize their functional outcomes and track their overall outcomes overtime (American Physical Therapy Association, 2015).

Donabedian's model served as a good foundation for this QI project in choosing the appropriate quality metrics that aligns with the organizational strategic plan and practice philosophies in improving the health and outcomes of the populations we serve (Agency for Healthcare Research and Quality, 2015). Donebadian's model allowed for three distinct aspects that were all important in improving care and leading to the selection of the right structure, process and outcome metrics (Agency for Healthcare Research and Quality, 2015). Please see Appendix G for a table reflecting the evaluation and planning matrix.

Results

Prescriptive Rehabilitative Therapies

This QI project comprising of 100 patients (50 pre and 50 post the intervention) undergoing elective spine surgeries compared whether or not patients received a referral during the 3-month post-surgery, the time the initial referrals were prescribed, and the type of referrals generated. The percentage of APRNs using the standardized assessment tools and the percentage of patients that have documentation of the ODI/EQ-5D-5L scores in their charts at the first post-op visit were assessed.

Demographics Characteristics

Demographic information is presented in table 1 (Appendix J). The mean age (years) for the pre-implementation was 59.73 (11.27) years, and the mean age post-implementation was 57.86 (14.63) years; this was not statistically significant, $t_{97}= 0.71$, p=0.48. There were 30 (53.6%) males (53.6%) pre-implementation and 26 (46.4%) males post-implementation (p=0.42, not significant). There was no significant difference between pre and post on race/ethnicity; there were 43 (51.8%) white pre-implementation and 40 (48.2%) white post-implementation (p=0.42).

Referral and Time to Referral

Results of referral and referral time are summarized in table 2 (Appendix K). The results showed that 20 (40%) patients received a referral pre-implementation, while 23 (46%) patients received a referral post-implementation; The difference was not statistically significant, Chi-square = 0.37, p=0.545. The time to referral was 4.36 (SD = 2.63) weeks pre-implementation and 5.74(SD=3.72) weeks post implementation. This difference was also not statistically significant, t= 1.33, p=0.191.

As for the percentage of APRNs using the standardized assessment tools pre and post the implementation, it changed from 0 to 100. All three APRNs have used the tools post the implementation. The documentation of patients that have the ODI/EQ-5D-5L scores in their charts at the first post-op visit also changed from 0 to 100%.

Type of Referral

Before implementation, among the 20 patient who received referrals, 16 received one type of referral, 3 received two types of referrals and 1 received three referrals. After implementation, among the 23 patients, 21 received one type of referral, 1 received two referrals and 1 received three referrals. The specific type of referral is presented in table 3. Please see appendix L.

<div align="center">

Discussion

</div>

Implications for Practice, Healthcare Policy, Executive Leaders and Quality/Safety

Patient-reported outcomes play a poignant role in developing clinical research for neurosurgical spine surgery (Staartjes et. al., 2019). The findings from our QI project may help inform APRNs in clinical neurosurgery practice of the benefits of integrating validated multi-faceted assessment tools to learn and derive comprehensive, objective data from their patients. Our quality improvement project is also congruent with the findings from Ilves et al. (2017), the adoption of validated multi-faceted tools in clinical practice by APRNs in neurosurgery can also serve as a precursor in evaluating the maximum effectiveness of the surgical intervention over time and utilized as a point of reference in the

development of evidence-based, cost-effective treatment plan**s**. Our QI project findings also inform healthcare policy at the hospital level based on risk stratification and decision making for resource allocation.

Our QI project findings can enlighten neurosurgery executive leaders regarding the benefits and importance of standardizing postoperative assessments, with the introduction of validated multi-faceted assessment tools in clinical practice. Executive leaders can have a deeper understanding of the documented patient-reported outcomes and the data-driven decisions reached by APRNs in clinical neurosurgery practice. This can also serves as a guide in informing executive leaders in supporting APRNs in their requests for ample clinic time slots for postoperative evaluation, purchasing licenses for validated multi-faceted assessment tools in electronic formats (for better usability) and providing the resources and tools required by the APRNs in tracking their quality outcomes at the organizational or national levels. The findings also highlight the importance of standardizing the evaluation of elective spine patients leading to improved patient-centered care, shared decision making and enhancing their recovery after undergoing surgery. Our findings although not statistically significant, are similar to Chotai et al. (2015), the utilization of EQ-5D-5L in assessing elective spine patients resulting in understanding the health-related quality of life and the need for clinicians to initiate the appropriate prescriptive referrals or rehabilitative therapies for adequate optimization of patients' post-operative course.

This QI project is the inaugural study primarily led by an APRN (DNP student) within the department of neurosurgery and brain repair, serving as an excellent foundation to build upon our abilities to meet neurosurgery specific quality metrics down the line when adopted. The findings from the assessment tools introduced led to the ability of the APRNs within the neurosurgery outpatient clinics, making data-driven decisions to improve outcomes. The DNP candidate, with the help of the

neurosurgical departmental leadership, can help foster an environment with an additional layer of quality improvement, patient safety, patient experience projects that are clinically relevant to the department and patients served.

Plans for Sustainability and Future Scholarship

Establishing a QI committee consisting of APRNs, neurosurgeons, and other members of the interdisciplinary team within the department of neurosurgery will ultimately benefit the ongoing performance of quality improvement projects geared towards improving the lives of our patients and their outcomes. We recommend future studies with longer observation period and including patient outcomes are suggested.

Conclusion

In conclusion, our findings have shown that the introduction of the ODI and EQ-5D-5L to patients undergoing elective spine surgery has not resulted in differences in the number of referral at the first post-operative visits, the timing and type of prescriptive rehabilitative therapies referrals generated when compared to baseline care. However, this QI project has added value to the current processes by standardizing the evaluation of post-operative spine patients with multi-faceted validated tools.

Neurosurgical clinicians often encounter multiple barriers (clinic time constraint, timely documentation, close follow-ups) in clinical practice that may deter them from implementing evidenced-based care despite the overwhelming data in literature on the diverse benefits in improving patient outcomes. Consistently striving to implement health care delivery innovation and quality improvement projects on an ongoing basis can guide clinicians in their development of individualized treatment plans for patients undergoing elective spine surgery. Integrating a multidisciplinary approach to patient care with the use of innovative, multi-facet validated assessment tools is expedient in decreasing underutilization of necessary evidenced-based treatment modalities in post-operative spine patients.

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Appendix A: Evidence Summary

Article #	Author & Date	Evidence Type	Sample Size, Setting	Study findings that help answer the EBP question	Observable Measures	Limitations	Evidence Level & Quality
1	Chotai et al. (2015).	Prospective Longitudinal	420 patients Single comprehensive spine center.	Introducing the EQ-5D in assessing patient reported outcomes post-operatively can help enlighten neurosurgical providers in understanding patients' outcomes, have an objective report from patients to guide clinical decision making.	Health and quality of life EQ-5D, SF-6D	Small sample size. Findings not generalizable.	Level II B
2	Devin and Mcgrit (2015)	Literature Review	Sample size not indicated. Inpatient and outpatient settings.	Supporting the decreasing use of opioids with emphasis on multimodal non-opioid medications in obtaining post-operative pain control.	Pain control Functional outcome ODI Neck disability index (NDI)	Poor data supporting post-operative protocols.	Level V B
3	Ilves et al. (2017)	Randomized Controlled Trial	104 Multicenter Tampere University Hospital and Central Finland Central	Offers supporting evidence on the usefulness and effect of the ODI and RAND-36 questionnaire in the assessment of patient reported	Disability Health related quality of life	Sample size, limiting the generalizability	Level I B

			Hospital, Finland	outcomes/functional outcomes.			
4	Malik, Jain, Kim, Khan and Yu (2018)	Systematic Review	Articles from multiple countries included in the study	Provides data on the importance of clinicians assessing the sex domain in post-operative spine patients.	Sexual activities and function	Majority of the articles reviewed were mainly level IV evidence. Scarce data of the sexual function in cervical patients.	Level II B
5	Madera et al. (2017)	Systematic Review	21 articles with Level I or II evidence

Outpatient | This article offers information on the importance of providers recommending formal physical therapy 2 – 3 months after spine surgeries to correspond with the healing process and bony fusion. | ODI Dallas pain score | Authors clinical practice opinion integrated within the review due to lack of limited RCT studies focusing on the rehabilitation of post-operative lumbar fusion patients. | Level 1 B |
| 6 | Nayak et al. (2019) | Systematic Review | 99 articles included in the final systematic review | Provides data revealing considerable factors such as psychometric validation, simplicity, readability, professional acceptance during the selection of | HRQoL EQ-5D SF-6D | Lacked the use of research/medical librarians for the article search, reviewers were not blinded | Level 1 A |

				validated tools			
7	Snowden and Peiris (2016)	Systematic Review	250 participants from 4 trials meet the inclusion criteria	Evidence from this systematic review reveals post-operative physical therapy initiated at four weeks after spine surgery is advantageous.	Adverse events, reduction of pain, function and disability, patient satisfaction, return to work	Inclusion criteria permitted the use of non-randomized control trials	Level I B
8	Wibault et al. (2018)	Randomized Controlled Trial	201 Outpatient	Reveals the effect of physical therapy in post-operative spine patients led to improvement of patient reported outcome of higher expectation fulfillment and the need for ongoing physical therapy after surgery	Neck disability Intensity, frequency of neck and arm pain, global outcome of treatment, expectation fulfillment, enablement.	Small sample size	Level I B

Adapted from Dearholt, S. & Dang, D. (2018). *Johns Hopkins Nursing Evidence-Based Practice Model and Guidelines*. Indianapolis, IN: Sigma

Theta Tau International.

Appendix B: Types of Referrals

Patient name and ID	
Time of visit	E.g: baseline initial

Referrals	Yes	No	Note
Pharmacological prescription			
Physical therapy			
Occupational therapy			
Massage therapy			
Speech therapy			
Formal interventional pain management			
Neurology referral			
Psychiatry/Mental health referral			
Skilled Nursing Rehabilitation			
Other			

Appendix C: ODI Questionnaire
ODI version 2.1a

This questionnaire is designed to give us information as to how your back (or leg) trouble affects your ability to manage in everyday life.
Please answer every section. Mark one box only in each section that most closely describes you today.

Section 1 -Pain intensity

- ○   I have no pain at the moment.
- ○   The pain is very mild at the moment.
- ○   The pain is moderate at the moment.
- ○   The pain is fairly severe at the moment.
- ○   The pain is very severe at the moment.
- ○   The pain is the worst imaginable at the moment.

Section 2 -Personal care (washing, dressing, etc.)

- ○   I can look after myself normally without causing additional pain.
- ○   I can look after myself normally but it is very painful.
- ○   It is painful to look after myself and I am slow and careful.
- ○   I need some help but manage most of my personal care.
- ○   I need help every day in most aspects of my personal care.
- ○   I do not get dressed, I wash with difficulty and stay in bed.

Section 3 -Lifting

- ○   I can lift heavy weights without additional pain.
- ○   I can lift heavy weights but it gives me additional pain.
- ○   Pain prevents me from lifting heavy weights off the floor but I can manage if they are conveniently positioned, e.g. on a table.
- ○   Pain prevents me from lifting heavy weights but I can manage light to medium weights if they are conveniently positioned.
- ○   I can only lift very light weights.
- ○   I cannot lift or carry anything at all.

Section 4 -Walking

- ○ Pain does not prevent me from walking any distance.

- ○ Pain prevents me from walking more than one mile.

- ○ Pain prevents me from walking more than a quarter of a mile.

- ○ Pain prevents me from walking more than 100 yards.

- ○ I can only walk using a cane or crutches.

- ○ I am in bed most of the time and have to crawl to the toilet.

Section 5 -Sitting

- ○ I can sit in any chair as long as I like.

- ○ I can sit in my favorite chair as long as I like.

- ○ Pain prevents me from sitting for more than 1 hour.

- ○ Pain prevents me from sitting for more than half an hour.

- ○ Pain prevents me from sitting for more than 10 minutes.

- ○ Pain prevents me from sitting at all.

Section 6 -Standing

- ○ I can stand as long as I want without additional pain.

- ○ I can stand as long as I want but it gives me additional pain.

- ○ Pain prevents me from standing for more than 1 hour.

- ○ Pain prevents me from standing for more than half an hour.

- ○ Pain prevents me from standing for more than 10 minutes.

- ○ Pain prevents me from standing at all.

Section 7 -Sleeping

- ○ My sleep is never interrupted by pain.

- ○ My sleep is occasionally interrupted by pain.

- ○ Because of pain I have less than 6 hours sleep.

- ○ Because of pain I have less than 4 hours sleep.

- ○ Because of pain I have less than 2 hours sleep.

- ○ Pain prevents me from sleeping at all.

Section 8 -Sex life (if applicable)

- ○ My sex life is normal and causes no additional pain.
- ○ My sex life is normal but causes some additional pain.
- ○ My sex life is nearly normal but is very painful.
- ○ My sex life is severely restricted by pain.
- ○ My sex life is nearly non existent because of pain.
- ○ Pain prevents me from having any sex life at all.

Section 9 -Social life

- ○ My social life is normal and causes me no additional pain.
- ○ My social life is normal but increases the degree of pain.
- ○ Pain has no significant effect on my social life apart from limiting my more energetic interests, e.g. sport, etc.
- ○ Pain has restricted my social life and I do not go out as often.
- ○ Pain has restricted my social life to home.
- ○ I have no social life because of pain.

Section 10 - Traveling

- ○ I can travel anywhere without pain.
- ○ I can travel anywhere but it gives me additional pain.
- ○ Pain is bad but I am able to manage trips over two hours.
- ○ Pain restricts me to trips of less than one hour.
- ○ Pain restricts me to short necessary trips of under 30 minutes.
- ○ Pain prevents me from traveling except to receive treatment.

Result

Your ODI

Appendix D: EQ-5D-5L Questionnaire

Health Questionnaire

English version for the USA

Under each heading, please check the ONE box that best describes your health TODAY.

MOBILITY

I have no problems walking ❑

I have slight problems walking ❑

I have moderate problems walking ❑

I have severe problems walking ❑

I am unable to walk ❑

SELF-CARE

I have no problems washing or dressing myself ❑

I have slight problems washing or dressing myself ❑

I have moderate problems washing or dressing myself ❑

I have severe problems washing or dressing myself ❑

I am unable to wash or dress myself ❑

USUAL ACTIVITIES *(e.g. work, study, housework, family or leisure activities)*

I have no problems doing my usual activities ❑

I have slight problems doing my usual activities ❑

I have moderate problems doing my usual activities ❑

I have severe problems doing my usual activities ❑

I am unable to do my usual activities ❑

PAIN / DISCOMFORT

I have no pain or discomfort ❑

I have slight pain or discomfort ❑

I have moderate pain or discomfort ❑

I have severe pain or discomfort ❑

I have extreme pain or discomfort ❑

ANXIETY / DEPRESSION

I am not anxious or depressed ❑

I am slightly anxious or depressed ❑

I am moderately anxious or depressed ❑

I am severely anxious or depressed ❑

I am extremely anxious or depressed ❑

- We would like to know how good or bad your health is TODAY.

- This scale is numbered from 0 to 100.

- 100 means the <u>best</u> health you can imagine.
  0 means the <u>worst</u> health you can imagine.

- Mark an X on the scale to indicate how your health is TODAY.

- Now, please write the number you marked on the scale in the box below.

YOUR
HEALTH
TODAY = ☐

```
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
```

From: EuroQol - Registration <<u>registration@euroqol.org</u>>
Date: April 25, 2019 at 5:41:02 AM EDT
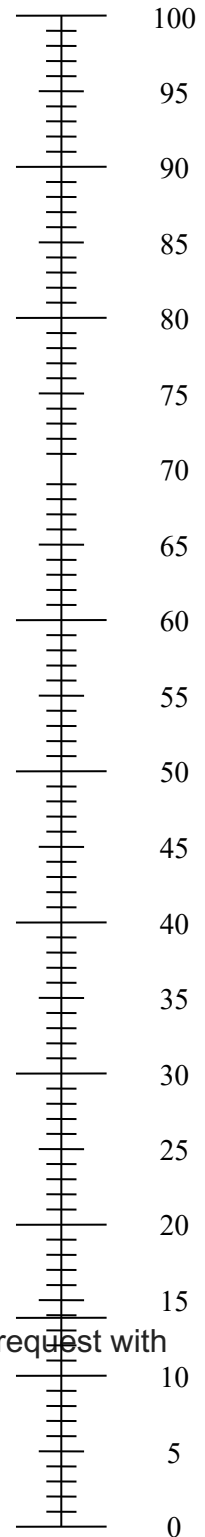**To:** "<u>mercyo@health.usf.edu</u>" <<u>mercyo@health.usf.edu</u>>
Subject: General conditions for the registration ID : L-29923

EQ-5D

Dear Mrs. MERCY OIGBOKIE ,

We have registered your agreement with our Terms of Use regarding your request with tracking number: L-29923 .

A team member will contact you as soon as possible to deliver the requested versions.

Yours sincerely,

Best regards,

Bernhard Slaap
Executive Director
EuroQol Research Foundation

T +31 88 4400196 | E slaap@euroqol.org | www.euroqol.org | Marten Meesweg 107 | 3068 AV Rotterdam The Netherlands

From: Anita Dwarkasing <dwarkasing@euroqol.org>
Date: April 25, 2019 at 9:37:49 AM EDT
To: "mercyo@health.usf.edu" <mercyo@health.usf.edu>
Subject: EQ-5D

Dear Mercy,

Thank you for your registration on the website (ID29923).

Please find the requested languages attached. The user guide can be downloaded from the website: https://euroqol.org/publications/user-guides/.

Best regards,

Anita Dwarkasing
Legal Assistant
EuroQol Research Foundation

EQ-5D

T +31 884400192 | E dwarkasing@euroqol.org | www.euroqol.org | Marten Meesweg 107 | 3068 AV Rotterdam The Netherlands

ref:_00D1r1peav._5001r2E6NSR:ref

Appendix E: Evaluation Planning Matrix

Structure	Objective	Evaluation Plan	Methods
Available personnel to administer the new assessment tools	Introduce the use of validated multi-facet functional outcomes and quality of life questionnaires as assessment tools within the department of neurosurgery in patients (i8 or older) undergoing elective spine surgeries	The percentage of post-operative patients (18 or older) with documented functional outcomes and quality of life scores in the electronic medical records.	Measure the percentage of available personnel to administer the new assessment tools.
Process	**Objective**	**Evaluation Plan**	**Methods**
The actual rate of APRNs use of standardized assessment tools for evaluating patients undergoing elective neurosurgical spine surgeries	To standardize the assessment of post-operative spine patients undergoing neurosurgical spine surgeries.	The frequency of using the assessment tools.	Measure the rate of APRNs that use the new assessment tools.

Outcomes	Objective	Evaluation Plan	Methods
Improve the time in generating prescriptive rehabilitation therapies and the type of therapies	Assess the time in generating prescriptive rehabilitation therapies and the type of therapies before the introduction of the multi-facet functional outcomes and quality of life questionnaires	The frequency/percentage of post-operative patients (18 or older) undergoing elective neurosurgical spine surgeries receiving prescriptive rehabilitation therapies referrals and the type of therapies	Measure the frequency and percentage of prescriptive rehabilitation therapies and type of therapies before the introduction of multi-facet functional outcomes and quality of life questionnaires
Improve the time in generating prescriptive rehabilitation therapies and the type of therapies	Assess the time of generating prescriptive rehabilitation and the type of therapies after the introduction of the multi-facet functional outcomes and quality of life questionnaires.	The frequency/percentage of post-operative patients (18 or older) undergoing elective neurosurgical spine surgeries receiving prescriptive rehabilitation therapies referrals and the type of therapies.	Measure the frequency and percentage of prescriptive rehabilitation therapies and type of therapies after the introduction of the multi-facet functional outcomes and quality of life

			questionnaires.

Appendix F: Boarding Pass

Post-Operative Care Pilot Check List/ Patient Boarding Pass for Elective Neurosurgical Spine Surgery between 08/27/19 – 12/13/19

APRNs, **please review the data in this table and circle/fill in as clinically**

indicated based on your physical assessment and data from the assessment tools

completed by your patients today.

Elective Surgery Performed Cervical: Thoracic: Lumbar: Date of Surgery:	2 weeks, 6 weeks, 12 weeks post-op visit
Sutures/Staples/Skin Glue	Wound infection or dehiscence: Yes/NO
Imaging – X-rays/CT/MRI	2 weeks, 6 weeks, 12 weeks post-op visit
Referrals: Therapeutic Treatments/Medications:	2 weeks, 6 weeks, 12 weeks post- op visit 2 weeks, 6 weeks, 12 weeks post-op visits

DATE OF SERVICE: _____

APRN SIGNATURE: _____

Appendix G: Pre and Post Intervention

Time	Pre-Intervention	Post (2 weeks)	Post (6 weeks)	Post (12 weeks)
Referrals				
Pharmacological prescription				
Physical therapy				
Occupational therapy				
Massage therapy				
Speech therapy				
Formal interventional pain management				
Neurology referral				
Psychiatry/Mental health referral				
Skilled Nursing Rehabilitation				
Other				

 Pre-intervention refers to baseline data and post-operative (after the introduction of the multi-

facet assessment tools).

Appendix H: Data Definition Codes

Patient ID Code	
Post-Operative Visit Date	
Medical Record Number	
Age	1 = 25 – 44.9 2 = 45 – 65 3 = > 65
Gender	1 = Male 2 = Female
Race/Ethnicity	1 = White/Caucasian 2 = Black/African American 3 = Hispanic/Latino 4 = Asian 5 = Other
ODI	1 = Yes 2 = No
EQ-5D-5L	1 = Yes 2 = No
Rehabilitation Therapies	1 = Yes 2 = No
Types of Therapies	1 = Rehabilitative Medicine 2 = Pain Management 3 = Neurology 4 = Speech Therapy
Medication	1 = Yes 2 = No
Clinical Diagnosis	1 = stenosis 2 = spondylosis 3 = spondylisthesis 4 = herniated discs 5 = degenerative disc disease 6 = scoliosis 7 = facet arthropathies
Surgical Intervention	1 = laminectomies 2 = foraminotomies 3 = corpectomies 4 = fusion/instrumentation 5 = anterior cervical disectomies 6 = total disc replacements 7= microdiskectomies

Appendix I: Variable Table

Dependent Variable	Independent Variable	Statistical Analysis
Time (Weeks) **Interval**	Implementation of the new assessment tools (pre) **Categorical**	Descriptive statistics
Change in type of therapies **Categorical**	Implementation of the new assessment tools (post) **Categorical**	Descriptive statistics
Type of therapies **Categorical**		Descriptive statistics

Appendix J: Characteristics of the Sample

Table 1. Characteristics of the sample

Variable	Pre-implementation n=50	Post-implementation n=50	Statistics, p value
Age (years)	59.73 (11.27)	57.86 (14.63)	t_{97}=0.71, p=0.48 Not significant
Gender			χ^2=0.65, p=0.42 Not significant
• Male	30 (53.6%)	26 (46.4%)	
• Female	20 (45.5%)	24 (54.5%)	
Race/Ethnicity			χ^2=0.64, p=0.42 Not significant
• White	43 (51.8%)	40 (48.2%)	
• Non-White	7 (41.2%)	10 (58.8%)	

Appendix K: Referral and Time to Referral

Table 2. Referral and time to referral

Variable	Pre-implementation n=49	Post-implementation n=50	Statistics, p value
Received referral			$\chi^2=0.37$, p=0.545 Not significant
• No	30 (60.0%)	27 (54.0%)	
• Yes	20 (40.0%)	23 (46.0%)	
Time to referral (weeks)	4.36 (SD=2.63) (n=18)	5.74 (SD=3.72) (n=23)	t=1.33, p=0.191 Not significant

Appendix L: Type of Referrals

Table 3. Types of referrals

	Frequency
Pre-implementation	
Physical Therapy	10
Physical Therapy & Pain Management	1
Aspen collar	1
Physical Therapy & Speech Therapy & Otolaryngology	1
Physical Therapy & Orthopedic Surgery	1
Physical therapy & Speech therapy	1
Smoking cessation	2
Speech therapy	2
Post-Implementation	
Physical Therapy	19
Physical therapy & pain management	1
Physical therapy & pain management & massage therapy	1
Lumbar Brace	1
Speech therapy	1