An-Najah National University
Faculty of Graduate Studies

PATIENT-REPORTED OUTCOMES MEASURES OF PAIN, QUALITY OF LIFE, MENTAL STATUS AND SLEEP QUALITY AMONG SPINAL NEUROSURGERY PATIENTS IN PALESTINE: A PROSPECTIVE LONGITUDINAL QUANTITATIVE STUDY

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This Thesis was defended successfully on 16/01/2025 and approved by:

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Dedication

I want to express my deep appreciation to Dr. Jamal Qaddumi for his exceptional guidance and invaluable feedback during my thesis work. His expert advice played a crucial role in shaping my research and bringing it to fruition.

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Immense gratitude to you all

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Declaration

I, the undersigned, declare that I submitted the thesis entitled:

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I declare that the work provided in this thesis, unless otherwise referenced, is the researcher's own work, and has not been submitted elsewhere for any other degree or qualification.

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Date:	16/01/2025

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Abstract

Introduction: The use of patient-reported outcomes measures (PROMs) is an application of the volume-to-value-based healthcare services, and were quantitatively used in the field of neurosurgery. Therefore, the current study aimed to investigate the preoperative and postoperative, as well as changes and factors of changes, in specific PROMs among spinal neurosurgery patients in a tertiary hospital in Palestine.

Method: The study was conducted using a prospective longitudinal design on a convenience sample of 99 lumbar and 35 cervical spine neurosurgery patients, and were interviewed to fill in a preoperative and one-month postoperative questionnaire that measures pain, quality of life (QoL), sleep quality and mental health PROMs. Valid versions of Arabic translated tools were used, including Neck Disability Index (NDI), Oswestry Disability Index (ODI), EuroQoL (EQ-5D-5L), Pittsburg Sleep Quality Index (PSQI), Epworth Sleepiness Scale (ESS) and Patient Health Questionnaire (PHQ-9). Data were analyzed using SPSS with full commitment of ethical considerations of anonymity and confidentiality.

Results: The patients had mean age of 49.16 years old, and were 50.7% females, 74.6% married, 59.7% underwent discectomy, a mean diagnosis-to-operation period of 7.15 weeks, and used preoperative paracetamol 69.4%, cortisones 76.9%, and NSAIDs 59.7%. All Proms showed significant postoperative overall improvements (p-value < 0.001), where better NDI improvements are found among urban residents and congenital disease-related operations, better ODI improvement among tumor resection patients, without hormonal disorders or use of preoperative cortisones, while better EQ-VAS improvements found among patients who are younger, and did not use preoperative paracetamol or muscle relaxants, and better ESS improvement are shown among older patients (p-value < 0.05).

Conclusion: The current study found an overall significant improvement among spinal neurosurgery patients in PROMs of pain, QoL, sleep quality and mental health. Some significant improvements were related to specific demographic and health-related factors. Several studies agree with the findings of the current study, with differences in the affecting factors related to sampling and population characteristics differences. Patient's engagement in preoperative education, recourse allocation and conduction of RCTs are recommended.

Keywords: Patient-reported outcomes measures; spinal neurosurgery; cervical; lumbar; pain; quality of life; sleep quality; sleep disturbance; sleepiness; mental health.

Chapter One
Introduction and Theoretical Background

1.1 Background

1.1.1 Value-based care in neurosurgery

The National Institutes of Health (NIH) has established the term known as patient-reported outcomes (PROs) as a product of the transition from volume-based to value-based healthcare services, in which a Patient-Reported Outcomes Measurement Information System has been initiated. In such a system, the focus is on collecting crucial health information related to the patient's history, assessment and postoperative phase that will help in enhancing the patient outcomes during and after hospitalization, which include, but are not limited to, comorbidities, mental health, social support, pre- and post-injury function, pain and quality of life (Tatman & Obremskey, 2019), which helps in exploring strategies that may enhance the value of care that is provided to patients by improving health outcomes and reducing the cost of delivered care, which is done by developing valid and accurate measurements of the patients' mental, physical and social health (Baumhauer & Bozic, 2016).

The term of patient-reported outcomes (PROs) has several definitions according to the targeted area of medicine and nursing healthcare, but it is mainly defined as outcomes that are directly reported by the patient who experience them, without an external interpretation from another person, like the physician, nurse or other healthcare providers (Crossnohere et al., 2021). Therefore, despite the lack of robust evidence of PROMs, studies have shown a great potential to increase patient satisfaction with services and treatment, as well as the enhancement of their awareness regarding their self-management and symptoms monitoring, which calls for the need to focus of health programs to understand the proper use of PROMs for each population, under specific context and conditions (Silveira Bianchim et al., 2023).

The shift to value-based healthcare has also reached the field of neurosurgery, which includes surgeries related to brain and spine, like craniotomy, cervical or lumbar discectomy, vertebral fusion and many more, and are performed using several surgical approaches, including open, minimal invasive and endoscopic surgeries (Cleveland

Clinic, 2022). The reporting of patient outcomes is done using patient-reported outcomes measures (PROMs), which consist of valid tools that intend to gather subjective information related to the patient's condition during several phases of surgical process, in order to build a comprehensive care plan and future short-term and long-term goals to improve surgical outcomes, with an increase in its use among neurosurgery patients (Beighley et al., 2022).

1.1.2 Development of PROMs tools

Despite the abundance of tools that measure PROMs, studies have shown that there is an urgent need to develop disease-specific PROMs in the field of neurosurgery to address the satisfaction, safety and different QoL and postoperative perspectives of the patients as the main specific outcomes related to neurosurgical procedures (Ghimire et al., 2017; Ghimire et al., 2018; Ramesh et al., 2023). Several studies have shown that reporting PROs among spinal neurosurgery patients have demonstrated significant functional and psychological improvements, with decreased related disabilities (Hartmann et al., 2020), while other studies have also focused on the cost-effectiveness and safety measures improvement in the hospital settings associated with such implementations (Mekhail et al., 2012).

A systematic review has found that there are 31 unique PROs to assess at least one domain among neurosurgery patients, where 73% of the studies have focused on tools related to specific physical function disability, 55% on pain and 32% on quality of life (QoL), taking in consideration that few studies 5.7% in neurosurgery field utilize neurosurgery-specific PROMs (Winebrake et al., 2020). In the field of neurospine surgical field, the most commonly used PROMs were found to be Scoliosis Research Society-22 (SRS-22), Short Form-12 and Short Form-36 (SF-12 and SF-36), Ronald-Morris Disability Questionnaire (RMDQ), and Oswestry Disability Index (ODI), with more use of disease-specific rather than generic tools in the recent years, and high encouragement of using translated tools of validated language across different settings and populations (Jamjoom et al., 2023).

1.1.3 Implementation and integration of PROMs in clinical care

There are several facilitators and barriers for the implementation and integration of PROMs in the clinical care, especially across the surgical specialties. For example, a study of quantitative and qualitative approaches concluded that the integration of PROMs in the electronic medical records (EMRs), alongside the presence of PROMs facilitators in the clinical area, as well as the intrinsic motivation of healthcare providers (HCPs) to implement such measures, and the support from leadership, are considered the main facilitators, while barriers and challenges were found to be abundant, including information technology (IT) issues, time barriers, language differences, and few audit and research efforts in this field (Amini et al., 2021; Roberts et al., 2020).

The implementation of PROMs inside healthcare services can be effectively conducted when it is systematically integrated into the healthcare system of the hospital, outpatient clinic or other institution of concern. This process starts with defining the purpose, which focuses on the motivations for implementing and objectives of using PROMs, followed by designing phase, where implementation process is decided in terms of needs, required resources, compatibility, complexity, adaptability and actual planning, then preparing, where the organization and staff are getting ready to use PROMs, through engagement of clinicians and practical training. Following this, PROMs are commenced in a form of trialability, finished with reflection and evaluation on the PROMs process and making improvements to develop the implementation, through channels of open communication (Foster et al., 2018). The proper implementation of PROMs inside health institutions requires systematic and ongoing identification of barriers, such as data collection burden, skepticism level among HCPs towards the validity of PROMs, and identification of concerns and issues of their implementation within the specific targeted healthcare services type (Heinemann et al., 2021; Hanbury, 2017).

Also, the use of PROMs face methodological issues, which are related to differences in data collection methods, as well as the nature of explanatory variables, which are originated from differences between patient-reported and administrative data (Sutherland et al., 2021). Other issues are concerned with the financial perspective, which are included in the need for support by experts, shared vision among healthcare specialists, patients and purchasers of healthcare services, targeting the sustainable implementation and improvement of healthcare quality (Van Der Wees et al., 2014), in addition to financial

issues across countries, like differences between low- and high-income courtiers, in the aspects of technological support, robust workflow and socioeconomic factors (Cheung et al., 2022).

In Palestine, the first neurosurgery development began in 1960, with the establishment of the Palestinian Neurosurgical Society in 2014, reaching the level that 34 neurosurgeons exist now across 17 centers in Palestine, as well as the presence of a neurosurgery residency program (Darwazeh et al., 2017). The development of neurosurgery in Palestine is considered gradual, and marked by efforts of many pioneers in this field, including Dr. Antone Tarazi, the first neurosurgeon on Palestine and Jordan (Awad & Jane, 2014), as well as Dr. Georgette Kidess, the first female neurosurgeon and who significantly contributed to the establishment of neurosurgery in Palestine, including the foundation of neurosurgery department at Ramallah Governmental Hospital, and inspires other female practitioners to overcome systemic challenges (Darwazeh et al., 2019).

On the other hand, there is a little focus on the field of neurosurgery in terms of evaluating surgical outcomes, including PROMs. The implementation of PROMs inside the Palestinian healthcare context faces challenges and barriers related to IT, finance, lack of interest, and others, similar to what have been discussed in other countries. Therefore, the current study aims to investigate several PROMs among spinal neurosurgery patients, including pain, QoL, sleep quality and mental status, as well as the most common demographic and medical factors that are related to their pre-post changes, following spinal neurosurgery in Palestine.

1.2 Problem Statement

Studies have shown that the assessment and documentation of PROs among neurosurgery patients is both “under-utilized” and “under-standardized” (Beighley et al., 2022), which is manifested by the few number of neurosurgery-specific PROMs tools (Winebrake et al., 2020) and the lack of robust evidence, yet high potential, of their use (Silveira Bianchim et al., 2023).

Along with the main challenge that faces neurosurgery field in Palestine, which is related to the need for further training to be delivered to healthcare providers (HCPs) who are involved in the field of neurosurgery, other challenges include that geopolitical barriers, as well as staff and equipment shortages (Darwazeh et al., 2017).

Moreover, the area of PROs among spinal neurosurgery patients in Palestine is under-covered in the scientific literature, which may be related to financial and staff-related issues (Schiavolin et al., 2018). Specific barriers related to this issue may include cultural beliefs and health perceptions of the Palestinian community (Najjar et al., 2018), language and communication barriers between patients and HCPs who mostly use medical jargon (Dunbar & Ghogawala, 2018), as well as the lack of validation of Arabic PROMs tools in the Palestinian context, in addition to the influence of healthcare expectations, social and family dynamics and trust in HCPs (Nshuti et al., 2020).

1.3 Significance of the Study

There is an increase trend in the use of PROMs in neurosurgery field, which is related to the emphasis on the need for clinicians to measure outcomes following such surgeries, as they reflect the patient-centered perspective, and therefore clinicians are better able to integrate the impact of multiple levels of relevant changes (Finkelstein & Schwartz, 2019). The use of longitudinal approach in PROMs for several surgical procedures was found to have effective assessment of postoperative symptom recovery trajectories, resulting in more reflection of the effectiveness in recovery evaluation over time (Shi et al., 2016; Fagundes et al., 2015). Also, the use of longitudinal methods of PROMs assessment was found to be beneficial in predicting the short- and long-term postoperative outcomes of surgeries, including pain and functional disability, using pre-surgical prediction algorithms, with the necessity to combine such longitudinal data with clinical factors to better understand patient outcomes (Marek et al., 2021; Rubery et al., 2019).

The results of the current study will guide HCPs and decision-makers towards several interventions that aim to improve spinal neurosurgery patients' physical and mental health outcomes, using the recommendations that the current study will provide based on the results and their discussion. For example, HCPs will be able to increase their awareness about the importance of covering the areas related to PROs among spinal neurosurgery patients, as they are considered the starting point for enhancing the quality of care, while decision-makers will be able to establish targeted guidelines related to interventions on enhancing the physical and mental health among them.

1.4 Objectives of the Study

The current study aimed to achieve the following objectives:

1. Determine preoperative and postoperative pain, QoL, sleep quality and mental status as main PROMs among a sample of Palestinian spinal neurosurgery patients.
2. Test the significance of differences in PROMs among spinal neurosurgery patients between preoperative and one-month postoperative phases.
3. Investigate the most common demographic (age, gender, literacy level, marital status, socioeconomic status, … etc.) and health-related (medical and surgical history, disease-specific history) factors that affect Palestinian spinal neurosurgery patient's PROMs changes.

1.5 Questions of the Study

The current study tried to answer the following questions:

1. What are the quantifiable measures of preoperative and postoperative pain, QoL, sleep quality and mental status among a sample of Palestinian spinal neurosurgery patients?
2. How much significant are the differences in PROMs among Palestinian spinal neurosurgery patients between preoperative and one-month postoperative phases?
3. What are the most common demographic (age, gender, literacy level, marital status, socioeconomic status, … etc.) and health-related (medical and surgical history, disease-specific history) factors that affect Palestinian spinal neurosurgery patient's PROMs changes?

1.6 Hypotheses of the Study

H_0: There are no significant changes in the pain, QoL, sleep quality and mental status before and after performing spinal neurosurgeries among Palestinian patients at the significance level of 0.05.

H_0: There are no significant relationships between demographic and health-related factors of Palestinian patients and the changes in pain, QoL, sleep quality and mental status between preoperative and postoperative phases of spinal neurosurgeries at the significance level of 0.05.

1.7 Definition of Terms

1.7.1 Conceptual Definitions

Neurosurgery: Is defined as a specialized branch of surgery the focuses on the diagnosis, treatment, prevention and rehabilitation of nervous system disorders, that include the brain, spinal cord and peripheral nerves, and involve various procedures, like spinal surgeries that aim pain alleviation, functional restoration and quality of life improvement by focusing on and targeting functional and structural problems (Schiavolin et al., 2018). This definition shows the integration of neurosurgery as a critical role in supporting patient-centered care, primarily in the measurement of PROMs from the perspective of patients' benefits, including pain and functional improvement.

Patient-Reported Outcome Measures (PROMS): In the context of medical research, PROMs are the tools or instruments that are used to gather patient's perspective on their health status, symptoms, functional status and quality of life, by providing a direct report from the subjective view of the patient about feeling or function related to health condition without being interpreted by HCPs or anyone else, and are considered essential for understanding the subjective outcomes for spinal neurosurgeries, including the main outcomes studied in the current thesis: pain, QoL, sleep quality and mental status, which help in guiding postoperative care and evaluating the surgical interventions' effectiveness, therefore, are considered a cornerstone in the value-based healthcare (Baumhauer & Bozic, 2016).

Pain: Is defined as the complex, subjective experience of sensory, emotional and cognitive dimensions of unpleasant sensation or response that is associated with actual or potential tissue damage, and is manifested in the current study by the chronic pain that the patient might have before conducting spinal neurosurgery, as the most common complain, and is defined by the International Statistical Classification of Diseases and Related Health Problems (ICD-11) by the World Health Organization (WHO) as the pain that persists for at least 3 months (Treede et al., 2019), as well as the postoperative pain status.

Quality of Life (QoL): It is a broad, multidimensional concept that includes patient's overall well-being, consisting of physical, psychological and social aspects of health, reflecting the degree of which he/she enjoys the important aspects of life, taking into

consideration the physical, mental, independence level, and social and environmental relationships factors (Haraldstad et al., 2019; Felce & Perry, 1995).

Sleep quality: It refers to the individual's experience of sleep, which includes several dimensions, like sleep duration, continuity, depth, and the overall subjective feeling of restfulness upon waking, with higher sleep quality identifies by sufficient duration, minimal disruptions, and being refreshed upon waking (Ohayon et al., 2017). A better sleep quality is connected with significant impact on recovery, pain perception and overall QoL among patients undergoing surgical procedures, including spinal neurosurgery, with increased pain and psychological distress associated with poor sleep quality (M. Marrache et al., 2021; Wang et al., 2021).

Mental health: The absence of mental illnesses is not a direct and mere definition of mental health, it also includes the presence of positive attributes, like emotional stability, resilience and the ability to lead fulfilling life, and therefore, it is considered a multifaceted concept of emotional, psychological and social well-being, that determines how the individual handles stress, relates to others and make choices, which is necessary for its impact on recovery, pain management and overall QoL post-surgery (Coronel-Santos & Rodríguez-Macías, 2022).

1.7.2 Operational Definitions

Neurosurgery: In the context of PROMs measurement and assessment, neurosurgery is defined as the spinal surgical interventions that are performed to focus on specific conditions of degenerative disc disease, spinal stenosis and/or spondylolisthesis, which are typically performed by trained and specialized neurosurgeons, with the main aim of pain reduction, sleep quality improvement, mental health enhancement, and ultimately enhancing patient's QoL. The outcomes therefore are assessed using valid tools to evaluate the changes in PROMs from the preoperative to postoperative phases. Such operational focus is directed toward benchmarks for surgical procedures that enable real-time monitoring of postoperative recovery and quality of care, as in tools like the National Neurosurgery Quality and Outcomes Database (N2QOD) (Asher et al., 2014).

Patient-Reported Outcome Measures (PROMS): In the context of the current study, the operational definition of PROMs are the validated questionnaires of scales that are administered to spinal neurosurgery patients at the two time points: preoperative and one-month postoperative, which will measure the specific outcomes of pain, QoL, sleep quality and mental status, and their operationalization in clinical practice requires careful selection of validated tools, ensuring that they are suitable and appropriate on the cultural and linguistic levels for the patient population of the study (Wild et al., 2005).

Pain: In the current study, pain is assessed using standardized and validated tools to measure the intensity and impact of pain on the daily life of the patient, and are assessed on both phases of the study, and included specific tools for cervical and lumbar spine neurosurgery. The Neck Disability Index (NDI) was used for cervical side, which was developed by Vernon (2008), who stated a strong validity and widespread of use in the clinical assessment of neck pain, among others (MacDermid et al., 2009). For the pain assessment in the lumbar spine side, the Oswestry Disability Index (ODI) was used, which remains one of the most robust and valid tools to measure the outcomes of spinal disorders, with a variety of validated versions across different languages (Fairbank & Pynsent, 2000).

The ODI consists of 10 sections related to the assessment of patient's personal care, walking, sitting, standing, and pain intensity, among others, and are scores on a scale of 0 – 5, with greater scores indicating greeter disability, and is categorized to minimal (0 – 20%), moderate (21 – 40%), severe (41 – 60%), crippling (61 – 80%) and bedbound or exaggerating (81 – 100%) according to the original authors. Over time, ODI was widely translated and culturally adapted in several languages, including Dutch, Russian, Portuguese and Arabic, ensuring its applicability in different populations and healthcare settings (van Hooff et al., 2015).

Similar to ODI, the NDI consists of 10 sections related to pain intensity, personal care, lifting, reading, headaches, concentration, work, driving, sleeping, and recreation that are scored on a scale of (0-5), and is scored by summing up the scores of each section to give a total score out of 50, with higher scores indicating greater neck disability, and then is categorized according to severity to none (0-4, 8%), mild (5-14, 10-28%), moderate (15-24, 30-48%), severe (25-34, 50-68%) and complete disability (35-50, 70-100%) according to the original authors.

Quality of Life (QoL): It focuses on the validated and standardized assessment tool of QoL that is used in the current study, which was chosen to be the EuroQoL-5D-5L tool, which is globally used to assess health-related QoL across five dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression, using a 5-point response (from worst to best) for each statement (EuroQoL Group, 1990), and showed strong performance across various populations and health conditions (Feng et al., 2021). The 5-level version of EuroQoL tool was used because it showed improved distributional properties, reduced ceiling effect and higher reliability and informativity indices compared to the 3-level original tool, which gives it better performance (Buchholz et al., 2018). Each dimension is scored on a 5-level rating: Level 1 = No problem, Level 2 = Slight problem, Level 3 = Moderate problem, Level 4 = Severe problem and Level 5 = Extreme problem. It uses a descriptive system that combines the levels in a 5-digit code, for example "11235" for a "no problems with mobility," "slight problems with self-care," "slight problems with usual activities," "moderate pain/discomfort," and "extreme anxiety/depression."

Sleep quality: In the context of spinal neurosurgery, there is no specific tool that targets patients undergoing this kind of surgeries, but highly valid and popular tools were used, which were the Pittsburgh Sleep Quality Index (PSQI) and Epworth Sleepiness Scale (ESS). Both tools are valid and reliable across different populations, including patients with sleep disorders, like sleep apnea and periodic limb movement disorder (Nishiyama et al., 2014), older populations (Beaudreau et al., 2012; Spira et al., 2012), where most of the spinal neurosurgery patients are, as well as their applicability across diverse populations, which is important for the global research context in neurosurgery (Gelaye et al., 2014). The mentioned references also support the idea of using both tools together to better cover the measurement of different and complementary dimensions of sleep-wake health, which reinforces the validity of using both tools by assessing sleep quality and excessive daytime sleepiness.

Mental health: For the operational definition of mental health in the context of spinal neurosurgery, the current study will use Patient Health Questionnaire (PHQ-9), which is a valid tool that is used for the assessment and screening of mental health issues, including major depressive disorders (MDD), epilepsy (Rathore et al., 2014), and migraine, among other neurological conditions (Seo & Park, 2015), with specific limitations and

considerations in its use among non-psychiatric patients, which is relevant to spinal neurosurgery patients (Manea et al., 2015).

1.8 Literature review

1.8.1 Introduction

The following section was conducted to review the most recent and relevant literature related to the targeted PROMs among spinal neurosurgery patients, in which articles that are most related to the topic, published in English language and in peer-reviewed journals, and compared preoperative and postoperative phases, with the focus on cervical and lumbar spine neurosurgeries, are included, with the use of the following keywords: pain, disability, quality of life, sleep quality, sleep pattern, mental health, mental status, spine surgery, spine neurosurgery. The used scientific databases included PubMed of National Library of Medicine (NLM), Scopus, and other spine- or neurosurgery-focused journals.

There is an increased focus on assessing and measuring PROMs among surgically intervened patients, in which its importance has been gained sur to the focus on the quality of care that is provided rather than its volume or amount, resulting in a patient-centered system that values what the individual patient receives in terms of QoL and experience (Sanchez et al., 2022). The hard part about PROMs is that they are subjective, in which discriminations can be found between what is measured and what is expected from the patient during hospitalization experience (White et al., 2020).

1.8.2 Review of the targeted PROMs in spine and spinal neurosurgery

Quality of life (QoL) among patients who undergo spine neurosurgeries is a common interest in the medical literature, but several scales and measures are used due to multidirectional surgical strategies, and therefore it is difficult to measure QoL among such patients after the application of such various modified procedures (Prokopienko & Sobstyl, 2022). In term of QoL reporting among spinal surgeries patients, reviews have stated that preoperative QoL measurement is under-reported, with several tools can be used, and we compared and meta-analyzed, such as EQ-5D, Short Form-36 and SF-6D, while in conclusion, all of the used QoL measures witnessed a significant improvement in their scores postoperatively, and this focuses on what is termed as Health-Related Quality of Life (HRQoL) area of measuring surgical outcomes (Nayak et al., 2019). The

latter term has been investigated in a study that applied a prospective design, and found that 35% of the patients have witnessed a significant improvement in HRQoL, compared to 8% worsening, with an overall significant improvement in all domains of HRQoL, and a complication rate that reached 27% (Quraishi et al., 2020).

Pain is among the most common postoperative complications of spine surgeries and is a point of interest as pain is commonly the first presentation for patients who complain of spinal diseases that require neurosurgical interventions (Swann et al., 2016). Pain is not exclusive as acute in the postoperative phase of spinal surgeries, because chronic pain may develop among such patients, with a pooled prevalence of 14.97%, and despite the technological and operational techniques advancement, the phenomenon of failed back surgery syndrome is still common 15% among spinal surgeries, and therefore, pain assessment and management in the perioperative phases of spinal surgeries are crucial, with the need for appropriate preoperative communication and treatment strategies that take multidisciplinary and coordinated efforts in consideration to yield the best results (Alshammari et al., 2023).

Studies have also shown that postoperative pain management among patients who underwent spine surgeries is in need for better comprehensive, multimodal understanding, because patients commonly develop chronic pain, and therefore they are in risk for developing opioid addiction, which also calls for better ongoing assessment and management of pain (Corley et al., 2022). Effective pain management for spine surgery patients starts in the intraoperative phase, with appropriate selection of pain killers, as well as postoperatively, with appropriate selection of pharmacological and non-pharmacological pain management methods, like cognitive-behavioral therapy, with demographic and clinical factors being taken into account for the appropriate selection (Shlobin & Rosenow, 2022).

Sleep quality (SQ), on the other hand, is another important outcome that is reported by the patients who undergo spine surgeries, because it is more related to their comfort, with several approaches being established to enhance it, such as progressive relaxation exercises (Yılmaz & Karabulut, 2022). Another used approach is called spinal cord stimulation (SCS), which targets the management of chronic postoperative pain in spine surgeries, resulting in enhanced SQ and physical function (Cho et al., 2017). Studies have

also shown that persistent sleep disturbances are common among spine surgery patients (25%), in which preoperative sleep disturbances are mostly related to chronic pain, which significantly correlates with poor HRQoL scorers. Moreover, while sleep disturbances have been shown to significantly decrease in most of patients 65%, those with unresolved sleep disturbances have significantly shown worse scores in postoperative pain interferences (Odds Ratio [OR] = 0.49), physical function (OR = 0.32) and satisfaction (OR = 0.57), which highlights the importance of investigating SQ among spine surgery patients, both in the preoperative and postoperative phases of treatment (M. Marrache et al., 2021).

Another neglected area in the perioperative management of spine surgery patients is the mental and psychological status, in which studies have shown that musculoskeletal pain significantly correlates with psychological distress, mainly represented as maladaptive beliefs, resulting in poorer surgical outcomes, and while studies have shown a significant improvement in the psychological status among 76.4% of the patients, several baseline factors (preoperative) have been shown to significantly predict the psychological improvements in the postoperative phase, including disability claiming, low and average lower back pain, catastrophizing index scores and dear avoidance beliefs (Havakeshian & Mannion, 2013). Reviews have also concluded that psychological dysfunction in emotional, cognitive, behavioral and interpersonal process domains significantly increase the probability of failed back surgery (Block et al., 2013). As a result of the clinical and QoL impairment that spine surgery patients experience in the postoperative phase, studies have shown that they are in need to receive sufficient quantities of individualized information at the appropriate time related to their conditions, in order to improve the psychological status, which target the clinical (pain, function and disability, economic (healthcare expenditure and costs) and psychological outcomes (fear-avoidance beliefs, stress and anxiety), and they reported a significant improvement in patients' knowledge, better preparation, increased physical activity and reduced negative thinking (Burgess et al., 2019).

1.8.3 Previous literature related to PROMs in spinal neurosurgery

The prediction of PROMs using the preoperative HRQoL is done through the quantification of the correlation between pre-post scores, which helps in selecting the surgical candidates and preoperative counselling, and was the aim of the retrospective

cohort study of Hey et al. (2018), who recruited all patients who underwent a single-level, elective lumbar spine surgery over a 2-year period, and were divided according to surgical approaches: disc herniation, spondylolisthesis and spinal stenosis, and targeted two PROMs: QoL (using both EQ-5D and Short Form (SF-36)) and pain (using ODI). The sample consisted of 52% males, with a mean age of 52 ± 13 years old, and mean durations of 1205 ± 1754 days of back pain and 1140 ± 1361 days of leg pain, in addition to that 47% underwent an instrumented fusion approach. For the back pain, the overall score of ODI significantly decreased from a mean of 41.4 ± 19.6 in the preoperative phase to 20.9 ± 20.6 after 6 months and 19.2 ± 20.7 after 24 months, which were significantly improving among disc herniation patients (40.5 ± 20.9 vs 16.1 ± 20.3 vs 16.4 ± 21.2, respectively) compared to patients of spinal stenosis (39.5 ± 19.1 vs 23.2 ± 22.1 vs 20.5 ± 19.1, respectively) and spondylolisthesis (44.5 ± 18.8 vs 24.3 ± 19.5 vs 20.9 ± 21.5, respectively). On the other hand, while the improvement in QoL scores of EQ-5D was significant among patients (0.45 ± 0.39 vs 0.76 ± 0.41 vs 0.74 ± 0.39, respectively), the pattern of QoL improvement was not different across the surgical approaches. The importance of baseline scores in the prediction of postoperative status appears in the findings that the 6-month postoperative ODI was predicted by baseline ODI and mental component score (MCS), while QoL scores were significantly predicted by baseline EQ-5D scores and MCS. Similarly, the 24-month postoperative scores of ODI were significantly predicted by baseline ODI, MCS and age at operation, with significant prediction of postoperative EQ-5D by the baseline EQ-5D and MCS, taking into account that the prediction was done using a multivariate regression model.

The specific relationship between the mental scores of patients, who have comparable mental status to the overall population, and the postoperative QoL and pain was also investigated among a sample of 83 adults who underwent minimal invasive lumbar spine surgeries, where ODI, VAS and SF-36 tools were used for the postoperative PROMs, while the MCS of SF-36 was used as the baseline data for preoperative mental scores. The sample consisted of 51% females, 82% married, 43% college education, 45% daily using over the counter (OTC) analgesics, 59% never using narcotic pain medications, and 38% never performing frequent exercise due to disability limitations, with 61% undergoing fusion surgical approach. The scores of ODI significantly improved from a mean of 34.2 ± 13.2 to 18.0 ± 16.2, with significant improvement in VAS back scores

from 5.4 ± 2.5 to 2.2 ± 2.2 and VAS leg score from 5.9 ± 2.7 to 2.2 ± 2.4, while the mental scores of SF-36 did not significantly improve (5.0 ± 11.4 to 55.1 ± 6.9). Therefore, the correlation scores showed that baseline mental scores did not significantly correlate with postoperative pain scores, while it predicted the postoperative MCS. This study highlights the importance of studying multiple PROMs to try to capture a full picture of the pre-post changes (Asher et al., 2015).

It is also recommended to include as much demographic and health-related factors as possible in the studying of postoperative changes in PROMs among spinal neurosurgeries. This is what has been applied in the study of Sivaganesan et al. (2020), who aimed to investigate the factors behind the presence of dissatisfaction among these patients witnessed significant improvement in QoL and physical aspects. In conclusion, the study found that 28% of patients who underwent spinal surgeries are classified as dissatisfied, with higher odds of dissatisfaction vs satisfaction across patients with baseline psychological distress (identified by having moderate to extreme anxiety/depression scores, 55% vs 46%, respectively), who were currently smoking (18% vs 14%, respectively), lower educational level (51% vs 45% among high school or less, respectively), higher American Society of Anesthesiology (ASA) grade (44% vs 38%, respectively among patients with Grade 3 and 4), lumbar vs spinal approaches (higher among lumbar), major complications within 90 days and surgical revision within 12 months (7% vs 3%, respectively). The study highlights the importance of looking at the postoperative improvement of spinal neurosurgery patients from a perspective that is wider than the clinical/quantitative views, which can be achieved through studying post-discharge satisfaction levels.

The prognosis of pain among spinal neurosurgery patients can be defined in several ways. For example, a comparative study was conducted on a sample of 92 patients who underwent surgical interventions for degenerative cervical myelopathy (DCM), and were rated for the changes in pain, using the valid tool of Neuropathic Pain Symptom Inventory (NPSI), with significant improvement if the score improved by 30% or more. The sample was homogeneous between patients who had pain improvement and who did not, in terms of symptom onset, symptom duration, underlying disorders, operative procedures (anterior vs posterior) and the use of specific drugs. The multivariate analysis of factors revealed that older age at operation (odds ration [OR] = 0.932, p-value = 0.012), longer

duration before the operation (OR = 0.589, p-value = 0.019) and higher preoperative NPSI scores (OR = 0.932, p-value = 0.014) significantly predicted less improvement of NPSI scores. The researchers concluded the importance of such subjective findings for both the surgeons and patients in managing the postoperative expectations of recovery (Nakajima et al., 2022).

Schwannoma tumors are specific non-cancerous tumors that arise in the Schwann cells which are responsible for producing myelin cells. Targeting patients who underwent hemilaminectomy for Schwannoma tumor resection, a retrospective study was conducted on a sample of 61 patients who were divided into two groups: pain-improved and pain-worsened at 1-month and 1-year postoperative periods, using the VAS. The sample consisted of patients with a mean age of 53.1 years old, 50.8% males, mean body mass index (BMI) of 24.38 kg/m^2, and mean operation time of 114.1 minutes. The preoperative pain scores were not significantly different between pain-improved and pain-worsened groups (3.48 ± 2.20 vs 4.25 ± 2.15, p-value = 0.176), and significantly decreased to a mean of 1.76 ± 1.56 vs worsened to a mean of 5.54 ± 1.26, respectively (p-value < 0.001) at 1-month postoperative phase, and 0.83 ± 1.09 vs 4.80 ± 1.58, respectively, at 1-year postoperative phase. Pain-improved group at 1-month postoperative phase significantly had smaller tumor size (2.60 ± 0.80 cm vs 3.40 ± 0.040, p-value < 0.001) and lower mean number of removed segments (1.55 ± 0.67 vs 1.96 ± 0.43, p-value = 0.005), while no significant differences appeared according to tumor type or location, or age, gender, medical history, BMI or operation time, which remained the same at the 1-year postoperative phase. Tumor size significantly predicted the worsened pain scores at 1-month (OR = 17.63, p-value = 0.001) and 1-year (OR = 67.25, p-value < 0.001) phases. The study concluded an effective and safe results of hemilaminectomy in the treatment of Schwannoma tumors (Gao et al., 2023).

Sleep disturbances are a great concern among spinal neurosurgery patients, and has several related factors to be taken into consideration in the preoperative phase. A study on a sample of 227 complaining of lumbar spine stenosis (LSS), with a mean age of 64 years old, 52% females, and were compared in their sleep quality using the PSQI tool, and pain using ODI and VAS tools, with Self-Rating Anxiety Scale (SAS) for anxiety level, and Dysfunctional Beliefs and Attitudes about Sleep (DBAS-16) for sleep-related beliefs. Patients who had sleep quality disturbances (36.6%) were significantly more

females (61.4% vs 47.2%, p-value = 0.014), and had higher scores of anxiety (52.3 ± 5.13 vs 45.4 ± 7.62, p-value < 0.001) but lower sleep-related beliefs (38.5 ± 5.93 vs 49.0 ± 8.62, p-value < 0.001) than patients without sleep quality disturbances, respectively, with no significant differences according to age, education, length of stay (LOS) and pain scores (Wang et al., 2020). Very similar results were found in the cross-sectional study of Kim, Park, et al. (2020) on a sample of 230 LSS patients, whom were assessed for sleep disturbances using PSQI, with a mean age of 67.7 years and 61.3% female distribution. The results showed that 66.1% of the patients were classified as having sleep disturbances, with significantly higher sleep disturbances among patients with older age (68.9 vs 65.4 years old, p-value = 0.024), female gender, and higher depression scores.

The mental status of patients undergoing spinal neurosurgeries is an area worth studying, because it was shown to significantly affect the physiological and psychological well-being, as well as the satisfaction level, of patients in the postoperative period. This was investigated in the prospective study of Wagner et al. (2020), who used several tools to assess the mental health status among a sample of 245 patients undergoing elective surgery for degenerative lumbar spine disease, who were followed for 3 and 12 months, including the Center for Epidemiological Studies Depression Scale (ADS-K), Post-Traumatic Stress Scale–10 (PTSS-10) and Anxiety Sensitivity Index–3 (ASI-3), while EQ-5D and SF-36 were used for the assessment of HRQoL. The scores of HRQoL significantly improved at 3-month phase for both EQ-5D (+0.2, p-value < 0.001) and the physical (+0.7, p-value < 0.001) and mental (+3.3, p-value = 0.018) domains of SF-36, which remained in similar pattern at 12-month postoperative phase. Patients who were classified as depressed significantly showed worse HRQoL and ODI scores in the preoperative phase, which significantly improved among patients who were non-depressed, highlighting the impact of preoperative mental status on the postoperative QoL and pain scores.

The previous results were in contrast with the prospective study of Goh et al. (2019) on sample of 104 patients undergoing anterior cervical discectomy and fusion (ACDF) approach, and used the mental score of SF-36 tool, as well as NDI and Japanese Orthopedic Association (JOA) tool for pain assessment. Results have shown that patients who reported high compared to low mental scores in the postoperative phase had significantly higher preoperative scores of mental domains (mean = 57.4 ± 6.3 vs 37.5 ±

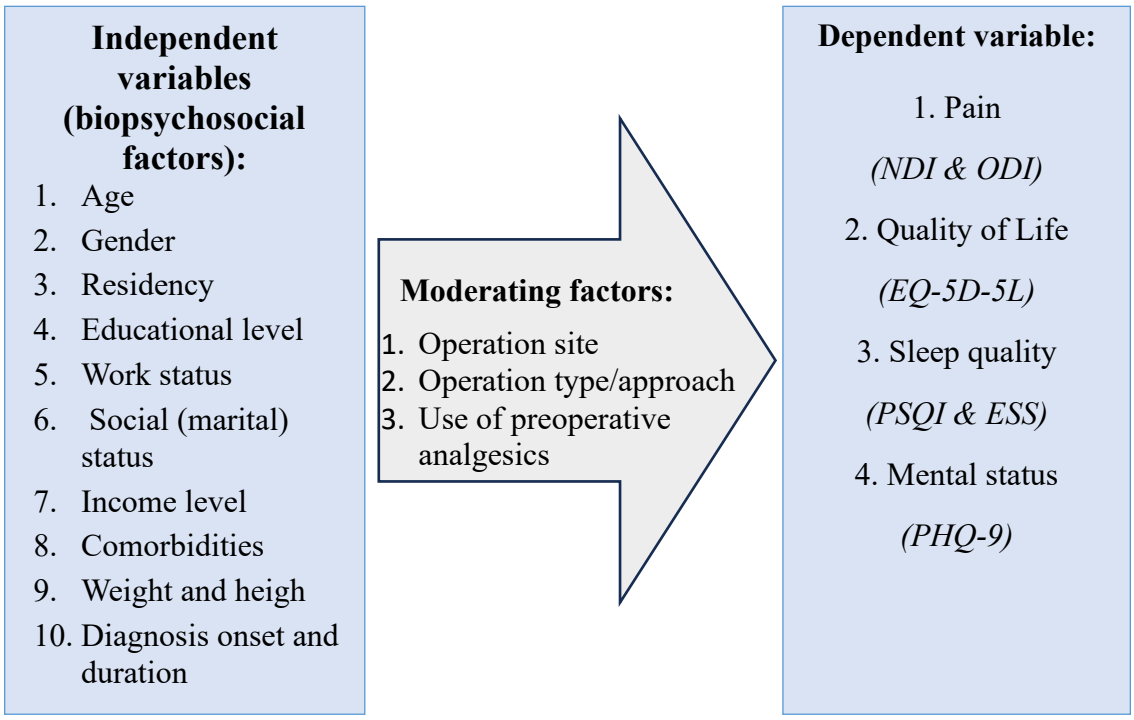
8.1, respectively). On the other hand, the differences between both groups were not significant in terms of LOS, comorbidities, return to work, return to function and satisfaction scores (p-value > 0.05), with greater improvement in pain scores among patients who had low mental scores in the preoperative phase (p-value = 0.007). Such findings conclude the idea that mental health of poor condition does not correlate with improvements in PROMs, satisfaction and other outcomes.

1.9 Conceptual Framework

As the current study aims to investigate the pre- and post-operative statuses, the difference between, and the factors affecting different physical, psychological and social variables among spinal neurosurgery patients, the use of Biopsychosocial Model is suggested to be the most suitable to structure and achieve the study's aims and objectives and test its hypotheses. Originally developed by Engel (1977) as a response to the biomedical model, that solely focused on the biological factors of diseases and treatments, the core principle of biopsychosocial model is based on the notion that health outcomes, including the surgical recovery, are influenced by an interaction of physical (biological), psychological and social factors, which promotes a holistic view of healthcare. In more details, the use of this model is supported by its holistic approach, focusing on mental health, QoL and sleep quality rather than the mere focus on physical variable of pain, with alignment on the emphasis on PROMs as it values the subjective experience of patients, in addition to the considerations of cultural and social contexts, which appeared in different variables that are studied in the demographic factors, like residency and marital status (Smith, 2020; Bolton & Gillett, 2019; Borrell-Carrió et al., 2004).

Figure 1.1

Conceptual framework of the current study among the spinal neurosurgery patients



Note: Conceptual framework of the current study among the spinal neurosurgery patients (NDI = Neck Disability Index, ODI = Oswestry Disability Index, EQ-5D-5L = EurQoL-5 Dimension-5 Level, PSQI = Pittsburg Sleep Quality Index, ESS = Epworth Sleepiness Scale, PHQ-9 = Patient Health Questionnaire).

Chapter Two
Methods

This chapter describes the methodological aspects that were adopted in the current study in terms of design, location, sampling, variables, data collection and analysis and ethical consideration.

2.1 Study Design

The study was implemented with a prospective, longitudinal, quantitative design, where the researcher collected data related to spinal neurosurgery patients' PROMs before and one month after the surgical intervention, without the manipulation of the intervention itself. The use of this design is associated with several advantages, including the observation of the targeted variables (PROMs) in a temporal way, which is useful for tracking the changes of outcomes overtime (Schober & Vetter, 2018), in addition the increase in the statistical power related to the precision of estimated measures, the value of the obtained data from patient's insights (Kwon et al., 2021), as well as reducing recall bias, because the patients report the outcomes in real-time or close to the surgery, unlike the retrospective studies (Stonbraker et al., 2019).

On the other hand, some disadvantages are included in this design, including the attrition bias, where patients are suspected to drop out of the study (Jin et al., 2020), which was eliminated by conducting a post-test investigation of PROMs after only one month, i.e., within the period where the patient visits the neurosurgery outpatient clinic. Also, the design faces the presence of confounding variables, which is caused by the absence of randomization (VanderWeele et al., 2018).

2.2 Site and Setting

The study was conducted in the neurosurgery department of Palestine Medical Complex (PMC) in Ramallah – Palestine. The PMC is a large tertiary hospital that serves as one of the largest public hospitals in Palestine, established in 1963, which provides a wide range of medical and surgical services and specialized patient care across the West Bank, in addition to serving as a referral center for advanced medical treatment, including neurosurgery, cardiology, cardiac surgery, oncology and trauma care. As of the latest annual health report by the Palestinian Ministry of Health (PMoH), the PMC holds a

capacity of 312 beds, with 774 staff members, including 335 nurses, 26 midwives, 87 specialists, 38 general physicians, 102 allied health sciences and 178 administrative and services employees (Ministry of Health, 2023).

Dr. Antone Tarazi was the first Palestinian neurosurgeon who started neurosurgery in Palestine, which began in 1960 by the establishment of the first center in Jerusalem – Palestine. In the recent years, Palestine has produced a number of neurosurgeons who provided further progress by establishing the Palestinian Neurosurgical Society in 2014, with 34 neurosurgeons (including 1 female) and 17 residents who serve across 17 centers in Palestine, with one neurosurgery residency program (Darwazeh et al., 2017).

In addition to having a specialized neurosurgery department, the selected setting is suitable for the current study because it serves a wide range of patients across the West Bank, therefore including a diverse patient population from various demographics, which improves the generalizability of the results. Also, the PMC acts as a referral center, which means that it received complex cases, resulting in more robust data collection and sufficient sample size.

2.3 Study Population, Sample and Sampling

The population of the study included all spinal neurosurgery patients who were planned to have cervical or lumbar neurosurgery operations for the removal of discopathies or tumors who were admitted and scheduled for operations during the study period. The researcher implemented the convenience sampling technique, where all eligible, available and accessible patients were included in the data collection, which aligns with the surgery schedules and outpatient clinic visits.

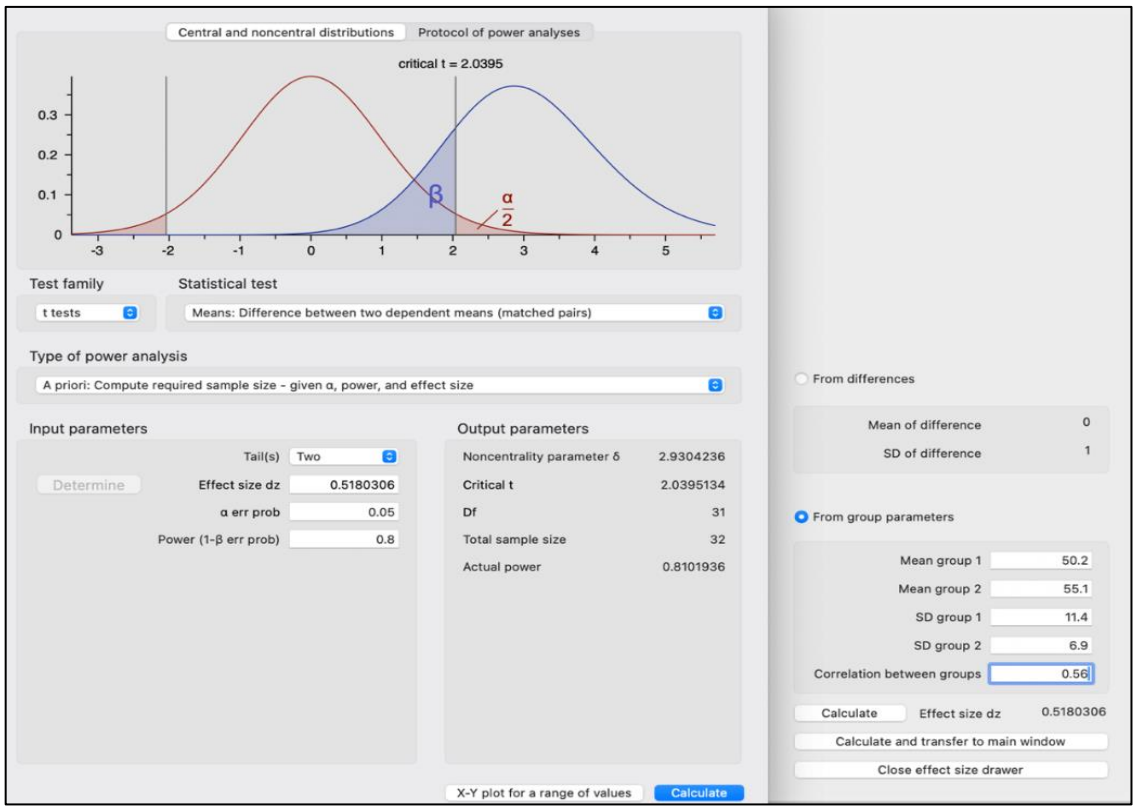
The chosen sampling technique is considered one of the non-probability sampling methods, where no randomization was applied. The convenience sampling method has several advantages related to ease of access to patients, which can save time and resources, especially in a time-limited period due to academic requirements and current political situation (Etikan et al., 2016). Also, it is cost-effective and more practical in a constrained time frame and relatively smaller population (Andrade, 2020). On the other hand, convenience sampling technique faces several disadvantages that should be addressed in the current study, including limited generalizability related to sampling bias (Emerson, 2021), vulnerability to selection bias, as the selection is based on availability,

and the lower validity, where applicability of study results on further healthcare institutions is limited (Zink, 2012).

The sample size was calculated using G*Power 3.1.9.6 software (Faul et al., 2007) on MacOS, which was based on t-test test family and differences between two dependent means (matched pairs) statistical test, with an effect size of 0.518 (based on means and standard deviation of a previous literature), error of 0.05 and power of 0.8, the recommended sample size was 32, as illustrated in the following figure. The researcher eventually recruited a total of 134 spinal neurosurgery patients during the data collection period, which helps in increasing the statistical power and generalizability of the study findings, as well as in accounting for potential dropouts and missing data, especially in the postoperative phase, where the number of patients who discontinued was 12 (out of 146), giving an attrition rate of 8.2%. a larger sample size also allowed for better addressing of variability in PROMs, as the PMC is the largest referral hospital in West Bank, and therefore this allowed for better addressing the cultural and demographic variations among the sampled patients.

Figure 2.1

*Sample size calculation using G*Power 3.1.9.6 software on MacOS (Faul et al., 2007)*



2.4 Eligibility Criteria

Inclusion criteria

1. Adult patient between 18 and 65 years old.
2. Undergoing spinal neurosurgery operation, including herniated disc, spinal stenosis, degenerative spinal disease and tumors from the cervical and/or lumbar areas.
3. Patients who are capable of providing informed consent.
4. Patients who completed both pre-test and post-test PROMs questionnaires.

Exclusion criteria

1. Patients undergoing additional major surgeries or operations during the same admission.
2. Patients with severe cognitive or psychiatric conditions, which leads to specific language and communication barriers.
3. Patients with specific postoperative complications which required readmission during the one-month postoperative period.
4. Patients who are non-compliant with follow-up, including patients who did not visit the neurosurgery outpatient clinic after one month or who refused to fill in the postoperative questionnaire.
5. Patients with emergency spinal neurosurgery operations.

2.5 Study Variables

Independent variables: Age, gender, residency, educational level, work status, social (marital) status, income level, comorbidities, height, weight, and diagnosis-to-operation period.

Dependent variable: Pain, QoL, sleep quality, and mental health.

2.6 Data Collection Tool and Process

Data were collected between 25th of January and 15th of August 2024 using a questionnaire that was developed by the researcher that consisted of five main sections: demographic data, pain, QoL, sleep quality and mental health. Demographic factors

included age (in complete years), gender (male/female), residency (city, village or camp), educational level (illiterate, up to elementary school, up to high school, or university education), work status (unemployed, employed in governmental section, employed in private section, or self-employed), social status (single, married or divorced/widowed), income level (up to 1800 ILS, 1800 – 3000 ILS, 3001 – 5000 ILS, or above 5000 NIS), comorbidities (hypertension, diabetes mellitus, hormonal dysfunction, or others), height (in centimeters), weight (in kilograms). Additional information included the type of surgery (disc removal, tumor resection, or congenital disorder), waiting time (from diagnosis till operation, in weeks), and the use of specific pain killers (non-steroidal anti-inflammatory drugs [NSAIDs], paracetamol, muscle relaxants, corticosteroids and/or others).

The second section of the questionnaire consisted of pain assessment tools, were Oswestry Disability Index (ODI) was used for lower back pain assessment for lumbar spine neurosurgery patients, while Neck Disability Index (NDI) was used for the pain assessment among cervical spine neurosurgery patients. The ODI was developed by Jeremy Fairbank and his colleagues in 1980 as a PROM that assesses the lower back pain (Fairbank & Pynsent, 2000), and is widely used for the purposes of clinical evaluation among healthcare professionals (HCPs), especially in terms of response to surgical procedures, and as research tool that is widely implied in research studies on spinal disorders and rehabilitation (Cook et al., 2020; Saltychev et al., 2017).

For patients with cervical spine neurosurgery type, NDI was used to assess the level of disability associated with neck pain, especially focusing on its impact on the activities of daily living (ADLs). It was developed by Howard Vernon and his colleagues in 1991 as a modification to the ODI to address specific assessment needs for the neck pain (Vernon & Mior, 1991). It was also used for clinical assessment and research purposes (Saltychev et al., 2018; Bakhtadze et al., 2015), and was culturally adapted in several languages, including Portuguese, Russian, Chinese and Arabic (Hung et al., 2015; Pereira et al., 2015).

The third section is concerned with the assessment of QoL among spinal neurosurgery patients, where EuroQoL 5-Dimension 5-Level (EuroQoL-5D-5L) tool was used. The EuroQoL was developed by EuroQoL Group (1990) as a generic measure of HRQoL,

with the original tool introduced in 1990 in a 3-level version, and was developed in 5-level in 2009 to overcome concerns of limited sensitivity and ceiling effects, where many participants reported no problems that limits the variability). The tool assesses five dimensions related to mobility, self-care, usual activities, pain/discomfort, and anxiety/depression (Hernández et al., 2019), and is used in clinical settings for the assessment of HRQoL in chronic diseases, like spinal conditions, and is applicable across multiple primary care and specialized healthcare settings (Huang et al., 2018). Also, it is used in the research and health economics, as it is frequently employed in clinical trials and cost-utility analysis, especially in the calculation of Quality-Adjusted Life Years (QALYs) (Pleyer et al., 2023). The tool is widely used and is culturally adapted in several contexts and languages (Zhou et al., 2021).

The process of data collection started with frequent visits to the neurosurgery department at PMC and contact with the head nurse to gather the names of patients who are scheduled to have a spinal neurosurgery, and then select the eligible patients to be included in the data collection. On the day of admission for each patient, the researcher collected the preoperative data in a specific Google Form that was prepared to include the mentioned sections, and after granting the patient's consent, the researcher starts collecting data primarily from the patient, and from any of the family members if present, in an interview method. The day of admission was chosen for preoperative data collection due to several reasons, including clinical relevance and accuracy of the collected data, in addition to standardization and consistency among all the targeted patients, as well as ensuring the patient's availability and engagement, which reduces the risk of missing data, and the patient's condition of being mentally prepared. Also, it aligns with neurological considerations regarding progressive symptoms nature, with the commitment to ethical and logistical feasibility, allowing for more controlled environment upon admission due to minimized external distractions.

The preoperative data collection took between 15 and 20 minutes, which was finished with ensuring that a postoperative data collection is planned to be conducted when the patient comes back to the neurosurgery outpatient clinic, which is automatically planned within discharge process. The researcher ensures that contact information of the patient is gathered for the purpose of postoperative phase follow up, and wouldn't be used for data analysis purposes.

On the day of neurosurgery outpatient visit, which is typically planned during the discharge process to be 14 days after the operation, the researcher meets the patient again and collect the postoperative PROMs data, which are filled in using a specific postoperative Google Form, which includes the mentioned sections, preceded by a section related to patient's file number to connect pre- and post-operative data for each patient.

2.7 Piloting

The researcher recruited a pilot sample of 10% of the targeted sample, and were asked to fill in the preoperative form of PROMs questionnaire. The piloting phase was used for two specific purposes: identification of time needed for data collection and related barriers and challenges, in addition to gathering feedback from the patient's perspective related to difficulties in terms, sentences and length of data collection tool, taking into consideration that the piloting sample was not included in the final sample of the study or its data analysis.

The researcher identified several challenges during the piloting phase, which included noise and interruptions from the patient's rom, either from companions, staff or other patients, in addition to patient's anxiety and emotional stress and literacy and understanding of the questionnaire. The researcher implemented some strategies to overcome such challenges, including ensuring patient privacy, where the researcher tried to have the patient and the closest companion involved in data collection, with the use of polite communication, proper and flexible time scheduling for data collection based on patient's preferences and overall situation, calming the surrounding environment, using simplified language during the questionnaire and providing assistance when the patient seems to be confused.

2.8 Validity of Study Tools

The Arabic versions of the selected questionnaires were used under the authors' permission, which was obtained by contacting them through their personal or professional emails that were listed in the correspondence details of the relevant articles. The final form of the questionnaire was reviewed by a panel of five experts in the field of the study, including two faculty doctors, two experience nurses in neurosurgery department and one neurosurgery resident doctor, as a part of the content validity, who agreed on the suitability of the used tool for the targeted PROMs among the study population. As the

questionnaire included validated tools in the Arabic language, most of the comments were focused on minor edits in the grammar aspect, while some modifications were done on the demographic data questions, including the addition of height and weight and the use of previous analgesic medications, and the removal of data related to postoperative analgesics and opioids use, as they are susceptible to have high percentage of missing data, and that they are focused on the inpatient period, without considering the period when patient is at home. It also worth mentioning that the validated Arabic versions are used for all PROMs tools, which ensured that the linguistic and cultural aspects are correctly captured, which helps in maintaining cross-cultural validity of the used tools, as they have been rigorously tested across different Arabic-speaking populations to ensure they provide reliable and valid results equal to the original versions.

The Arabic version of NDI (NDI-Ar) was used for the section related to neck pain among the patients, which was validated by Shaheen et al. (2013) on a sample of Egyptian patients, who found a high internal consistency (using Cronbach's alpha test) that was 0.89, with an excellent test-retest reliability at 0.96, and a significant correlation between the scores of the two phases of administration ($r = 0.92$, p-value < 0.05), with a 2-factor structure explaining 67.58% of the total variance that was demonstrated from the factor analysis. In addition, the Arabic version of ODI was validated by Algarni et al. (2014) on a sample of Saudi Arabian patients, using the Arabic ODI that was validated earlier on a Tunisian sample. The validation study found an excellent intra-observer reliability of 0.99, and a good construct validity as manifested by significant correlations with VAS pain scale ($r = 0.708$), Roland–Morris Low Back Pain Disability ($r = 0.656$), and the Quebec Back Pain Disability Scale ($r = 0.792$). the factor analysis also showed a two-factor construct that explained 63.5% of the total variance.

The official Arabic version of EuroQoL-5D-5L from EuroQoL group was used, which is referenced as EuroQoL-5D-5L Arabic v1.1 for Israel. The form included an introductory page that emphasized the ability of the interviewer to modify the interview style to suit the data collection process, with the use of questionnaire's guidelines as much as possible, and the need to provide clarification for the patient in cases of misunderstanding or language conflicts.

The Arabic version of PSQI that was validated by Suleiman et al. (2010) was used in the current study. The tool was translated and back-translated by 10 Arabic bilingual translators, and was found to have an acceptable internal consistency (Cronbach's alpha = 0.65), moderate to high correlations between the translated and global PSQI in five domains (r = 0.53 – 0.82, p-value < 0.01), with moderate construct correlations with Insomnia Severity Index (r = 0.76) and the Medical Outcome Study Short Form-36 (r = -0.33), which supported the convergent validity.

The Arabic version of ESS was validated by Attal et al. (2020) on a sample of Yemeni medical students, and was used in the current study due to simplicity of used language, and good results of validity, in which its model showed acceptable goodness of fitness (CMINDF = 2.362, CFI = 0.91, IFI = 0.92) and acceptable reliability scores (Cronbach's alpha = 0.65 for factor 1 and 0.62 for factor 2), with a two-factor construct that explained an acceptable percentage of variance.

The Arabic version of PHQ-9 that was validated by AlHadi et al. (2017) on a Saudi Arabian sample was used in the current study. The study recruited a sample of 731 university students, with 8 mental health experts included in the face validation process. Results showed good internal consistency scores of Cronbach's alpha between the Arabic PHQ-9 and the original PHQ-9 (0.857), General Anxiety Disorder-7 (0.763), PHQ-15 (0.826) and panic disorder module (0.696).

2.9 Data Analysis

For the purpose of data analysis, Statistical Package for Social Sciences (SPSS) software version 25.0 was used to produce the descriptive and analytical results of the study's data. Descriptive results included frequencies and percentages of patients' responses to statements of PROMs tools, as well as the mean and standard deviation (SD) of overall and domain-specific scores, and their minimum and maximum values.

In addition, analytical results included the investigation of significance of differences in mean PROMs scores between preoperative and postoperative phases using paired sample t-test, while mean differences tests were used to investigate the relationship between patients' demographic and health-related factors and the mean differences in scores of PROMs between the two phases, using independent samples t-test (for dichotomous

independent factors) and one-way ANOVA (for non-dichotomous independent factors), while Pearson correlation test was used to investigate the correlation between continuous independent factors and differences in preoperative-postoperative PROMs scores, with a p-value of 0.05 to consider these tests to have significant results.

2.10 Ethical Considerations

Every study process adhered to the guidelines of the Helsinki Declaration for research with human beings. Approval was granted from the Institutional Review Board (IRB) of An-Najah National University before the start of the data collection (Appendix C), which was followed by the approval from the MoH for starting data collection from the PMC (Appendix D). Also, before any data was collected, an Arabic consent form (Appendix B) was received from each patient, which highlighted the aims of the study, components of the questionnaire, and follow-up process, with ensuring anonymity and confidentiality protocols.

As the targeted population was neurosurgery department inpatients, the researcher intended to implement several aspects of ethical rights of patients in clinical research, including beneficence, where the overall aim of the study was to collect subjective data about their surgical outcomes, which can be used as valuable insights into the potentials of developing and improving healthcare services that are provided in the Palestinian neurosurgery departments. In addition, the principle of non-maleficence was applied, where every effort was made to minimize potential harm or discomfort of patients during data collection, including using non-invasive data collection method (filling in a questionnaire), as well as assuring that the collected data will not affect the type or quality of the healthcare services provided to them. Also, the principle of justice included equitable selection and recruitment from diverse backgrounds to ensure the representativeness of the sample to the overall population.

The names and phone numbers of the participants were kept anonymous, and the data were used by the researcher and the supervisors for research purposes only. Finally, the patients had the ability to withdraw from the participation at any time, without the need to declare any reasons.

Chapter Three

Results

The following chapter reviews the descriptive and analytical results of the current study, where descriptive results are concerned with the frequencies and percentages of patients' responses to demographic factors and statements of pain, QoL, sleep quality and mental health tools, with means and standard deviations of the scale variables, including PROMs scores, while analytical results include the investigation of the relationship between study's independent and dependent variables, the differences in PROMs scores across study groups and demographic factors, and their differences between preoperative and 1-month postoperative phases, using the suitable inferential statistics.

3.1 Part 1: Demographic data of the patients

Most of the patients who were recruited in the current study (70.1%) were in the later middle-aged adult group, with a mean age of 49.16 ± 6.06 years old, ranging from 32 to 66 years old. Around half of the sample were male patients (49.3%), with an approximate percentage of patients who live in rural areas (48.5%). Moreover, near half of the participants (45.5%) have the bachelor's educational degree, while nearly three fourths of them (74.6%) are married. In terms of professional life, 38.8% of the patients work in the private sector, compared to 23.9% who are self-employed, with 39.6% having between 1800 and 3000 Israeli New Shekel (ILS) of monthly income, as shown in Table 3.1 below.

In terms of the operation-related data, most of the patients 73.9% underwent lumbar spine neurosurgery approach, compared to 26.1% for the cervical approach. Of these patients, 59.7% underwent discectomy, while around one third of them 29.9% underwent tumor resection. The patients had a mean period between diagnosis and operation of 7.15 ± 4.68 weeks, with a mean weight of 80.31 ± 7.40 kilograms, ranging from 64 to 99 kilograms, while the mean height was 169.28 ± 7.51 centimeters, ranging from 150 to 185 centimeters, giving a mean BMI of 28.17 ± 3.47 kg/m^2, giving an overall overweight status, which ranged from 20.52 to 38.46 kg/m^2. The most common comorbidities found among the patients was hypertension 29.9%, followed by diabetes mellitus 24.6% and hormonal issues 14.9%. During the preoperative period, more than two thirds of the patients reported having paracetamol 69.4%, which was higher than non-steroidal anti-

inflammatory drugs (NSAIDs, 59.7%), for pain relief, while more than half of the patients have used muscle relaxants 54.5%, with a higher percentage of patients who reported consuming corticosteroids 76.9%, as shown in Table 3.2 below.

Table 3.1

Distribution of demographic data of the patients (N = 134)

Variable	Values	Frequency	Percentage
Age	Younger middle-aged adults	33	24.6%
	Later middle-aged adult	94	70.1%
	Older adults	7	5.2%
	Mean ± SD (min – max)	49.16 ± 6.06 (32 – 66)	
Gender	Male	66	49.3%
	Female	68	50.7%
Residency	City	52	38.8%
	Village/Town	65	48.5%
	Camp	17	12.7%
Education	Up to elementary school	20	14.9%
	Up to high school	53	39.6%
	University degree	61	45.5%
Marital status	Single	20	14.9%
	Married	100	74.6%
	Other	14	10.4%
Work status	Not working	26	19.4%
	Working in governmental sector	24	17.9%
	Working in private sector	52	38.8%
	Self-employed	32	23.9%
Monthly income	< 1800 ILS	33	24.6%
	1800-3000 ILS	53	39.6%
	3001-5000 ILS	33	24.6%
	> 5000 ILS	15	11.2%

Note: ILS = Israeli New Shekel (currency), SD = Standard deviation, min = minimum value, max = maximum value.

Table 3.2

Distribution of the patients' characteristics related to health and operation

Variable	Values	Frequency	Percentage
Operation site	Cervical	35	26.1%
	Lumbar	99	73.9%
Operation type	Discectomy	80	59.7%
	Tumor resection	40	29.9%
	Congenital malformation	14	10.4%
Diagnosis to operation period (in weeks)	Mean ± SD (min – max)	7.15 ± 4.68 (1 – 7)	
Patient's weight (kilograms)	Mean ± SD (min – max)	80.31 ± 7.40 (64 – 99)	
Patient's height (centimeters)	Mean ± SD (min – max)	169.28 ± 7.51 (150-185)	
BMI (kg/m^2)	Mean ± SD (min – max)	28.17 ± 3.47 (20.52 – 38.46)	

Variable	Values	Yes		No	
Comorbidities	HTN	40	29.9%	94	70.1%
	DM	33	24.6%	101	75.4%
	Hormonal issues	20	14.9%	114	85.1%
	Others	13	9.7%	121	90.3%
Preoperative medication consumption	NSAIDs	80	59.7%	54	40.3%
	Paracetamol	93	69.4%	41	30.6%
	Muscle relaxants	73	54.5%	61	45.5%
	Cortisones	103	76.9%	31	23.1%
	Others	29	21.6%	105	78.4%

Note: SD = Standard deviation, BMI = Body Mass Index, HTN, Hypertension, DM = Diabetes mellitus, NSAIDs = non-steroidal anti-inflammatory drugs

3.2 Part 2: Pain

For the patients who underwent cervical spine neurosurgery approach, the NDI was used to evaluate the pain status and changes in the preoperative and postoperative phases, as shown in Table E.1 in appendix E. The table shows that 60.0% of the patients reported a fairly severe pain intensity in the preoperative phase, which significantly improved in the postoperative phase, where 71.4% of them reported a moderate pain intensity (t = 5.924,

p-value < 0.001). The improvement pattern also applies for the rest of NDI domains from the preoperative to the postoperative phases, including personal care, where 68.6% reported needing some help preoperatively, which significantly improved so that 71.4% of them reported ability to take care of self but with pain (t = 11.509, p-value < 0.001). Nearly half of the patients reported preoperative pain preventing them from lifting weights, while 65.7% of them reported postoperative ability to lift heavy weights without extra pain (t = 9.061, p-value < 0.001). Moreover, 42.9% of the patients reported preoperative ability to read with moderate neck pain, which significantly improved postoperatively so that 42.9% of them can do so with slight neck pain (t = 5.375, p-value < 0.001).

Patients have also witnessed significant improvement in headaches, where 48.6% of them reported infrequent moderate headaches, which decreased postoperatively so that 45.7% of them reported no headaches at all (t = 7.990, p-value < 0.001), in addition to improvements in concentration, where 37.1% of the patients reported preoperative fair degree of difficulty concentrating, compared to 40.0% who reported a postoperative full state of concentration with no difficulty (t = 8.860, p-value < 0.001). In addition, 45.7% of the patients reported preoperative inability to most of the usual works, which significantly improved so that 45.7% of them reported postoperative ability to do as much work as they want (t = 5.490, p-value < 0.001). Other improvements also included driving, where 28.6% of the patients reported preoperative inability to drive as much because of pain in neck, while 66.7% of them reported slight postoperative neck pain while driving (t = 5.480, p-value < 0.001). Nearly half of the patients 48.6% reported preoperative moderate sleep disturbances, which significantly decreased in the postoperative phase, where 62.9% of them reoperated slight sleep disturbances (t = 7.366, p-value < 0.001). Lastly, 51.4% of the patient reported preoperative ability to engage in few recreational activities, which significantly improved in the postoperative phase so that 48.6% of the patients reported slight neck pain with an ability to engage in all of the usual recreation activities (t = 5.056, p-value < 0.001).

When the overall NDI score was calculated and categorized among cervical spine neurosurgery patients, it showed a significant decrease in overall score from a mean of 53.847 ± 6.658 in the preoperative phase to a mean of 21.568 ± 5.283 in the postoperative phase, with a mean decrease by 32.279 (t = 26.943, p-value < 0.001), which was also

reflected in the categories of NDI, where 85.7% of the patients had severe preoperative disability, which was significantly decreased to a percentage of 57.1% having moderate and 42.9% having minimal disabilities (t = 15.289, p-value < 0.001), indicating a significant improvement in neck pain after one month of the operation.

Table 3.3

Description of overall NDI scores and categories

NDI category	Preoperative phase		Postoperative phase		Mean dif.	t	p-value
	N	%	N	%			
Minimal disability	0	0.0%	15	42.9%			
Moderate disability	0	0.0%	20	57.1%			
Severe disability	30	85.7%	0	0.0%	1.571	15.289	< 0.001
Crippling disability	5	14.3%	0	0.0%			
Bed-bound	0	0.0%	0	0.0%			
Overall mean ± SD	53.847 ± 6.658		21.568 ± 5.283		32.279	26.943	< 0.001

Note: N = Number (frequency), t = paired t-test value, SD = standard deviation, NDI = neck disability index

Patients who underwent lumbar spine neurosurgery approach were evaluated for their pain using ODI, which is described in Table E.2 in appendix E. The table shows that pain intensity has significantly decreased in which that 34.3% of the patients witnessed a moderate pain relief from pain killers, while 62.6% of the patients in the postoperative phase stated that their pain was somehow bad but managed without pain killers (t = 15.939, p-value < 0.001). In addition, personal care category has significantly improved, where 64.6% of the patient preoperatively reported looking after themselves to be painful, while 56.6% of them postoperatively reported the ability to do so without causing pain (t = 11.238, p-value < 0.001), while the domain of lifting witnessed more significant improvement, where 72.7% of the patients reported preoperative ability to lift light weights only, compared to 55.6% in the postoperative phase to have the ability to lift heavy weights but with extra pain (t = 18.454, p-value < 0.001). Walking domain has also witnessed a significant improvement, where 68.7% of the patients preoperatively reported pain to prevent them from walking more than one fourth of a mile, compared to 74.7% in the postoperative phase who reported preventing them from walking more than one mile (t = 17.769, p-value < 0.001), with less, but still significant, improvement in

sitting domain, where 51.5% of the patients preoperatively reported pain to prevent them from sitting for more than one hour, while the same percentage 51.5% stated that the pain postoperatively prevents them from sitting as long as they like ($t = 7.266$, p-value < 0.001).

The rest of activities have also witnessed significant improvements, where 71.7% of the patients reported preoperatively that pain prevents them from standing for more than 30 minutes, compared to 56.6% in the postoperative phase who reported prevention from standing for more than one hour ($t = 10.719$, p-value < 0.001), while 60.6% of the patients reported preoperative less than 4 hours of sleep although having medications, while 55.6% of them postoperatively reported sleeping as long as they want with the help of medications ($t = 18.077$, p-value < 0.001). Among patients who were married, 47.5% of them reported preoperative pain to prevent them totally from having sexual activities, compared to 57.6% in the postoperative phase who reported their sexual life to be regular but increasing their pain ($t = 13.765$, p-value < 0.001). In terms of social life, 62.6% of the patients in the preoperative phase reported pain to restrict their social life so that they do not go out often, which significantly improved so that 66.7% of the patients in the postoperative phase to do regular social life activities but with an increase in pain ($t = 16.852$, p-value < 0.001). Lastly, 40.4% of the patients reported preoperative pain to restrict their travelling for journeys over 1 hour, while 44.4% of them reported this restriction in the postoperative phase to be mild ($t = 10.752$, p-value < 0.001).

The overall and categorization of ODI score is shown in Table 3.4, where the overall score showed a significant decrease from a preoperative mean of 58.929 ± 5.438 to a postoperative mean of 24.687 ± 5.629, with a mean decrease by 34.242 ($t = 47.424$, p-value < 0.001), indicating an overall improvement in lumbar area pain after one month of the operation. In more details, 68.7% of the patients had severe disability category in the preoperative phase, compared to 71.7% having moderate and 27.3% having minimal disability categories in the postoperative phase ($t = 25.803$, p-value < 0.001).

Table 3.4

Description of overall ODI scores and categories

ODI category	Preoperative phase		Postoperative phase		Mean dif.	t	p-value
	N	%	N	%			
Minimal disability	0	0.0%	27	27.3%			
Moderate disability	0	0.0%	71	71.7%			
Severe disability	68	68.7%	1	1.0%	1.576	25.803	< 0.001
Crippling disability	31	31.3%	0	0.0%			
Bed-bound	0	0.0%	0	0.0%			
Overall mean ± SD	58.929 ± 5.438		24.687 ± 5.629		34.242	47.424	< 0.001

Note: N = Number (frequency), t = paired t-test value, SD = standard deviation, ODI = Oswestry disability index.

3.3 Part 3: Quality of Life (QoL)

The quality of life (QoL) among the recruited patients was assessed using the five-dimension EuroQoL tool, where patients' responses and pre-post comparison are shown in Table 3.5. The domain of mobility showed a significant improvement, where 58.2% of the patients had moderate problem in walking, compared to 53.0% having slight problem in walking in postoperative phase (t = 8.242, p-value < 0.001). The same pattern was witnessed in other domains. For example, the problem in self-care was moderate among 49.3% of the patients in the preoperative phase, while it was slight among 52.2% of them postoperatively (t = 6.797, p-value < 0.001), with 59.7% having severe preoperative problems in usual activities, compared to 63.4% having slight related problems (t = 16.930, p-value < 0.001). Also, problems related to pain or discomfort was severe among 73.9% of the patients in the preoperative phase, compared to slight among 56.7% of them in postoperative phase (t = 19.497, p-value < 0.001). Lastly, anxiety issues were severe among 52.2% of the patients preoperatively, compared to 54.5% with slight and 40.3% with no related problems in the postoperative phase (t = 13.302, p-value < 0.001).

The overall VAS mean significantly improved from 21.642 ± 13.500 in the preoperative phase to a mean of 68.508 ± 22.158 in the postoperative phase, with a mean increase by 46.9 points (t = -28.720, p-value < 0.001). The utility score also showed a significant improvement from a mean of 0.0637 to 0.7012, with a mean improvement by 0.638 points (t = -20.753, p-value < 0.001).

Table 3.5

Distribution of patients' responses and preoperative-postoperative differences of EQ-5D-5L scale (N = 134)

Statements	Preoperative		Postoperative		Mean dif.	t	p-value
	N	%	N	%			
1. Mobility							
You have no problems in walking about?	18	13.4%	46	34.3%			
You have slight problems in walking about?	29	21.6%	71	53.0%			
You have moderate problems in walking about?	78	58.2%	13	9.7%	0.776	8.242	< 0.001
You have severe problems in walking about?	8	6.0%	4	3.0%			
You are unable to walk about?	1	0.7%	0	0.0%			
2. Self-care							
You have no problems washing or dressing yourself?	14	10.4%	30	22.4%			
You have slight problems washing or dressing yourself?	29	21.6%	70	52.2%			
You have moderate problems washing or dressing yourself?	66	49.3%	29	21.6%	0.731	6.797	< 0.001
You have severe problems washing or dressing yourself?	20	14.9%	5	3.7%			
You are unable to wash or dress yourself?	5	3.7%	0	0.0%			
3. Usual activities							
You have no problems doing your usual activities?	4	3.0%	32	23.9%			
You have slight problems doing your usual activities?	14	10.4%	85	63.4%			
You have moderate problems doing your usual activities?	20	14.9%	9	6.7%	1.724	16.930	< 0.001
You have severe problems doing your usual activities?	80	59.7%	8	6.0%			
You are unable to do your usual activities?	16	11.9%	0	0.0%			
4. Pain or discomfort							
You have no pain or discomfort?	0	0.0%	17	12.7%			
You have slight pain or discomfort?	4	3.0%	76	56.7%			
You have moderate pain or discomfort?	21	15.7%	32	23.9%	1.612	19.497	< 0.001
You have severe pain or discomfort?	99	73.9%	9	6.7%			
You have extreme pain or discomfort?	10	7.5%	0	0.0%			
5. Anxiety or depression							
You are not anxious or depressed?	16	11.9%	54	40.3%			
You are slightly anxious or depressed?	17	12.7%	73	54.5%			
You are moderately anxious or depressed?	29	21.6%	5	3.7%	1.522	13.302	< 0.001
You are severely anxious or depressed?	70	52.2%	2	1.5%			
You are extremely anxious or depressed?	2	1.5%	0	0.0%			
ED-5D VAS (mean ± SD)	21.642 ± 13.500		68.508 ± 22.158		46.9	-28.720	< 0.001
Utility score (mean (min – max))	0.0637 (-0.451 – 0.710)		0.7012 (0.298 – 0.948)		0.638	-20.753	< 0.001

Note: N = Number (frequency), SD = standard deviation, t = paired t-test value, VAS = visual analogue scale.

3.4 Part 4: Sleep Quality

The sleep quality among the patients was assessed using two tools, where responses and changes of PSQI statements are shown in Table 3.6 and Table 3.7, while those related to ESS are shown in Table 3.8. In the PSQI tool, most of the sleep problems have witnessed significant decrease in the frequency of 3 times or more from the preoperative to postoperative phase, including unable to sleep within 30 minutes (73.1% vs. 26.9%, respectively, $t = 16.309$, p-value < 0.001), frequent waking up during sleep (72.4% vs. 14.9%, respectively, $t = 23.560$, p-value < 0.001), problems in breathing during sleep (82.1% vs. 20.9%, respectively, $t = 16.551$, p-value < 0.001), among others. Also, 44.0% of the patients reported preoperative using of sleep medication 1 – 2 times a week, compared to 54.5% who stated a postoperative use of less than one time a week ($t = 12.597$, p-value < 0.001).

The overall quality of sleep also showed a significant improvement, where 72.4% of the patients rated it as fairly bad in the preoperative phase, compared to 52.2% who rated it as fairly good, and 39.6% as very good, in the postoperative phase ($t = 17.594$, p-value < 0.001), which also applies for the rating of enthusiasm, where 52.2% of the patients rated enthusiasm to be somewhat of a problem in the preoperative phase, compared to 45.5% of a slight problem in the postoperative phase ($t = 13.725$, p-value < 0.001). Among the married patients, specific issues that were noticed by the partner were also included, which all showed significant improvement after one month of the operation. For example, 53.0% of the patients reported their partners to witness snoring 1 – 2 times a week, which decreased in the postoperative phase so that 48.0% of them witnessed it for less than once a week ($t = 11.927$, p-value < 0.001), and while 64.0% of the partners witnessed breath pauses less than once a week in the preoperative phase, 71.0% reported witnessing none in the month after the operation ($t = 12.662$, p-value < 0.001).

Table 3.6

Distribution of patients' responses and preoperative-postoperative differences of PSQI (N = 134, presented in frequencies and percentages)

Statement	Preoperative								Postoperative								Mean dif.	t*
	None		≤1 a week		1-2 times a week		≥3 times a week		None		≤1 a week		1-2 times a week		≥3 times a week			
Within 30 minutes	0	0.0%	6	4.5%	30	22.4%	98	73.1%	10	7.5%	33	24.6%	55	41.0%	36	26.9%	0.813	16.309
Waking up	0	0.0%	14	10.4%	23	17.2%	97	72.4%	18	13.4%	20	14.9%	76	56.7%	20	14.9%	0.888	23.560
Bathroom	0	0.0%	14	10.4%	21	15.7%	99	73.9%	32	23.9%	18	13.4%	36	26.9%	48	35.8%	0.888	11.778
Breathing	0	0.0%	4	3.0%	20	14.9%	110	82.1%	17	12.7%	14	10.4%	75	56.0%	28	20.9%	0.940	16.551
Cough	0	0.0%	16	11.9%	40	29.9%	78	58.2%	30	22.4%	44	32.8%	26	19.4%	34	25.4%	0.985	14.893
Cold	13	9.7%	18	13.4%	71	53.0%	32	23.9%	46	34.3%	50	37.3%	28	20.9%	10	7.5%	0.896	14.235
Hot	53	39.6%	41	30.6%	30	22.4%	10	7.5%	86	64.2%	35	26.1%	13	9.7%	0	0.0%	0.522	8.030
Bad dreams	6	4.5%	45	33.6%	67	50.0%	16	11.9%	56	41.8%	49	36.6%	28	20.9%	1	0.7%	0.888	12.988
Pain	0	0.0%	16	11.9%	86	64.2%	32	23.9%	11	8.2%	96	71.6%	24	17.9%	3	2.2%	0.978	18.657
Others	14	10.4%	37	27.6%	61	45.5%	22	16.4%	65	48.5%	51	38.1%	14	10.4%	4	3.0%	1.000	14.396
Medications	10	7.5%	45	33.6%	59	44.0%	20	14.9%	42	31.3%	73	54.5%	15	11.2%	4	3.0%	0.806	12.597
Trouble awake	8	6.0%	22	16.4%	102	76.1%	2	1.5%	64	47.8%	48	35.8%	22	16.4%	0	0.0%	1.045	14.891
Problem	Not at all		Slight		Somewhat		Very big		Not at all		Slight		Somewhat		Very big			
Enthusiasm	16	11.9%	30	22.4%	70	52.2%	18	13.4%	64	47.8%	61	45.5%	8	6.0%	1	0.7%	1.075	13.725
	Very good		Fairly good		Fairly bad		Very bad		Very good		Fairly good		Fairly bad		Very bad			
Overall quality	13	9.7%	4	3.0%	97	72.4%	20	14.9%	53	39.6%	70	52.2%	11	8.2%	0	0.0%	1.239	17.594
Partner issues	None		≤1 a week		1-2 times a week		≥3 times a week		None		≤1 a week		1-2 times a week		≥3 times a week			
Snoring	10	10.0%	14	14.0%	53	53.0%	23	23.0%	33	33.0%	48	48.0%	17	17.0%	2	2.0%	1.010	11.927
Breath pause	6	6.0%	64	64.0%	21	21.0%	9	9.0%	71	71.0%	26	26.0%	3	3.0%	0	0.0%	1.010	12.662
Leg twitch	25	25.0%	53	53.0%	12	12.0%	10	10.0%	71	71.0%	26	26.0%	3	3.0%	0	0.0%	0.810	9.282
Confusion	11	11.0%	22	22.0%	56	56.0%	11	11.0%	77	77.0%	20	20.0%	3	3.0%	0	0.0%	0.970	12.794
Others	24	24.0%	51	51.0%	13	13.0%	12	12.0%	42	42.0%	47	47.0%	10	10.0%	1	1.0%	0.700	8.042

Note: * = All differences between preoperative and postoperative phases are significant at p-value < 0.001.

According to the scoring of PSQI tool, the global PSQI score showed a significant decrease from a preoperative mean of 1.522 ± 1.995 to a postoperative mean of 7.866 ± 1.969, with a mean decrease by 5.657 points (t = 26.830, p-value < 0.001). In addition, all components of sleep quality showed significant improvements between the preoperative and the one-month postoperative phases, including sleep latency (2.687 ± 0.554 to 1.873 ± 0.896, respectively, t = 16.309, p-value < 0.001), sleep efficiency (1.403 ± 1.034 to 0.358 ± 0.841, respectively, t = 10.769, p-value < 0.001), and daytime dysfunction (1.903 ± 0.533 to 0.851 ± 0.569, respectively, t = 18.345, p-value < 0.001), except for sleep duration (1.388 ± 1.501 to 1.522 ± 1.505, respectively, t = -0.749, p-value = 0.455).

Table 3.7

Differences in sleep quality component and PSQI score between preoperative and postoperative phases

Component	Preoperative		Postoperative		Mean dif.	t	p-value
	Mean	SD	Mean	SD			
Subjective sleep quality	1.925	0.752	0.687	0.618	1.239	17.594	< 0.001
Sleep latency	2.687	0.554	1.873	0.896	0.814	16.309	< 0.001
Sleep duration	1.388	1.501	1.522	1.505	-0.134	-0.749	0.455
Sleep efficiency	1.403	1.034	0.358	0.481	1.045	10.769	< 0.001
Sleep disturbance	2.552	0.499	1.716	0.452	0.836	18.497	< 0.001
Use of sleep medication	1.664	0.822	0.858	0.727	0.806	12.597	< 0.001
Daytime dysfunction	1.903	0.533	0.851	0.569	1.052	18.345	< 0.001
Global PSQI score	13.522	1.995	7.866	1.969	5.657	26.830	< 0.001

Note: SD = Standard deviation, t = paired t-test values, PSQI = Pittsburg Sleep Quality Index.

The daytime sleepiness of the recruited patients was assessed using ESS, as shown in Table 3.8. All areas of sleepiness have witnessed significant improvements from the preoperative to one-month postoperative phases, where majority of the issues happened “mostly” in the preoperative phase, and turned to become rare or never happening in the postoperative phase, including sleepiness while sitting and reading (68.7% mostly vs. 52.2% never, respectively, t = 17.939, p-value < 0.001), as well as while watching TV (64.2% mostly vs. 48.5% never, respectively, t = 17.094, p-value < 0.001), and while lying down to rest (57.5% mostly vs. 50.7% rarely, respectively, t = 12.748, p-value <

0.001). This also applies for sleepiness while sitting after a lunch (57.5% mostly vs. 44.8% rarely, respectively, t = 11.654, p-value < 0.001).

Other differences were less significant, including sleepiness while being a passenger in a car (from 70.1% rarely to 61.9% never, respectively, t = 11.464, p-value < 0.001) and while sitting and talking (from 67.2% rarely to 64.2% never, respectively, t = 8.672, p-value < 0.001). Overall, the score of ESS significantly decreased from a preoperative mean of 11.425 ± 2.328 to a postoperative mean of 4.672 ± 1.867, with a mean decrease by 6.754 points (t = 37.539, p-value < 0.001), indicating an overall significant decrease in sleepiness in the one-month postoperative phase.

Table 3.8

Differences in daytime sleepiness using ESS between preoperative and postoperative phases

Situation	Preoperative								Postoperative								Mean dif.	t*
	Never		Rarely		Mostly		Always		Never		Rarely		Mostly		Always			
Sitting and reading	13	9.7%	16	11.9%	92	68.7%	13	9.7%	70	52.2%	51	38.1%	11	8.2%	2	1.5%	1.194	17.939
Watching TV	17	12.7%	13	9.7%	86	64.2%	18	13.4%	65	48.5%	59	44.0%	10	7.5%	0	0.0%	1.194	17.094
Inactive in public	33	24.6%	18	13.4%	73	54.5%	10	7.5%	69	51.5%	56	41.8%	9	6.7%	0	0.0%	0.896	12.851
As a car passenger	13	9.7%	94	70.1%	13	9.7%	14	10.4%	83	61.9%	51	38.1%	0	0.0%	0	0.0%	0.828	11.464
Lying down to rest	16	11.9%	33	24.6%	77	57.5%	8	6.0%	44	32.8%	68	50.7%	22	16.4%	0	0.0%	0.739	12.748
Sitting and talking	34	25.4%	90	67.2%	6	4.5%	4	3.0%	86	64.2%	48	35.8%	0	0.0%	0	0.0%	0.493	8.672
Sitting after lunch	18	13.4%	37	27.6%	77	57.5%	2	1.5%	50	37.3%	60	44.8%	24	17.9%	0	0.0%	0.664	11.654
Stopped in a car	22	16.4%	66	49.3%	29	21.6%	17	12.7%	72	53.7%	52	38.8%	7	5.2%	3	2.2%	0.746	10.538
ESS score	11.425 ± 2.328								4.672 ± 1.867								6.754	37.539

Note: * = All differences between preoperative and postoperative phases are significant at p-value < 0.001. ESS = Epworth Sleepiness Scale, t = paired t-test value.

3.5 Part 5: Mental Health

The mental status of the patients was assessed using the PHQ-9 tool, where the patients' responses and changes from the preoperative to one-month postoperative phases are shown in Table 3.9. The table shows that most of the statements were reported to happen between several days a week to more than half of the days in the preoperative phase, and changed to happen mostly never in the postoperative phase. For example, 32.1% of the patients reported preoperative limited interest for several days, compared to 51.5% reporting never experiencing it in the postoperative phase ($t = 11.247$, p-value < 0.001). Also, experiencing feeling down was reported by 53.7% of the patients to happen several days in the preoperative phase, compared to 53.7% who never reported it in the postoperative phase ($t = 5.524$, p-value < 0.001). More significant improvements were shown in feelings of trouble sleeping and feeling tired, where they were experienced more than half of the days in the preoperative phase by 45.5% and 50.0% of the patients, respectively, and decreased in the postoperative phase, were 39.6% and 32.8% of them, respectively, never experienced them.

Having appetite problems have also significantly improved (38.8% in several days vs. 54.5% never, respectively, $t = 11.852$, p-value < 0.001), with a better improvement in feeling bad about self (from 41.8% during several days vs. 80.6% never, respectively, $t = 9.531$, p-value < 0.001) and trouble concentrating (from 46.3% during several days vs. 73.1% never, $t = 12.557$, p-value < 0.001). Moving or speaking too slow or too fast have also significantly improved from being experienced more than half of the days by 59.7% of the patients in the preoperative phase to 56.7% never experienced in the postoperative phase ($t = 15.447$, p-value < 0.001). Lastly, thoughts of death or self-harm was never experienced by 57.5% of the patients in the preoperative phase, compared to 91.8% in the postoperative phase ($t = 7.769$, p-value < 0.001).

Table 3.9

Differences in mental status using PHQ-9 between preoperative and postoperative phases

Statement	Preoperative								Postoperative								Mean dif.	t*
	Never		Several days		More than half of days		Almost everyday		Never		Several days		More than half of days		Almost everyday			
Limited interest	30	22.4%	43	32.1%	29	21.6%	32	23.9%	69	51.5%	51	38.1%	12	9.0%	2	1.5%	0.866	11.247
Feeling down	33	24.6%	72	53.7%	20	14.9%	9	6.7%	72	53.7%	61	45.5%	1	0.7%	0	0.0%	0.567	8.524
Trouble sleeping	16	11.9%	29	21.6%	61	45.5%	28	20.9%	53	39.6%	71	53.0%	9	6.7%	1	0.7%	1.067	14.510
Feeling tired	9	6.7%	25	18.7%	67	50.0%	33	24.6%	44	32.8%	69	51.5%	18	13.4%	3	2.2%	1.075	14.400
Appetite problems	24	17.9%	52	38.8%	45	33.6%	13	9.7%	73	54.5%	52	38.8%	9	6.7%	0	0.0%	0.828	11.852
Feeling bad about self	52	38.8%	56	41.8%	20	14.9%	6	4.5%	108	80.6%	24	17.9%	2	1.5%	0	0.0%	0.642	9.531
Trouble concentrating	22	16.4%	62	46.3%	33	24.6%	17	12.7%	98	73.1%	31	23.1%	5	3.7%	0	0.0%	1.030	12.557
Moving/speaking slowly	13	9.7%	29	21.6%	80	59.7%	12	9.0%	76	56.7%	44	32.8%	12	9.0%	2	1.5%	1.127	15.447
Thoughts of death or hurt	77	57.5%	39	29.1%	13	9.7%	5	3.7%	123	91.8%	7	5.2%	4	3.0%	0	0.0%	0.485	7.769

Note: * = All differences between preoperative and postoperative phases are significant at p-value < 0.001, t = Paired t-test value.

The overall score and categorization of PHQ-9 scoring is shown in Table 3.10, which shows that the overall score significantly decreased from a preoperative mean of 12.00 ± 2.639 to a postoperative mean of 4.31 ± 1.890 (t = 37.650, p-value < 0.001), with 67.9% of the patients categorized as having moderate depression in the preoperative phase, compared to 54.1% of them having minimal, and 45.1% having mild, depression in the postoperative phase (t = 29.079, p-value < 0.001).

Table 3.10

Differences in mental status severity classifications and overall score between preoperative and postoperative phases

Severity classification	Preoperative		Postoperative		t	p-value
	N	%	N	%		
Minimal depression	0	0.0%	72	54.1%		
Mild depression	18	13.4%	60	45.1%		
Moderate depression	91	67.9%	1	0.8%	29.079	< 0.001
Moderately severe depression	25	18.7%	0	0.0%		
Severe depression	0	0.0%	0	0.0%		
Overall score (mean ± SD)	12.00 ± 2.639		4.31 ± 1.890		37.650	< 0.001

Note: t = paired t-test value, SD = standard deviation.

3.6 Part 6: Differences in PROMs improvement across patients' characteristics

This part shows the differences in improvements of PROMs scores across the different categories of patients' demographic and health-related factors, which will help identifying the most common factors related to better improvement among spinal neurosurgery patients in Palestine.

As shown in Table E.3 in appendix E, which tested the significance of differences in preoperative-postoperative PROMs scores across the categories of patients' demographic factors, the age of the spinal neurosurgery patients was significantly related with differences in both EQ-VAS and ESS scores, where the highest improvement in VAS scores the represent their QoL are significantly noticed among patients between 30 and 44 years old (mean difference = 53.33) than older patients, with a significant, negative correlation between patients' age and the mean difference of VAS after one month of the operation (r = -0.184, p-value < 0.05), which indicates and overall better improvement in

spinal neurosurgery patients' QoL among younger patients. Also, the daytime sleepiness significantly improved among older patients, for example among patients of 60 years old and more (mean difference = -8.86) compared to who are between 45 and 59 years old (mean difference = -6.50), without a significant correlation between age and improvement in daytime sleepiness.

The residency of the patients also significantly impacted the improvement in NDI scores, where the mean difference was -35.26 among patients living in urban areas, compared to -30.22 among rural area residents and -29.14 among residents of refugee camps ($F = 2.987$, p-value < 0.05), which indicates a better improvement in neck disability index among urban area residents than others. On the other hand, none of the rest of the spinal neurosurgery patients' demographic factors showed significant relationships with the improvements in postoperative PROMs (p-value > 0.05).

When the medical and health-related factors of spinal neurosurgery patients were tested in having significant relationships with the improvement in postoperative PROMs, more factors showed significant results, as shown in Table E.4 in appendix E. For example, there was a significant improvement in NDI scores among spinal neurosurgery patients who underwent congenital diseases-related surgeries (mean difference = -36.67) compared to discectomy (mean difference = -33.04) and tumor resection (mean difference = -29.64) approaches, indicating an overall higher improvement in neck disability index among patients with congenital diseases ($F = 2.689$, p-value < 0.05). Also, differences in ODI scores showed significant differences across types of surgeries, where tumor resection patients (mean difference = -36.67) showed better improvement than patients of discectomy (mean difference = -33.05) and congenital diseases (mean difference = -33.83), indicating an overall better improvement in back pain index among patients with tumor-related spinal neurosurgical disorders ($F = 2.951$, p-value < 0.05).

Moreover, patients without hormonal disorders showed more significant improvement in ODI scores (mean difference = -34.99) than patients with related disorders (mean difference = -30.38), indicating a better improvement in back pain index among patients who do not present with preoperative hormonal disorders ($t = 2.409$, p-value < 0.05).

Also, patients who reported using preoperative paracetamol for pain management showed less improvement in EQ-VAS scores (mean difference = 43.76) compared to patients who consumed them preoperatively (mean difference = 53.9), which applies for the use of muscle relaxants (mean difference = 41.78 vs. 52.95, respectively), indicating and overall less improvement in postoperative QoL VAS scores among patients who consumed preoperative paracetamol ($t = -2.095$) or muscle relaxants ($t = -2.512$). In terms of the ODI scores, patients who reported using preoperative cortisones significantly showed less improvement (mean difference = -33.09) than who did not use them (mean difference = -37.83), indicating an overall less improvement in back pain index among patients who reported preoperative cortisones ($t = 2.919$, p-value < 0.05). On the other hand, the rest of the medical and health-related factors did not significantly affect the improvement in postoperative PROMs among spinal neurosurgery patients (p-value > 0.05).

3.7 Conclusion

The sample of the study consisted of spinal neurosurgery patients who have a mean age of 49.16 ± 6.06 years old, 50.7% females, 45.5% acquiring the bachelor's degree, and mostly married (74.6%), with 38.8% working in the private sector and 39.6% with 1800 – 3000 ILS of monthly income. Also, 73.9% of the patients underwent lumbar spine neurosurgery approach, of them are 59.7% undergoing discectomy procedure, with a mean diagnosis-to-operation time of 7.15 ± 4.68 weeks.

Among the patients with cervical spine neurosurgery, 85.7% of them had a preoperative severe disability index, compared to 57.1% having postoperative moderate disability index (p-value < 0.001), which applied also among the lumbar spine neurosurgery patients (68.7% for preoperative severe disability and 71.7% for postoperative moderate disability index, p-value < 0.001), indicating an overall significant improvement in pain among all patients. All domains of QoL showed significant improvement, with a significant increase in utility index from 0.0673 to 0.7012 (p-value < 0.001) and EQ-5D VAS from 21.642 to 68.508 (p-value < 0.001), indicating an overall improvement in patients' QoL.

All components of sleep quality showed significant improvement in the postoperative phase (p-value < 0.001), except for sleep duration component (p-value = 0.455), with a significant improvement in global PSQI score from 13.522 ± 1.955 to 7.866 ± 1.969 (p-value < 0.001), and a significant improvement in ESS total score from 11.425 ± 2.328 to 4.672 ± 1.867 (p-value < 0.001), indicating an overall improvement in sleep quality among all patients. Lastly, the mental status of the patients significantly improved, as the mean score of PHQ-9 significantly decreased from 12.00 ± 2.639 to 4.31 ± 1.890 (p-value < 0.001).

Chapter Four
Discussion and Conclusions

The following is a discussion of the current study results, which is done by comparing the findings with previous literature, and giving comments from the researcher on similarities and differences.

4.1 Discussion of study findings and comparison with previous studies

The previous study of Hey et al. (2018) found positive results in terms of significant improvements in spinal neurosurgery patients' pain and QoL, which was similar to the findings of the current study, where the mean scores of ODI in the previous study significantly decreased from preoperative of 41.4 ± 19.6 to a 6-month postoperative of 20.9 ± 20.6, compared to a significant decrease from a preoperative mean of 58.929 ± 5.438 to a 1-month postoperative mean of 24.687 ± 5.629, and the mean scores of EQ-5D have significantly increased from 0.45 ± 0.39 to 0.76 ± 0.41 in the previous study, compared to an increase from 0.0637 to 0.7012 in the current study, indicating an overall agreement between the findings of both studies. On the other hand, some differences should be addressed, including the chronological approaches of both studies, where the previous study compared preoperative findings with two postoperative phases (6-month and 2-year), compared to a 1-month postoperative phase in the current study, which gives a superiority of the previous study, taking into account that the current study was limited by academic conditions. Also, the previous study used SF-36 tool in addition to EQ-5D to assess QoL among the patients, which was not preferred in the current study as it contains more PROMs to measure, and therefore the use of a 36-item tool would have prolonged interview time with the patients, which increases data collection bias due to patient's fatigue, especially in the postoperative phase, where the patients have limited time to finish the interview.

Although, the previous study showed insignificant changes in the targeted PROMs between the 6-month and 2-year phases, indicating that shorter, single postoperative phase makes much more sense to be followed up, as the patients who undergo spinal neurosurgeries tend to witness improvements in a relatively shorter period of time compared to what researchers of the previous study may have imagined, which is also supported by previous studies, such as Vaishnav et al. (2019), who reported an overall

initial improvement in early postoperative period within an average of 6 weeks, while Shahi et al. (2022) stated that sustained improvements are seen within subsequent months to 1 year, taking into account several factors, such as age and surgical approach, which support and overall need of shorter postoperative follow up period to address significant improvements. Another limitation of the previous study is that they did not compare the preoperative and postoperative VAS scores of EQ-5D among the patients, giving an advantage of the current study, where it helped in capturing a subjective quantitative picture of the patient's improvement in overall QoL.

In accordance with the previous study of Asher et al. (2015), the current study was also concerned with studying multiple PROMs among spinal neurosurgery patients, which helps in better studying of the overall improvement of patients' life after the surgery from several perspectives. Both studies agreed on significant improvements in ODI scores, which was from 34.2 ± 13.2 to 18.0 ± 16.2 in the previous study, and from 58.929 ± 5.438 to 24.687 ± 5.629 in the current study, taking into account some similarities in both studies' samples, including in percentage of female, married and college educated patients. The assessment of multiple PROMs in one study among spinal neurosurgery patients showed several benefits and is supported by evidence, where they help in capturing a more comprehensive perspectives of patients, and the exploration of multidimensional improvement in patient's life (Ramesh et al., 2023; Schiavolin et al., 2018). Also, this provides a more holistic understanding of patients' recovery and treatment efficacy, taking the benefits of using valid tools across diverse outcomes (Åkerstedt et al., 2024; Parai et al., 2019). On the other hand, the current study did not include the assessment of patients' improvement in satisfaction, which was applied in the previous study of Sivaganesan et al. (2020), which tested the demographic factors related to patient's satisfaction in the field of spinal neurosurgery. The current study was limited by the high variability of the measured PROMs, and therefore adding another scale related to assessment of patient's satisfaction would have increased the bias of data collection as mentioned earlier, while it is recommended if circumstances allow. Moreover, it is recommended to add more specific demographic and surgery-related factors to be involved in testing the relationship with PROMs differences, as achieved in the previous study, like ASA scoring, and the prediction of specific postoperative complications, taking

into consideration that the exclusion criteria of the current study included patients with postoperative complications.

Other possible factors that can be studies are also related to the surgery, as applied in the retrospective study of Gao et al. (2023), including operation time, tumor (and possibly number of discopathy levels), and number of mean removed tumor segments. The previous study also found that none of the studied demographic or operation-related factors significantly impacted the decrease in pain levels after 1 month and 1 year of the operation. On the opposite, the current study did not investigate for the differences in PROMs according to patients' demographic and health-related factors, and only tested their differences between the preoperative and 1-month postoperative phases. On the other hand, both studies used VAS, and while the previous study used it for pain assessment compared to HRQoL in the current study, both studies found significant improvements in VAS scores, taking into account that the current study excluded patients with specific postoperative complications, and therefore, the previous study succeeded in comparing the factors that may affect patients to experience pain improvement or worsening.

Both studies of Kim, Park, et al. (2020) & Wang et al. (2020) investigated the sleep disturbances among spinal neurosurgery patients using a cross-sectional design, where the main aims were to assess the most common patients' factors affecting sleep disturbances, while limited studies were found compare sleep disturbances in different postoperative phases, although the previous studies used PSQI for the assessment of sleep disturbances.

Another study was conducted in the same year by Kim, Lee, et al. (2020) using a comparative design between the surgical and conservative approaches to assess the changes and related factors that affect sleep disturbances among lumbar spine stenosis patients, but the study did not investigate the specific changes in sleep disturbances between preoperative and postoperative phases. Other studies were limited by the conduction of comparative approaches in sleep disturbances between two approaches of treatment, or the correlation between sleep disturbances and other postoperative consequences, like pain, HRQoL and disability (Coronado et al., 2024; Majd Marrache et al., 2021).

In the current study, the mental status was assessed using a short, but valid, tool of PHQ-9, and showed a significant improvement in all statements and the overall scores and categories of depression (p-value < 0.001). Specific comments on such results include that the preoperative percentage of patients who reported never having the thoughts of self-harm or death was high 57.5%, which is supported by the fact that Palestinian culture is mostly following a religious scheme. This was also supported by several studies, where religious participation has been linked to increased self-esteem and reduced depressive symptoms, which potentially results in less thoughts of self-harm and death, in addition to having a supportive social life in religious communities, as in Palestine, which was found to buffer against depressive symptoms associated with self-harm (Kohrt et al., 2016; Sherkat & Reed, 1992). The ninth item of PHQ-9 tool is specifically found to have diverse sensitivity and specificity across different cultures, with significantly less engagement or endorsement in self-harm and death thoughts among religious cultures (Na et al., 2018). Another study found that this item is also significantly lower in response among religious cultures where their ideologies stigmatize or discourage the acknowledgment of such thoughts (Shaff et al., 2024).

In the previous study of Wagner et al. (2020), the mental status of the spinal neurosurgery patients significantly improved in the postoperative phase, which is parallel with the findings of the current study, although it used different mental status assessment tools (ADS-K, PTSS-10 and ASI-3 vs PHQ-9), and had specific aims related to the comparison of such findings with other outcomes, like sleep pattern and HRQoL. On the other hand, a specific result was shared between both studies, where both studies showed a significant improvement in HRQoL as measured using EQ-5D tool, where the previous study showed a significant improvement in the utility score of EuroQoL by a mean of 0.2 (p-value < 0.001), compared to a significant increase by 0.638 (p-value < 0.001), which indicates and overall higher improvement in QoL among the Palestinian patients who were recruited in the current study, which can be related to several factors, including sample variations, like in sample size (245 vs 134), as well as the differences in postoperative phases (3- and 6-month vs 1-month in the current study), and the exclusion of complicated patients in the current study, which played a significant role in having more improvements in all PROMs.

4.2 Discussion of differences in PROMs improvement among spinal neurosurgery patients across their demographic and health-related factors

The previous study of Hey et al. (2018) found a significant difference in the improvement of patients' ODI scores across the different neurosurgery approaches, where better improvements were noticed among patients undergoing surgeries of disc herniation, compared to spinal stenosis and spondylolisthesis, while the current study found significant improvements across patients of tumor resection, compared to congenital disorders and discectomy. While both studies share the general finding related to significantly different improvement levels across various approaches, they were different in categorizing the patients according to surgical approaches, where the current study categorized all neurosurgeries related to spine, while the previous study categorized the patients who were selected according to specific selection criteria, which included single-level, elective lumbar surgeries. On the other hand, these shared results indicate the benefits that patients witness in various surgical types, although both studies conducted the follow up over different points of time. Moreover, both studies share the finding related to absence of differences in utility scores of EQ-5D tool across the surgical approaches, despite sharing the finding that HRQoL scores significantly improved after surgical intervention.

The previous study of Sivaganesan et al. (2020) highlighted the importance of searching beyond the quantitative/objective measurement of improvement in patients' PROMs, with the recommendation of investigating the impact on short-term and long-term patient's satisfaction levels, which is also recommended by the researcher of the current study. This appears in that the previous study found significant differences in satisfaction pattern in the postoperative period according to patients' preoperative satisfaction and anxiety levels, smoking status, educational level, anesthesiology score, surgical site (lumbar vs. spinal) and presence of postoperative complications. While the current study excluded patients who suffered from postoperative complications, it is commonly recommended to include them in future studies, where the postoperative follow up period is longer than one month.

The use of different tools to assess improvements in postoperative PROMs among spinal neurosurgery patients may interpret the differences in the factors that affect these

improvements. This was found in the difference between the current study and the previous study of Nakajima et al. (2022), where the previous study found better improvements in neck pain after cervical spine neurosurgery among patients with older age, longer duration before surgery and higher preoperative pain, while the current study found that neck pain improvement was significantly better among patients who live in urban areas and who underwent congenital disease-related neurosurgery, with no significant relationship with diagnosis-to-operation period or age. The use of different tools across studies means that the construct that these tools target may include different aspects, such as emotional and social aspects of recovery, such as the differences between VAS and ODI ability to capture subtle changes in pain or disability (Parai et al., 2019).

Moreover, the current study found that patients who live in urban areas showed significantly better improvement in neck disability scores, which may be explained by the higher availability and reachability of neurosurgery procedures in cities, compared to lack of resources and difficulties in transportations in rural areas, which applies in the current political situations in Palestine. In terms of age, the current study found that younger spinal neurosurgery patients have significantly shown better improvements in the overall QoL, as seen in the higher pre-post differences in EQ-VAS scores, which highlights that age significantly influence the recovery and QoL outcomes in the postoperative period, which can be interpreted by the younger age's better physiological resilience, lower preoperative comorbidities, greater postoperative physical activity and stronger mental health and adaptation. This finding was also aligned with the previous study of Chouhdari et al. (2019), who found improvements in EQ-5D and EQ-VAS scores across all age groups, as well as significantly better improvements among younger patients, who underwent lumbar spine decompression. Also, another study (Croci et al., 2022) among patients who underwent cervical myelopathy surgery have found significantly better early improvements in EQ-VAS scores among younger patients, but were insignificant across age groups at the 12-month point, which also supports the idea that early assessment of PROMs is enough.

Several other factors may interpret the differences in PROMs improvement among spine neurosurgery patients in the postoperative period. For example, the congenital disease-related surgeries showed significantly better improvement in neck disability scores, which can be related to that this category of patients mostly undergo surgical procedures at

younger ages, where age plays a significant role in the healing process and rehabilitation capabilities (Vaishnav et al., 2019). Across different populations, the demographic and socioeconomic factors of the patients may play a significant role in mediating the impact of preoperative PROMs levels and other medical and health-related factors on the improvement of postoperative PROMs. This point reflects the need to include as much factors as possible in the analysis of PROMs improvement.

Also, previous studies have concluded the significant role of access to resources on the recovery and rehabilitation services (Andersen et al., 2023; Gelalis et al., 2018), while other studies focused on the importance of addressing the patient's expectation of medical and surgical services that they receive in different settings, e.g., governmental vs. private sectors, as they may mediate the impact on patients' satisfaction level, which may interfere with their compliance of postoperative instruction, and ultimately the outcomes (Crawford et al., 2017), which also calls for the recommendation to include emotional and mental variables in similar studies in the future, that helps in the application of biopsychosocial framework, where preoperative anxiety and depression, as well as lower levels of social support, that is more found in socioeconomically disadvantaged populations, can affect PROMs improvement levels (Tripp et al., 2017).

4.3 Conclusion

The current study was conducted on convenience sample of 134 lumbar and cervical spine neurosurgery patients to assess their preoperative and postoperative PROMs related to pain, QoL, sleep quality and mental health using valid tools that were translated to Arabic, in addition to the significance of their pre-post changes and the most common demographic and health-related factors that affecting them.

All PROMs showed significant improvement at the one-month postoperative time point (p-value < 0.001), with significantly better improvement in EQ-VAS with younger age and ESS with older age, better improvement in NDI in urban residents, better improvement in NDI among congenital disease-related and ODI among tumor resection surgeries and no preoperative hormonal disorders, with better improvement in EQ-VAS among patients who did not use preoperative paracetamol or muscle relaxants, and better improvement in ODI among patients who did not use preoperative cortisones (p-value < 0.05).

Several studies agreed with the overall improvements in postoperative PROMs among spinal neurosurgery patients, with some differences related to the used tools, sample characteristics and population-related factors. Also, differences in factors related to improvements in postoperative PROMs were noticed.

4.4 Recommendations

Based on the discussion of the current study results, the following recommendations are proposed to patients, healthcare providers and policymakers.

4.4.1 Recommendations for patients

1. Educate the patients on the expectations related to postoperative improvement in PROMs after spinal neurosurgeries, as well as the time needed for noticing significant improvements, and the factors related to them, especially the factors related to preoperative PROMs status.
2. Increase patients' awareness on the active engagement in social support networks that help in optimizing outcomes related to rehabilitation and counselling, especially in the rural areas, where resources and reachability to advanced treatment approaches are limited.
3. Emphasize on the need to adhere to postoperative instructions and follow-up schedules that help in improving rehabilitation and functional recovery.

4.4.2 Recommendations for healthcare providers

1. Apply the holistic approach in health assessment, including the use of multiple PROMs tools to assess preoperative and postoperative levels, as well as the changes in them.
2. Include the mental and emotional health in the preoperative assessment of patients, like anxiety, depression and expectations screening, which will give a better picture ion their impact on postoperative improvement in clinical outcomes after spinal neurosurgery.
3. Take the differences in patients' sociodemographic and health-related factors into account when designing individual post-discharge care plans and teaching, which

will give patients more personalized care and apply the patient-centered care approaches.

4. Focus on shorter postoperative clinical follow-up, like within 6 weeks to 3 months, which will help gather more informative improvements, as supported by evidence.
5. Provide spinal neurosurgery patients with preoperative education on the expectations of postoperative status and improvement period, as well as on the best and evidence-based approaches to achieve the optimal recovery and improvement in PROMs.

4.4.3 Recommendations for policymakers

1. Implement better resource allocation to healthcare services related to spinal neurosurgery procedures that will help bridge the gap between urban and rural areas, which will help in achieving better neurosurgical and rehabilitative services.
2. Develop and adopt policies that support the use of valid and standardized tools in the assessment of preoperative and postoperative PROMs among spinal neurosurgery patients, which will help in the consistency of assessing patient outcomes, especially if applied across multiple healthcare facilities.
3. Provide the suitable fund for future studies that assess changes in PROMs among spinal neurosurgery, and the inclusion of further factors, with the use of other robust methodological approaches, like randomized controlled trials (RCTs), which will produce rigorous evidence-based results that help in better understanding of surgical outcomes improvement.

4.5 Limitations

The conduction of the study was limited by the following points:

1. Due to limitations of academic requirements, the postoperative follow-up period was only for one month, which could have caused incomplete capturing of the recovery of patients, where previous studies suggested prolonged periods of 6 months and even more.
2. The exclusion of patients who developed postoperative complications, and their inclusion would have given the ability to compare the most common factors that relate to developing such complications and worsen the improvement of PROMs.

3. The recruitment of a relatively smaller sample size that previous studies, which is caused by limited time due to academic needs, and may have limited the generalizability of study's results.
4. Study setting included a single center, which may limit the representativeness of findings, because there are variations in patients' characteristics across governmental and private settings, and across different areas of Palestine.
5. Limited research infrastructure in Palestine, including funding, which limited the ability of conducting multicenter/interventional designs.
6. The political and economic instability in Palestine caused by the current war, which caused interruptions that have impacted the healthcare delivery, rehabilitation programs and follow-up visits of the patients, and therefore affecting study consistency and data collection process.

List of Abbreviations

Abbreviation	Meaning
ACDF	Anterior cervical discectomy and fusion
ADLs	Activities of daily living
ANOVA	Analysis of Variance
ASI	Anxiety Sensitivity Index
BMI	Body Mass Index
DCM	Degenerative cervical myelopathy
EMRs	Electronic Medical Records
EQ-5D-5L	EuroQoL – 5 Dimension – 5 Level
ESS	Epworth Sleepiness Scale
HCPs	Healthcare Providers
HRQoL	Health-Related Quality of Life
ICD	International Statistical Classification of Diseases and Related Health Problems
ILS	Israeli Shekel (currency)
IQR	Interquartile range
IRB	Institutional Review Board
IT	Information Technology
JOA	Japanese Orthopedic Association
LOS	Length of stay
LSS	Lumbar spine stenosis
MCS	Mental component score
MDD	Major Depressive Disorders
N2DOQ	the National Neurosurgery Quality and Outcomes Database
NDI	Neck Disability Index
NIH	National Institute of Health
NLM	National Library of Medicine
NPSI	Neuropathic Pain Symptom Inventory
NSAIDs	Non-steroidal anti-inflammatory drugs
ODI	Oswestry Disability Index
OR	Odds ratio
OTC	Over the counter
PHQ-9	Patient Health Questionnaire

Abbreviation	Meaning
PMC	Palestine Medical Complex
PMoH	Palestinian Ministry of Health
PROMs	Patient-Reported Outcomes Measures
PROs	Patient-Reported Outcomes
PSQI	Pittsburg Sleep Quality Index
PTSS	Post-traumatic Stress Scale
QALYs	Quality-Adjusted Life Years
QoL	Quality of Life
RCT	Randomized controlled trial
RMDQ	Ronald-Morris Disability Questionnaire
SAS	Self-rating Anxiety Scale
SCS	Spinal cord stimulants
SD	Standard deviation
SPSS	Statistical Package for Social Sciences
SQ	Sleep quality
SRS	Scoliosis Research Society
VAS	Visual Analogue Scale
WHO	World Health Organization

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Appendices

Appendix A

Study tool (PROMs questionnaire)

الجزء الأول: المعلومات الشخصية والطبية

أرجو الإجابة على الأسئلة التالية باختيار ما يناسبها من الخيارات المقابلة:

الأسئلة	الإجابات
العمر (بالسنوات)	
الجنس	ذكر
	أنثى
مكان السكن	مدينة
	قرية / بلدة
	مخيم
المستوى التعليمي	غير متعلم
	تعليم حتى الدرجة الابتدائية
	تعليم حتى الثانوية العامة
	تعليم جامعي
طبيعة العمل	لا أعمل حاليا (عاطل عن العمل أو ربة منزل)
	أعمل في وظيفة حكومية
	أعمل في وظيفة في القطاع الخاص
	أعمل في عملي الخاص
الحالة الاجتماعية	أعزب / عزباء
	متزوج / متزوجة
	أخرى (مطلق/ة أو أرمل/ة)
مستوى الدخل	أقل من الحد الأدنى (1800 شيكل شهريا)
	1800 – 3000 ش شهريا
	3001 – 5000 ش شهريا
	أكثر من 5000 ش شهريا
هل لديك أحد الأمراض التالية؟	ارتفاع ضغط الدم
	مرض السكري
	اختلال الهرمونات (الدرقية أو النخامية أو غيرها)

	غير ذلك
نوع العملية	إزالة دسيك
	إزالة ورم
	تشوه خلقي
كم الوقت الذي انتظرته من قرار التشخيص حتى العملية نفسها؟ (بالأسابيع)	
مكان العملية	الرقبة
	المنطقة القطنية–العجزية
	المنطقة الصدرية
الطول (بالسنتميتر)	
الوزن حتى عمل العملية (بالكيلوغرام)	
ماذا استخدمت من التالية لتسكين الألم قبل العملية؟	NSAIDs
	Paracetamol
	Muscle relaxants
	Cortisones
	Others

القسم الثاني: استبيان إعاقة آلام الرقبة Neck Disability Index (NDI) (لمرضى جراحة الأعصاب في الرقبة)

يرجى القراءة: هذا الاستبيان مُعد ليمكننا من فهم إلى أي مدي يؤثر ألم رقبتك في قدرتك على القيام بأنشطتك اليومية. في كل جزء يرجى وضع علامة في مربع *واحد فقط* والذي ينطبق عليك. على الرغم من وجود عبارتين في جزء واحد قد تتصلان بحالتك، يرجى وضع علامة في المربع الذي يصف *بصورة دقيقة* مشكلتك الصحية في الوقت الحالي (هذه الأسئلة تعبر عن حالتك الصحية في الوقت الحالي)

الجزء 1 – شدة الألم

- ☐ ليس لدى ألم في الرقبة في الوقت الحالي.
- ☐ الألم خفيف جدا في الوقت الحالي.
- ☐ الألم معتدل في الوقت الحالي.
- ☐ الألم شديد نوعا ما في الوقت الحالي.
- ☐ الألم شديد للغاية في الوقت الحالي.
- ☐ الألم أسوء ما يمكن تخيله في الوقت الحالي.

الجزء 2 – العناية الشخصية (الاغتسال و الليس ... الخ).

- ☐ أستطيع الاعتناء بنفسي بصورة طبيعية بدون حدوث ألم إضافي في الرقبة.
- ☐ أستطيع الاعتناء بنفسي بصورة طبيعية ولكن ذلك يسبب ألما إضافيا في الرقبة.
- ☐ من المؤلم الاعتناء بنفسي وأكون بطيئا وحذرا.
- ☐ أحتاج إلي بعض المساعدة ولكني أقوم بمعظم نواحي العناية الشخصية.
- ☐ أحتاج إلي المساعدة اليومية في معظم نواحي العناية الشخصية.
- ☐ لا يمكنني ارتداء ملابسي وأغتسل بصعوبة وأمكث في الفراش.

الجزء 3 – الرفع

- ☐ أستطيع رفع الأوزان الثقيلة بدون ألم إضافي في الرقبة.
- ☐ أستطيع رفع الأوزان الثقيلة، لكن ذلك يسبب ألما إضافيا في الرقبة.
- ☐ يمنعني ألم الرقبة من رفع الأوزان الثقيلة من الأرض، ولكن أستطيع عمل ذلك إذا كانت الأوزان موضوعة بشكل ملائم "علي طاوله"
- ☐ يمنعني ألم الرقبة من رفع الأوزان الثقيلة، ولكن أستطيع حمل أوزان خفيفة إلي متوسطة إذا كانت موضوعة بشكل ملائم.
- ☐ أستطيع رفع الأوزان الخفيفة جدا.
- ☐ لا أستطيع رفع أو حمل أي شيء مطلقا.

الجزء 4 – القراءة

- ☐ أستطيع قراءة ما أريد بدون ألم في الرقبة.
- ☐ أستطيع قراءة ما أريد مع ألم خفيف في الرقبة.
- ☐ أستطيع قراءة ما أريد مع ألم معتدل في الرقبة.
- ☐ لا أستطيع قراءة ما أريد بسبب ألم معتدل في الرقبة.
- ☐ لا أستطيع قراءة ما أريد بسبب ألم شديد في الرقبة.
- ☐ لا أستطيع القراءة مطلقا.

الجزء 5 – الصداع

- ☐ ليس لدى صداع مطلقا.
- ☐ لدى صداع بسيط يأتي بشكل غير منتظم.
- ☐ لدى صداع معتدل يأتي بشكل غير منتظم.
- ☐ لدى صداع معتدل يأتي بشكل متكرر.
- ☐ لدى صداع شديد يأتي بشكل متكرر.
- ☐ لدى صداع طوال الوقت تقريبا.

الجزء 6 – التركيز

- ☐ أستطيع التركيز بصورة كاملة عندما أريد بدون صعوبة.
- ☐ أستطيع التركيز بصورة كاملة عندما أريد مع صعوبة طفيفة.
- ☐ لدى درجة معقولة من الصعوبة في التركيز عندما أريد.
- ☐ لدى الكثير من الصعوبة في التركيز عندما أريد.
- ☐ لدى قدر كبير من الصعوبة في التركيز عندما أريد.
- ☐ لا أستطيع التركيز مطلقا.

الجزء 7 – العمل

- ☐ أستطيع القيام بالعمل بالقدر الذي أريد.
- ☐ أستطيع القيام بعملي المعتاد ، ولكن ليس أكثر.
- ☐ أستطيع القيام بمعظم عملي المعتاد ، ولكن ليس أكثر.
- ☐ لا أستطيع القيام بعملي المعتاد .
- ☐ بالكاد أستطيع القيام بأي عمل على الإطلاق.
- ☐ لا أستطيع القيام بأي عمل مطلقا.

الجزء 8 – القيادة

- ☐ أستطيع أن أقود سيارتي بدون ألم في الرقبة.
- ☐ أستطيع أن أقود سيارتي طالما أريد مع ألم بسيط فقط في الرقبة.
- ☐ أستطيع أن أقود سيارتي طالما أريد مع ألم معتدل في الرقبة.
- ☐ لا أستطيع أن أقود سيارتي طالما أريد بسبب ألم معتدل في الرقبة.
- ☐ بالكاد أستطيع أن أقود بسبب ألم حاد في الرقبة.
- ☐ لا أستطيع أن أقود سيارتي مطلقا.

الجزء 9 – النوم

- ☐ ليس لدى اضطراب في النوم.
- ☐ النوم مضطرب بشكل بسيط (اقل من ساعة واحدة بلا نوم).
- ☐ النوم مضطرب بشكل خفيف (1 – 2 ساعة بلا نوم).
- ☐ النوم مضطرب بشكل معتدل (2 -3 ساعة بلا نوم).
- ☐ النوم مضطرب بشكل كبير (3 – 5 ساعة بلا نوم).
- ☐ النوم مضطرب بشكل تام (5 – 7 ساعة بلا نوم).

الجزء 10 – الأنشطة الترويحية أو الترفيهية

- ☐ أنا قادر على المشاركة في جميع أنشطتي الترفيهية بدون ألم في الرقبة مطلقا.
- ☐ أنا قادر على المشاركة في جميع أنشطتي الترفيهية ، مع بعض الألم في الرقبة.
- ☐ أنا قادر على المشاركة في معظم ولكن ليس جميع أنشطتي الترفيهية ، بسبب ألم في الرقبة.
- ☐ أنا قادر على المشاركة في عدد قليل من أنشطتي الترفيهية بسبب ألم في الرقبة.
- ☐ أستطيع بالكاد أن أقوم بالأنشطة الترفيهية بسبب ألم في الرقبة.
- ☐ لا أستطيع القيام بأي أنشطة ترفيهية مطلقا.

القسم الثاني: مقياس أوسوستري للعجز Oswestry Disability Index (ODI) (لمرضى جراحة الأعصاب في باقي الظهر)

الفقرة 1:شدة الآلام:
0-□ ليس لدي الآلام في أسفل ظهري حاليا .
1-□ أشعر حاليا بالآلام خفيفة في أسفل ظهري .
2-□ أشعر حاليا بالآلام متوسطة في أسفل ظهري .
3-□ أشعر حاليا بالآلام شديدة الى حد ما في أسفل ظهري.
4-□ أشعر حاليا بالآلام شديدة جدا في أسفل ظهري.
5-□ أشعرحاليا بالآلام في اسفل ظهري أكثر مما يمكن تصورها .

الفقرة 2:العناية الشخصية – كالاغتسال ولبس الثياب:
0-□ - يمكنني أن أعتني بنفسي واهتم بأموري الخاصة بشكل طبيعي دون أن يزيد ذلك في الآلام أسفل ظهري.
1-□ - يمكنني أن أعتني بنفسي واهتم بأموري الخاصة ولكن ذلك يزيد في الآلام اسفل ظهري.
2-□ - يمكنني أن أعتني بنفسي واهتم بأموري الخاصة ولكن يأخذ ذلك مني وقتا أطول من المعتاد.
3-□ - أحتاج إلى بعض المساعدة ولكن يمكنني القيام بمعظم أموري الخاصة بنفسي .
4-□ - أحتاج إلى المساعدة بشكل يومي للقيام بأموري الخاصة .
5-□ - أبقى في سريري وأغسل بصعوبة ولا أستطيع أن ألبس ثيابي .

الفقرة 3:رفع الأشياء ونقلها:
0-□ - أستطيع أن أرفع الأشياء الثقيلة من غير أن يزيد ذلك في الآلام أسفل ظهري.
1-□ - أستطيع أن أرفع الأشياء الثقيلة ولكن ذلك يزيد في الآلام أسفل ظهري .
2-□ -الآلام أسفل ظهري تمنعني من رفع الأشياء الثقيلة إذا كانت على الأرض، لكن يمكنني رفعها إذا كانت في مكان مرتفع-عال- كالطاولة مثلا.
3-□ -الآلام أسفل ظهري تمنعني من رفع الأشياء الثقيلة، لكن بإمكاني رفع الأشياء الخفيفة ومتوسطة الوزن إذا كانت في مكان مرتفع-عال-.
4-□ -أستطيع رفع الأشياء خفيفة الوزن فقط .
5-□ - لا أستطيع رفع أو حمل أي شيء على الإطلاق.

الفقرة 4:المشي:
0-□ -لاتمنعني الآلام أسفل ظهري من المشي لأي مسافة (كالمشي بجوار المنزل).
1-□ - الآلام أسفل ظهري تمنعني من المشي أكثر من ألف وخمسمئة متر (كيلو ونصف) .
2-□ - الآلام أسفل ظهري تمنعني من المشي أكثر من ألف متر (كيلومتر واحد).
3-□ - الآلام أسفل ظهري تمنعني من المشي أكثر من أربعمئة متر.
4-□ - لا أستطيع المشي دون الاستعانة بعصا أو عكاز.
5-□ - أبقى في الفراش معظم الوقت وازحف للوصول الى المرحاض (دورة المياه).

الفقرة 5:الجلوس :
0-□ -يمكنني الجلوس على أي كرسي المدة التي أريدها.
1-□ -يمكنني الجلوس فقط على كرسي مريح المدة التي أريدها.
2-□ - الآلام أسفل ظهري تمنعني من البقاء جالسا على أي كرسي أكثر من ساعة .
3-□ -الآلام أسفل ظهري تمنعني من البقاء جالسا على أي كرسي أكثر من نصف ساعة.
4-□ -الآلام أسفل ظهري تمنعني من الجلوس لأكثر من عشر دقائق .
5-□ -الآلام أسفل ظهري تمنعني من الجلوس مطلقا.

الفقرة 6:الوقوف:
0-□ - أستطيع البقاء واقفا المدة التي أريد ها دون أن يزيد ذلك في الآلام أسفل ظهري.
1-□ - أستطيع البقاء واقفا المدة التي أريدها ولكن ذلك يزيد في الآلام أسفل ظهري.
2-□ -الآلام أسفل ظهري تمنعني من الوقوف لأكثر من ساعة.
3-□ - الآلام أسفل ظهري تمنعني من الوقوف لأكثر من نصف ساعة.
4-□ - الآلام أسفل ظهري تمنعني من الوقوف لأكثر من عشر دقائق.
5-□ - الآلام أسفل ظهري تمنعني من الوقوف مطلقا.

الفقرة 7:النوم :
0-□ - نومي لايضطرب أبدا بسبب الآلام أسفل ظهري.
1-□ - يضطرب نومي احيانا بسبب الآلام أسفل ظهري .
2-□ - أنام أقل من6 ساعات يوميا بسبب الآلام أسفل ظهري.
3-□ - أنام أقل من4 ساعات يوميا بسبب الآلام أسفل ظهري .
4-□ - أنام أقل من ساعتين يوميا بسبب الآلام أسفل ظهري.
5-□ - لا أستطيع النوم مطلقا بسبب الآلام أسفل ظهري.

الفقرة 8:الحياة الجنسية (هذه الفقرة للمتزوجين أو من سبق لهم الزواج ومارسوا الحياة الجنسية , إذا لم ينطبق عليك هذا الشرط الرجاء الانتقال للفقرة رقم 9):

0-□ - حياتي الجنسية عادية ولا تسبب زيادة في الآلام أسفل ظهري.
1-□ - حياتي الجنسية عادية ولكنها تسبب زيادة في بعض الآلام أسفل ظهري .
2-□ - حياتي الجنسية تكاد تكون عادية ولكنها تسبب لي آلاما شديدة في أسفل ظهري
3-□ - حياتي الجنسية نادرة جداً بسبب الآلام أسفل ظهري.
4-□ - حياتي الجنسية تقريبا مقطوعة بسبب الآلام أسفل ظهري.
5-□ - الآلام أسفل ظهري تمنعني من الحياة الجنسية مطلقا.
6-□لم يسبق لي الزواج ولم امارس الحياة الجنسية.

الفقرة 9:الحياةالاجتماعية (زيارة و استقبال الأقارب والأصحاب،الخروج مع الاصدقاء, المشاركة في الاحتفالات أو الأنشطة الإجتماعية ...):
0-□ - حياتي الإجتماعية عادية ولا تزيد في الآلام أسفل ظهري.
1-□ - حياتي الإجتماعية عادية ولكنها تزيد من حدة الآلام في أسفل ظهري.
2-□ - الآلام أسفل ظهري لا تؤثر على حياتي الاجتماعية ولكنها تقلل من أعمالي التي تتطلب مجهودا كبيرا.
3-□ - تأثرت حياتي الاجتماعية وتقلصت علاقاتي مع الآخرين بسبب الآلام أسفل ظهري.
4-□ - بسبب الآلام أسفل ظهري أصبحت حياتي الاجتماعية منحصرة في المنزل .
5 □ - حياتي الإجتماعية انقطعت بسبب الآلام أسفل ظهري.

الفقرة 10:السفر:
0-□ - أستطيع السفر إلى أي مكان من غير أن يزيد ذلك في الآلام أسفل ظهري.
1-□ - استطيع السفر إلى أي مكان ولكنه يزيد في الآلام أسفل ظهري.
2-□ - الآلام أسفل ظهري شديدة ولكني استطيع تحمل السفر في حدود الساعتين.
3-□ - الآلام أسفل ظهري تقيد رحلاتي (سفري) لأقل من ساعة.
4-□ - الآلام أسفل ظهري تقيد رحلاتي القصيرة الضرورية (سفري القصير) لأقل من نصف ساعة.
5-□ - الآلام أسفل ظهري تمنعني من السفر لأي مكان إلا لتلقي العلاج.
6-□لم أسافر يوما ما (لم أفعل ذلك).

القسم الثالث: جودة الحياة EQ-5D-5L

لا تختر أكثر من إجابة واحدة في كل مجموعة من الأسئلة

أولاً، أود أن أسألك عن القدرة على التنقل. هل ستقول أن:

لا مشاكل عندك في المشي؟	❑
عندك مشاكل طفيفة في المشي؟	❑
عندك مشاكل متوسطة في المشي؟	❑
عندك مشاكل حادة في المشي؟	❑
لا تقدر على المشي أبدًا؟	❑

بعد ذلك، أود أن أسألك عن قدرتك على الاهتمام بنفسك. هل ستقول أن:

ليس لديك أي مشاكل في الاستحمام أو ارتداء ملابسك بنفسك؟	❑
لديك مشاكل طفيفة في الاستحمام أو ارتداء ملابسك بنفسك؟	❑
لديك مشاكل متوسطة في الاستحمام أو ارتداء ملابسك بنفسك؟	❑
لديك مشاكل حادة في الاستحمام أو ارتداء ملابسك بنفسك؟	❑
لا تقدر على الاستحمام أو ارتداء ملابسك أبدًا؟	❑

بعد ذلك، أود سؤالك عن الأنشطة المعتادة مثل العمل، الدراسة، الأعمال المنزلية، النشاطات الأسرية أو الترفيهية. هل ستقول أن:

لا مشاكل عندك في ممارسة أنشطتك المعتادة؟	❑
عندك مشاكل طفيفة في ممارسة أنشطتك المعتادة؟	❑
عندك مشاكل متوسطة في ممارسة أنشطتك المعتادة؟	❑
عندك مشاكل حادة في ممارسة أنشطتك المعتادة؟	❑
لا تقدر على ممارسة النشاطات المعتادة أبدًا؟	❑

بعد ذلك، أود أن أسألك عن الألم أو الإحساس بعدم الراحة. هل ستقول أن:

- لا ألم عندك أو انزعاج؟ ❑
- عندك ألم أو انزعاج طفيف؟ ❑
- عندك ألم أو انزعاج متوسط؟ ❑
- عندك ألم أو انزعاج حاد؟ ❑
- عندك ألم شديد جداً أو انزعاج شديد جداً؟ ❑

أخيرًا، أود أن أسألك عن القلق أو الاكتئاب. هل ستقول أن:

- ليس لديك قلق أو اكتئاب؟ ❑
- لديك قلق أو اكتئاب طفيف؟ ❑
- لديك قلق أو اكتئاب متوسط؟ ❑
- لديك قلق أو اكتئاب حاد؟ ❑
- لديك قلق أو اكتئاب شديد جداً؟ ❑

EQ-5D VAS

الآن، أود أن أسألك عن مدى جودة أو سوء صحتك <u>اليوم</u>.

أود منك أن تتصور في ذهنك خطًّا عموديًّا مرقمًا من 0 (صفر) إلى 100.

(ملاحظة إلى الشخص المجري للمقابلة: إذا كان الحوار وجهًا لوجه، فيُرجى عرض خطّ المقياس التمثيليّ البصريّ (VAS) على المستجيب.)

الرقم 100 في الطرف العلوي للخط يعني <u>أفضل</u> حالة صحية يُمكن تصورها.

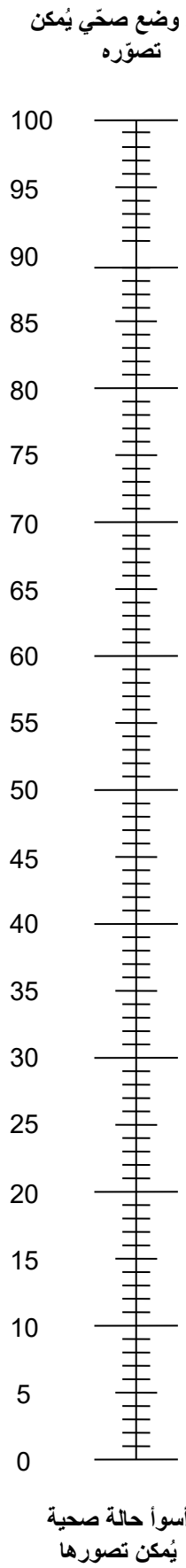
الرقم 0 في الطرف السفلي للخط يعني <u>أسوأ</u> حالة صحية يُمكن تصورها.

والآن أود منك إخباري بموضع النقطة التي ستضعها على هذا الخط لتعبر عن حالتك الصحية <u>اليوم</u>.

(ملاحظة إلى الشخص المجري للمقابلة: ضع إشارة على الخط في النقطة التي تُشير إلى الحالة الصحية للمتلقي <u>اليوم</u>. والآن، قم رجاء بكتابة الرقم الذي أشرت إليه على المقياس في المربع أدناه.)

<u>حالة المستجيب الصحية اليوم</u> = ☐

شكرًا لك على قضاء الوقت في الإجابة عن هذه الأسئلة.



القسم الرابع: جودة النوم

<u>الجزء الأول: مؤشر جودة النوم Pittsburgh Sleep Quality Index (PSQI)</u>

1- خلال الشهر الماضي متى كنت تذهب إلى الفراش ليلا؟
ميعاد النوم المعتاد..... (مثلا: 10:30 مساء)

2- خلال الشهر الماضي كم كان عدد الدقائق التي تستغرقها حتى تخلد للنوم كل ليلة عادة؟
عدد الدقائق..... (مثلا 10 دقائق)

3- خلال الشهر الماضي متى كنت تنهض من الفراش في الصباح؟
ميعاد النهوض من الفراش..... (مثلا: 7:30 صباحا)

4- خلال الشهر الماضي كم كان عدد الساعات الفعلية التي تنامها كل ليلة ؟ (هذا قد يختلف عن عدد الساعات التي تقضيها في الفراش)
عدد ساعات النوم كل ليلة..... (مثلا: 10:30 ساعات)

اختار الإجابة الافضل لكل من الأسئلة التالية، من فضلك اجب على جميع الأسئلة.

5- خلال الشهر الماضي كم مره حدثت لك مشاكل خلال النوم لأنك..

الجملة	ليس خلال الشهر الماضي	أقل من واحدة في الأسبوع	مرة أو مرتين في الأسبوع	ثلاث مرات أو أكثر في الأسبوع
لا تستطيع النوم خلال 30 دقيقة				
الاستيقاظ في منتصف الليل أو في الصباح الباكر				
اضطررت للاستيقاظ من أجل الذهاب إلى الحمام				
لا تستطيع التنفس بارتياح				
السعال أو الشخير العالي				
الشعور بالبرد الشديد				
الشعور بالحر الشديد				
تساورك أحلام سيئة				
الشعور بالألم				
أسباب أخرى.....				

6- خلال الشهر الماضي، كيف تقيم جودة نومك عموما؟

- جيد جدا
- جيد إلى حد ما
- سيء جدا
- سيء إلى حد ما

الجملة	ليس خلال الشهر الماضي	أقل من واحدة في الأسبوع	مرة أو مرتين في الأسبوع	ثلاث مرات أو أكثر في الأسبوع
7- خلال الشهر الماضي كم مرة أخذت أدوية موصوفة أو غير موصوفة لتساعدك على النوم؟				
8-خلال الشهر الماضي كم مرة واجهت مشكلة بالبقاء مستيقظا أثناء القيادة أو أثناء تناول وجبات الطعام أو خلال الانخراط في الأنشطة الاجتماعية؟				

9- خلال الشهر الماضي، كم كان حجم المشكلة لديك للحفاظ على ما يكفي من الحماس لإنجاز الأمور؟

- لا مشكلة على الإطلاق
- فقط مشكلة بسيطة جدا
- مشكلة إلى حد ما
- مشكلة كبيرة جدا

10- هل لديك شريك في الفراش أو تشارك الغرفة؟

- لا يوجد شريك في الفراش أو لا تشارك الغرفة
- شريك في غرفة أخرى
- شريك في الغرفة وليس في الفراش
- شريك في الفراش

11- إذا كان لديك شريك في الفراش او تشارك الغرفة اسأله / اسألها خلال الشهر الماضي، كم مره كان لديك؟

الجملة	ليس خلال الشهر الماضي	أقل من واحدة في الأسبوع	مرة أو مرتين في الأسبوع	ثلاث مرات أو أكثر في الأسبوع
1. شخير بصوت عال				
2. وقفة طويلة بالأنفاس أثناء النوم				
3. رجل غير هادئة أثناء النوم				
4. نوبات من الارتباك خلال النوم				
5. أي عدم راحة خلال النوم....				

الجزء الثاني: مقياس إيبورث Epworth Sleepiness Scale (ESS)

ما فرصة حدوث إغفاءة في أي من الحالات التالية؟

الوضعية	عدد مرات الحدوث			
	أبدا	نادرا	غالبا	دائما
خلال الجلوس والقراءة				
خلال مشاهدة التلفاز				
الجلوس هادئا في الأماكن العامة (مسرح، غرف انتظار، أثناء اجتماع)				
الجلوس كراكب في السفر لمدة ساعة من غير توقف				
خلال التمدد للراحة بعد الظهر إذا سمحت الظروف				
خلال الجلوس والتحدث مع شخص آخر				
خلال الجلوس هادئا بعد الغداء				
في السيارة أثناء التوقف نتيجة الزحام لعدة دقائق				

القسم الخامس: مقياس الصحة النفسية Patient Health Questionnaire (PHQ-9)

ما مدى تكرار انزعاجك من أي مشكلة من المشكلات التالية خلال الأسبوعين الآخرين؟	أبدا	عدة أيام	أكثر من نصف الأيام	كل يوم تقريبا
قلة الاهتمام أو المتعة عند القيام بالأشياء				
الشعور بالضيقة أو الاكتئاب أو اليأس				
صعوبات في النوم أو في الاستمرار في النوم أو كثرة النوم				
الشعور بالتعب أو قلة النشاط				
قلة الشهية أو شراهة الأكل				
الشعور بعدم الرضا عن نفسك أو أنك فاشل أو خذلت نفسك أو عائلتك				
صعوبات في التركيز على الأشياء كقراء الجريدة أو مشاهدة التلفاز				
التحرك أو التحدث ببطء شديد لدرجة ملحوظة، أو العكس: التململ وعدم القدرة على الاستقرار لدرجة التحرك من مكان لآخر أكثر من المعتاد				
التفكير بأنه من الأفضل لك الموت أو التفكير بإيذاء نفسك بطريقة ما				

شكرا لك عزيزي المريض على مشاركتك الثمينة،،،

Appendix B

Informed Consent Form (Arabic)

عزيزي المريض / عزيزتي المريضة

لقد تم اختيارك للمشاركة في هذه الدراسة تحت عنوان مقاييس النتائج المبلّغ عنها من قبل المريض عن الألم وجودة الحياة والحالة النفسية وجودة النوم بين مرضى جراحة الأعصاب في العمود الفقري في فلسطين، والتي تعتبر جزءا من رسالة الماجستير في تخصص البحث السريري من جامعة النجاح الوطنية. تهدف الدراسة إلى تقييم الألم، جودة الحياة، الحالة النفسية وجودة النوم عند مرضى جراحة العمود الفقري، وكذلك أهم الفروقات في هذه النتائج بناء على العوامل الشخصية والمرضية لكل مريض.

أود التأكيد في هذه الدراسة على أن جميع البيانات التي سيتم جمعها سيتم التعامل معها بسريّة وخصوصية تامّة، حيث إنه لن يتم جمع معلومات حساسة عن المريض، وأي معلومات عن الاسم أو طريقة التواصل ستستخدم لغرض المتابعة خلال فترة الدراسة فقط لا غير، وسيتم التخلص منها بعد الانتهاء من جمع البيانات، وكذلك سيتم حفظ المعلومات في ملف مغلق إلى حين البدء بتحليلها، وسيتم التعامل معها من قبل الباحث والمشرف ولأغراض البحث العلمي فقط. كما ويمكنك الانسحاب من المشاركة في أي وقت تشاء دون الحاجة لإبداء الأسباب.

للاستفسار حول الدراسة لا تتردد في التواصل مع الباحث الرئيسي أو المشرف:

الطالب: أحمد دقة: 0597119523

المشرف: الدكتور جمال قدومي: 0599877617

نشكر لك استثمار وقتك الثمين في إثراء البحث العلمي في فلسطين

التاريخ : _____ التوقيع : _____

الرقم الشخصي للتواصل: _____

Appendix C

Institutional Review Board (IRB) approval

An-Najah National University
Faculty of Medicine & Health Sciences
Institutional Review Board

جامعة النجاح الوطنية
كلية الطب وعلوم الصحة
لجنة اخلاقيات البحث العلمي

Ref: Mas. Dec. 2023/62

IRB Approval Letter

Title of Research:

Patient-Reported Outcomes Measures of Pain, Quality of Life, Mental Status and Sleep Quality among Spinal Neurosurgery Patients in Palestine: A Prospective Longitudinal Quantitative Study

Submitted by:
Ahmad Abdulrahman Daqqa

Supervisor:
Jamal Qaddumi

Approved:
21th Dec. 2023

Your Study Title "**Patient-Reported Outcomes Measures of Pain, Quality of Life, Mental Status and Sleep Quality among Spinal Neurosurgery Patients in Palestine: A Prospective Longitudinal Quantitative Study**." reviewed by An-Najah National University IRB committee and was approved on 21th Dec. 2023

Hasan Fitian, MD

IRB Committee Chairman

IRB Institutional Review Board

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Appendix D

Approval from Ministry of Health (facilitation letter)

State of Palestine
Ministry of Health
Education in Health and Scientific Research Unit

دولة فلسطين
وزارة الصحة
وحدة التعليم الصحي والبحث العلمي

Ref.: ....
Date:..................

الرقـــم: عتح/ ١٣٤/ ٢٠٢٤
التـــاريخ: ٢٠/ ١/ ٢٠٢٤

عطوفة الوكيل المساعد لمجمع فلسطين الطبي المحترم،،،

تحية واحتـرام،،

الموضـــوع: تسهيل مهمة بحث

يرجى تسهيل مهمة الطالب: **احمد دقه**– برنامج ماجستير في البحث السريري– جامعة النجاح، في عمل بحث بعنوان:

"Patient-Reported Outcomes Measures of Pain, Quality of Life, Mental Status and Sleep Quality among Spinal Neurosurgery Patients in Palestine: A Prospective Longitudinal Quantitative Study"

حيث سيتم جمع معلومات عن طريق توزيع استبانة على المرضى (بعد اخذ موافقتهم)، علما ان البحث تحت اشراف د. جمال القدومي، وذلك في:

- **مجمع فلسطين الطبي (قسم الجراحة– مبنى القلب والجراحات التخصصية الكويتي)**

على ان يتم الالتزام باساليب واخلاقيات البحث العلمي، وعدم التعرض للمعلومات التعريفية للمرضى.

على ان يتم تزويد الوزارة بنسخة PDF من نتائج البحث. والتعهد بعد النشر لحين الحصول على موافقة الوزارة على نتائج البحث.

مع الاحترام،،

د. عبد الله القواسمي
رئيس وحدة التعليم الصحي والبحث العلمي

دولة فلسطين وزارة الصحة
وحدة التعليم الصحي والبحث العلمي

نسخة: مشرف الدراسة المحترم/ جامعة النجاح

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Appendix E

Tables

Table E.1

Distribution of cervical neurosurgery patients' responses to NDI statements (N = 35, mean differences are out of 5)

Statements	Preoperative		Postoperative		Mean dif.	t	p-value
	N	%	N	%			
Section 1: Pain Intensity							
I have no pain at the moment.	1	2.9%	1	2.9%	1.142	5.924	< 0.001
The pain is very mild at the moment.	1	2.9%	4	11.4%			
The pain is moderate at the moment.	1	2.9%	25	71.4%			
The pain is fairly severe at the moment.	21	60.0%	3	8.6%			
The pain is very severe at the moment.	10	28.6%	2	5.7%			
The pain is the worst imaginable at the moment.	1	2.9%	0	0.0%			
Section 2: Personal Care (Washing, Dressing, etc.)							
I can look after myself normally without causing extra pain.	0	0.0%	5	14.3%	2.028	11.509	< 0.001
I can look after myself normally but it causes extra pain.	1	2.9%	25	71.4%			
It is painful to look after myself and I am slow and careful.	4	11.4%	3	8.6%			
I need some help but can manage most of my personal care.	24	68.6%	2	5.7%			
I need help every day in most aspects of self-care.	3	8.6%	0	0.0%			
I do not get dressed, I wash with difficulty and stay in bed.	3	8.6%	0	0.0%			
Section 3: Lifting							
I can lift heavy weights without extra pain.	0	0.0%	23	65.7%	1.886	9.061	< 0.001
I can lift heavy weights but it gives extra pain.	4	11.4%	8	22.9%			
Pain prevents me lifting heavy weights off the floor, but I can manage if they are conveniently placed, for example on a table.	17	48.6%	2	5.7%			
Pain prevents me from lifting heavy weights but I can manage light to medium weights if they are conveniently positioned.	10	28.6%	1	2.9%			
I can only lift very light weights.	3	8.6%	1	2.9%			
I cannot lift or carry anything.	1	2.9%	0	0.0%			
Section 4: Reading							
I can read as much as I want to with no pain in my neck.	0	0.0%	8	22.9%	1.229	5.375	< 0.001
I can read as much as I want to with slight pain in my neck.	4	11.4%	15	42.9%			

I can read as much as I want with moderate pain in my neck.	15	42.9%	7	20.0%			
I can't read as much as I want because of moderate pain in my neck.	11	31.4%	3	8.6%			
I can hardly read at all because of severe pain in my neck.	3	8.6%	2	5.7%			
I cannot read at all.	2	5.7%	0	0.0%			
Section 5: Headaches							
I have no headaches at all.	0	0.0%	16	45.7%			
I have slight headaches, which come infrequently.	3	8.6%	13	37.1%			
I have moderate headaches, which come infrequently.	17	48.6%	4	11.4%	1.857	7.990	< 0.001
I have moderate headaches, which come frequently.	8	22.9%	2	5.7%			
I have severe headaches, which come frequently.	4	11.4%	0	0.0%			
I have headaches almost all the time.	3	8.6%	0	0.0%			
Section 6: Concentration							
I can concentrate fully when I want to with no difficulty.	1	2.9%	14	40.0%			
I can concentrate fully when I want to with slight difficulty.	3	8.6%	18	51.4%			
I have a fair degree of difficulty in concentrating when I want to.	13	37.1%	2	5.7%	1.857	8.860	< 0.001
I have a lot of difficulty in concentrating when I want to.	11	31.4%	0	0.0%			
I have a great deal of difficulty in concentrating when I want to.	6	17.1%	1	2.9%			
I cannot concentrate at all.	1	2.9%	0	0.0%			
Section 7: Work							
I can do as much work as I want to.	2	5.7%	16	45.7%			
I can only do my usual work, but no more.	4	11.4%	11	31.4%			
I can do most of my usual work, but no more.	16	45.7%	5	14.3%	1.429	5.490	< 0.001
I cannot do my usual work.	9	25.7%	3	8.6%			
I can hardly do any work at all.	3	8.6%	0	0.0%			
I can't do any work at all.	1	2.9%	0	0.0%			
Section 8: Driving							
I can drive my car without any neck pain.	0	0.0%	1	4.8%			
I can drive my car as long as I want with slight pain in my neck.	3	14.3%	14	66.7%			
I can drive my car as long as I want with moderate pain in my neck.	6	28.6%	5	23.8%	1.400	5.480	< 0.001
I can't drive my car as long as I want because of moderate pain in my neck.	6	28.6%	1	4.8%			
I can hardly drive at all because of severe pain in my neck.	4	19.0%	0	0.0%			
I can't drive my car at all.	2	9.5%	0	0.0%			
Section 9: Sleeping							
I have no trouble sleeping.	0	0.0%	6	17.1%	1.629	7.366	< 0.001
My sleep is slightly disturbed (less than 1 hr sleepless).	5	14.3%	22	62.9%			

My sleep is mildly disturbed (1-2 hrs sleepless).	7	20.0%	4	11.4%			
My sleep is moderately disturbed (2-3 hrs sleepless).	17	48.6%	3	8.6%			
My sleep is greatly disturbed (3-5 hrs sleepless).	4	11.4%	0	0.0%			
My sleep is completely disturbed (5-7 hrs sleepless).	2	5.7%	0	0.0%			
Section 10: Recreation							
I am able to engage in all my recreation activities with no neck pain at all.	2	5.7%	9	25.7%			
I am able to engage in all my recreation activities, with some pain in my neck.	6	17.1%	17	48.6%			
I am able to engage in most, but not all of my usual recreation activities because of pain in my neck.	2	5.7%	5	14.3%	1.514	5.056	< 0.001
I am able to engage in a few of my usual recreation activities because of pain in my neck.	18	51.4%	3	8.6%			
I can hardly do any recreation activities because of pain in my neck.	6	17.1%	1	2.9%			
I can’t do any recreation activities at all.	1	2.9%	0	0.0%			

Table E.2

Distribution of lumbar neurosurgery patients' responses to ODI statements (N = 99, mean differences are out of 5)

Statements	Preoperative		Postoperative		Mean dif.	t	p-value
	N	%	N	%			
1. Pain intensity							
I can tolerate the pain I have without having to use pain killers.	1	1.0%	32	32.3%	2.374	15.939	< 0.001
The pain is bad but I manage without taking pain killers.	9	9.1%	62	62.6%			
Pain killers give complete relief from pain.	21	21.2%	3	3.0%			
Pain killers give moderate relief from pain.	34	34.3%	2	2.0%			
Pain killers give very little relief from pain.	14	14.1%	0	0.0%			
Pain killers have no effect on the pain and I do not use them.	20	20.2%	0	0.0%			
2. Personal care (e.g., Washing, Dressing)							
I can look after myself normally without causing extra pain.	0	0.0%	56	56.6%	1.455	11.238	< 0.001
I can look after myself normally but it causes extra pain.	2	2.0%	19	19.2%			
It is painful to look after myself and I am slow and careful.	64	64.6%	5	5.1%			
I need some help but manage most of my personal care.	32	32.3%	19	19.2%			
I need help every day in most aspects of self-care.	1	1.0%	0	0.0%			
I don't get dressed; I wash with difficulty and stay in bed.	0	0.0%	0	0.0%			
3. Lifting							
I can lift heavy weights without extra pain.	0	0.0%	3	3.0%	2.081	18.454	< 0.001
I can lift heavy weights but it gives extra pain.	2	2.0%	55	55.6%			
Pain prevents me from lifting heavy weights off the floor, but I can manage if they are conveniently positioned, e.g., on a table.	9	9.1%	26	26.3%			
Pain prevents me from lifting heavy weights, but I can manage light to medium weights if they are conveniently positioned.	14	14.1%	13	13.1%			
I can lift very light weights.	72	72.7%	2	2.0%			
I cannot lift or carry anything at all.	2	2.0%	0	0.0%			
4. Walking							
Pain does not prevent me from walking any distance.	0	0.0%	9	9.1%	1.778	17.769	< 0.001
Pain prevents me from walking more than one mile.	2	2.0%	74	74.7%			
Pain prevents me from walking more than ½ mile.	17	17.2%	7	7.1%			
Pain prevents me from walking more than ¼ mile.	68	68.7%	9	9.1%			
I can only walk using a stick or crutches.	9	9.1%	0	0.0%			
I am in bed most of the time and have to crawl to the toilet.	3	3.0%	0	0.0%			

5. Sitting							
I can sit in any chair as long as I like.	0	0.0%	7	7.1%	0.828	7.266	< 0.001
I can only sit in my favorite chair as long as I like.	9	9.1%	51	51.5%			
Pain prevents me from sitting more than one hour.	51	51.5%	28	28.3%			
Pain prevents me from sitting more than ½ hour.	37	37.4%	11	11.1%			
Pain prevents me from sitting more than 10 minutes.	2	2.0%	2	2.0%			
Pain prevents me from sitting at all.	0	0.0%	0	0.0%			
6. Standing							
I can stand as long as I want without extra pain.	0	0.0%	4	4.0%	1.141	10.719	< 0.001
I can stand as long as I want but it gives me extra pain.	0	0.0%	28	28.3%			
Pain prevents me from standing for more than one hour.	21	21.2%	56	56.6%			
Pain prevents me from standing for more than 30 minutes.	71	71.7%	9	9.1%			
Pain prevents me from standing for more than 10 minutes.	2	2.0%	2	2.0%			
Pain prevents me from standing at all.	5	5.1%	0	0.0%			
7. Sleeping							
Pain does not prevent me from sleeping well.	0	0.0%	31	31.3%	2.202	18.077	< 0.001
I can sleep well only by using medication.	6	6.1%	55	55.6%			
Even when I take medication, I have less than 6 hrs sleep.	13	13.1%	9	9.1%			
Even when I take medication, I have less than 4 hrs sleep.	60	60.6%	4	4.0%			
Even when I take medication, I have less than 2 hrs sleep.	9	9.1%	0	0.0%			
Pain prevents me from sleeping at all.	11	11.1%	0	0.0%			
8. Sexual life							
My sexual life is normal and gives me no extra pain.	1	1.0%	4	4.0%	1.758	13.765	< 0.001
My sexual life is normal but increases the degree of pain.	3	3.0%	57	57.6%			
Pain has no significant effect on my sexual life apart from limiting my more energetic efforts.	11	11.1%	19	19.2%			
Sexual activities are rare because of the pain.	19	19.2%	2	2.0%			
The pain totally prevents me from sexual activity.	47	47.5%	0	0.0%			
I haven't married or had sexual activities	18	18.2%	17	17.2%			
9. Social life							
My social life is normal and gives me no extra pain.	2	2.0%	20	20.2%	1.848	16.852	< 0.001
My social life is normal but increases the degree of pain.	5	5.1%	66	66.7%			
Pain has no significant effect on my social life apart from limiting my more energetic interests, e.g., dancing, etc.	17	17.2%	10	10.1%			
Pain has restricted my social life and I do not go out as often.	62	62.6%	3	3.0%			

Pain has restricted my social life to my home.	12	12.1%	0	0.0%			
I have no social life because of pain.	1	1.0%	0	0.0%			
10. Travelling							
I can travel anywhere without extra pain.	2	2.0%	31	31.3%	1.657	10.752	< 0.001
I can travel anywhere but it gives me extra pain.	13	13.1%	44	44.4%			
Pain is bad, but I manage journeys over 2 hours.	23	23.2%	15	15.2%			
Pain restricts me to journeys of less than 1 hour.	40	40.4%	6	6.1%			
Pain restricts me to short necessary journeys under 30 minutes.	16	16.2%	3	3.0%			
Pain prevents me from traveling except to the doctor or hospital.	5	5.1%	0	0.0%			

Table E.3

Relationship between demographic factors and pre-post differences in PROMs scores among spinal neurosurgery patients

Factors		PROMs differences (postoperative – preoperative scores)													
		NDI		ODI		Utility score		EQ-VAS		PSQI		ESS		PHQ-9	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Age	30-44	-28.80	3.78	-34.79	7.86	0.65	0.29	53.33	24.07	-7.61	2.90	-7.03	1.94	-7.61	2.90
	45-59	-32.75	7.49	-34.34	7.00	0.64	0.25	45.74	26.82	-7.76	2.15	-6.50	2.00	-7.76	2.15
	≥60	-36.00	.	-30.67	5.89	0.55	0.25	31.43	19.52	-7.14	2.61	-8.86	2.67	-7.14	2.61
	F	0.795		0.826		0.445		2.365*		0.241		4.821*		0.241	
	Correlation	r = -0.082		r = 0.163		r = -0.098		r = -0.184*		r = -0.023		r = -0.037		r = -0.023	
Gender	Male	-30.18	4.13	-35.14	7.00	0.62	0.27	47.42	27.08	-7.86	2.39	-6.64	1.89	-7.86	2.39
	Female	-33.86	8.44	-33.29	7.33	0.65	0.24	46.32	25.39	-7.51	2.35	-6.87	2.26	-7.51	2.35
	t	1.696		-1.280		-0.692		0.243		-0.854		0.641		-0.854	
Residency	City	-35.26	6.38	-34.22	6.64	0.63	0.26	50.19	25.24	-7.44	2.08	-6.98	2.02	-7.44	2.08
	Rural	-30.22	6.51	-34.56	7.70	0.65	0.26	45.54	26.52	-7.83	2.52	-6.62	2.25	-7.83	2.52
	Camp	-29.14	7.60	-32.44	6.54	0.60	0.22	41.76	27.67	-7.88	2.62	-6.59	1.58	-7.88	2.62
	F	2.978*		0.329		0.357		0.826		0.453		0.502		0.453	
Education	Elementary	-35.31	9.22	-33.40	6.33	0.64	0.27	52.50	24.25	-8.35	2.98	-6.65	2.06	-8.35	2.98
	High school	-30.98	5.85	-33.08	7.21	0.61	0.24	45.85	27.83	-7.17	2.26	-6.77	2.29	-7.17	2.26
	University	-31.17	6.08	-35.32	7.29	0.66	0.27	45.90	25.39	-7.92	2.17	-6.77	1.93	-7.92	2.17
	F	1.306		1.148		0.528		0.542		2.397		0.029		2.397	
Marital status	Single	-35.11	4.29	-32.00	7.25	0.66	0.28	47.00	24.94	-7.45	2.35	-6.40	1.39	-7.45	2.35
	Married	-32.02	7.59	-34.51	7.34	0.65	0.25	47.40	25.49	-7.62	2.44	-6.81	2.25	-7.62	2.44
	Others	-32.00	4.00	-36.00	5.66	0.52	0.24	42.86	33.38	-8.50	1.74	-6.86	1.66	-8.50	1.74
	F	0.250		1.211		1.585		0.183		0.969		0.339		0.969	
Work	None	-34.08	8.21	-30.89	7.80	0.57	0.23	48.08	25.46	-7.58	2.98	-6.69	2.24	-7.58	2.98
	Governmental	-36.70	6.92	-33.78	7.16	0.59	0.30	47.50	26.74	-7.83	2.14	-6.92	2.12	-7.83	2.14
	Private	-29.08	4.93	-36.11	7.11	0.69	0.22	48.27	26.70	-7.46	2.12	-6.56	2.14	-7.46	2.12
	Self-employed	-34.31	8.71	-34.30	6.37	0.65	0.29	43.13	26.20	-8.03	2.40	-7.00	1.88	-8.03	2.40
	F	2.452		2.225		1.783		0.287		0.428		0.354		0.428	
Income	<1800	-28.06	4.84	-33.00	8.53	0.63	0.28	47.88	27.24	-7.42	2.96	-6.88	2.09	-7.42	2.96
	1800-3000	-31.54	6.87	-33.49	5.50	0.62	0.26	45.85	26.27	-8.28	1.97	-6.40	1.88	-8.28	1.97
	3001-5000	-36.94	7.48	-36.32	7.45	0.63	0.24	48.18	27.44	-7.48	2.32	-7.30	2.53	-7.48	2.32
	>5000	-35.00	7.07	-34.77	7.68	0.72	0.24	45.33	22.32	-6.60	1.84	-6.53	1.46	-6.60	1.84
	F	2.411		1.113		0.549		0.086		2.478		1.394		2.478	

* = Significant difference in improvement at p-value < 0.05. PROMs = Patient-reported outcomes measures, NDI = Neck Disability Index, ODI = Oswestry Disability Index, EQ-VAS = EuroQoL Visual Analogue Scale, PSQI = Pittsburg Sleep Quality Index, ESS = Epworth Sleepiness Scale, PHQ-9 = Patient Health Questionnaire, t = independent samples t-test value, F = one-way ANOVA test value, SD = standard deviation.

Table E.4

Relationship between patients' health and operation-related factors and pre-post differences in PROMs scores among spinal neurosurgery patients

Factors		PROMs differences (postoperative – preoperative scores)													
		NDI		ODI		Utility score		EQ-VAS		PSQI		ESS		PHQ-9	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Site	Cervical	-32.28	7.09	.	.	0.68	0.28	48.86	25.29	-7.71	2.66	-6.57	2.17	-7.71	2.66
	Lumbar	.	.	-34.24	7.18	0.62	0.25	46.16	26.52	-7.68	2.26	-6.82	2.06	-7.68	2.26
	t	-		-		1.018		0.523		-0.080		0.601		-0.080	
Type	Discectomy	-33.04	7.04	-33.05	6.54	0.65	0.26	46.37	27.11	-7.58	2.14	-6.79	2.01	-7.58	2.14
	Tumor	-29.64	6.94	-36.67	7.32	0.61	0.27	44.25	24.80	-7.83	2.33	-6.67	2.15	-7.83	2.33
	Congenital	-36.67	7.86	-33.83	8.80	0.65	0.19	57.14	23.35	-7.93	3.58	-6.79	2.42	-7.93	3.58
	F	2.689*		2.951*		0.225		1.302		0.228		0.040		0.228	
HTN	Yes	-33.88	7.76	-33.86	7.35	0.59	0.29	47.25	25.32	-7.53	2.49	-6.83	2.21	-7.53	2.49
	No	-31.55	6.80	-34.40	7.16	0.66	0.24	46.70	26.62	-7.76	2.32	-6.72	2.04	-7.76	2.32
	t	-0.091		0.338		-1.206		0.111		0.515		-0.257		0.515	
DM	Yes	-29.64	6.33	-35.28	7.87	0.66	0.23	50.91	27.99	-7.48	2.22	-7.12	2.45	-7.48	2.22
	No	-33.06	7.22	-33.89	6.96	0.63	0.27	45.54	25.51	-7.75	2.41	-6.63	1.95	-7.75	2.41
	t	1.208		-0.834		0.577		1.024		0.563		-1.042		0.563	
Hormonal	Yes	-29.44	8.78	-30.38	8.07	0.60	0.26	40.50	23.28	-8.10	2.36	-6.30	1.89	-8.10	2.36
	No	-32.64	6.93	-34.99	6.80	0.64	0.26	47.98	26.55	-7.61	2.37	-6.83	2.11	-7.61	2.37
	t	0.847		2.409*		-0.701		-1.182		-0.847		1.057		-0.847	
Other comorbidities	Yes	-30.67	4.75	-37.75	9.10	0.55	0.30	52.31	27.74	-7.46	1.94	-5.85	1.86	-7.46	1.94
	No	-32.55	7.43	-33.93	6.97	0.65	0.25	46.28	26.02	-7.71	2.41	-6.85	2.09	-7.71	2.41
	t	0.544		-1.448		-1.252		0.789		0.360		1.664		0.360	
NSAIDs	Yes	-30.69	6.66	-33.86	6.55	0.65	0.23	47.25	26.86	-7.70	2.39	-6.91	2.23	-7.70	2.39
	No	-34.67	7.27	-34.80	8.09	0.63	0.29	46.30	25.28	-7.67	2.35	-6.52	1.83	-7.67	2.35
	t	1.669		0.634		0.441		0.206		-0.080		-1.075		-0.080	
Paracetamol	Yes	-32.25	6.22	-33.88	6.79	0.64	0.24	43.76	25.87	-7.78	2.42	-6.71	1.97	-7.78	2.42
	No	-32.38	10.52	-34.94	7.94	0.64	0.30	53.90	25.68	-7.46	2.25	-6.85	2.34	-7.46	2.25

	t	0.042		0.698		-0.073		-2.095*		-0.724		0.368		-0.724	
Muscle relaxants	Yes	-32.12	7.51	-34.44	7.13	0.67	0.26	41.78	26.68	-8.01	2.34	-6.67	2.24	-8.01	2.34
	No	-32.44	6.83	-34.00	7.33	0.60	0.25	52.95	24.31	-7.30	2.35	-6.85	1.90	-7.30	2.35
	t	0.132		-0.299		1.636		-2.512*		-1.767		0.500		-1.767	
Cortisones	Yes	-32.71	7.48	-33.09	6.74	0.66	0.25	47.38	26.90	-7.60	2.37	-6.80	2.10	-7.60	2.37
	No	-30.57	5.33	-37.83	7.48	0.57	0.26	45.16	23.79	-7.97	2.36	-6.61	2.04	-7.97	2.36
	t	-0.708		2.919*		1.700		0.413		0.754		-0.428		0.754	
Other meds.	Yes	-32.07	8.54	-33.58	5.80	0.60	0.24	41.72	28.04	-7.48	2.25	-6.48	1.90	-7.48	2.25
	No	-32.36	6.62	-34.40	7.50	0.65	0.26	48.29	25.55	-7.74	2.40	-6.83	2.13	-7.74	2.40
	t	0.110		0.446		-0.842		-1.199		0.523		0.790		0.523	
Period till op.	Correlation	r = 0.273		r = -0.071		r = -0.017		r = -0.093		r = 0.021		r = 0.162		r = 0.021	
Weight	Correlation	r = -0.058		r = 0.038		r = -0.097		r = 0.127		r = 0.094		r = -0.003		r = 0.094	
Height	Correlation	r = 0.023		r = -0.077		r = 0.082		r = 0.119		r = 0.140		r = 0.031		r = 0.140	
BMI	Correlation	r = -0.058		r = 0.100		r = -0.123		r = 0.008		r = -0.041		r = -0.031		r = -0.041	

Note: = Significant difference in improvement at p-value < 0.05. PROMs = Patient-reported outcomes measures, NDI = Neck Disability Index, ODI = Oswestry Disability Index, EQ-VAS = EuroQoL Visual Analogue Scale, PSQI = Pittsburg Sleep Quality Index, ESS = Epworth Sleepiness Scale, PHQ-9 = Patient Health Questionnaire, t = independent samples t-test value, F = one-way ANOVA test value, SD = standard deviation, r = correlation coefficient, HTN = Hypertension, DM = Diabetes Mellitus, NSAIDs = non-steroidal anti-inflammatory drugs, BMI = Body Mass Index.*

جـامعـــة النجاح الوطنية
كليـــة الدراســـات العليـــا

مقاييس النتائج المبلّغ عنها من قبل المريض عن الألم وجودة الحياة والحالة النفسية وجودة النوم بين مرضى جراحة الأعصاب في العمود الفقري في فلسطين: دراسة كمية طولية مستقبلية

إعداد
أحمد عبد الرحمن أسعد دقه

إشراف
د. جمال قدومي

قدمت هذه الرسالة استكمالا لمتطلبات الحصول على درجة الماجستير في البحث السريري، من كلية الدراسات العليا، في جامعة النجاح الوطنية، نابلس– فلسطين.
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الملخص

المقدمة: يعد استخدام مقاييس النتائج المبلغ عنها من قبل المرضى (PROMs) تطبيقًا لنموذج الرعاية الصحية القائم على القيمة بدلاً من الحجم، وقد تم استخدامه بشكل كمي في مجال جراحة الأعصاب. بناءً على ذلك، هدفت الدراسة الحالية إلى التحقيق في المقاييس المبلغ عنها من قبل المرضى قبل وبعد العمليات الجراحية، بالإضافة إلى التغيرات والعوامل المؤثرة فيها، بين مرضى جراحة الأعصاب في العمود الفقري في مستشفى ثالثي في فلسطين.

الطريقة: أُجريت الدراسة باستخدام تصميم طولي استباقي على عينة مريحة تضم 99 مريضًا لجراحة الفقرات القطنية و35 مريضًا لجراحة الفقرات العنقية. تم مقابلة المرضى لملء استبيان قبل العملية وبعد شهر واحد من العملية، لقياس الألم، جودة الحياة (QoL)، جودة النوم، والصحة النفسية كمقاييس للنتائج. تم استخدام نسخ مترجمة إلى اللغة العربية ومعتمدة من أدوات مثل مؤشر إعاقة الرقبة (NDI)، مؤشر إعاقة أسفل الظهر (ODI)، استبيان جودة الحياة الأوروبي (EQ-5D-5L)، مؤشر بيتسبيرغ لجودة النوم (PSQI)، مقياس إبوورث للإغفاءة (ESS)، واستبيان صحة المريض (PHQ-9). تم تحليل البيانات باستخدام برنامج SPSSمع التزام تام بالاعتبارات الأخلاقية لضمان المجهولية والسرية.

النتائج: بلغ متوسط أعمار المرضى 49.16 عامًا، وكان 50.7% منهم إناثًا، و74.6% متزوجين، و59.7% أجروا عمليات استئصال القرص، بمتوسط فترة بين التشخيص والجراحة 7.15 أسابيع. استخدم المرضى الأدوية التالية قبل العمليات: الباراسيتامول 69.4%، الكورتيزون 76.9%، ومضادات الالتهاب غير

الستيرويدية 59.7%. أظهرت جميع مقاييس (PROMs) تحسنًا كبيرًا بعد العمليات الجراحية (القيمة الاحتمالية < 0.001)، حيث لوحظت تحسينات أفضل في مؤشر (NDI) بين سكان المدن والمرضى الذين أجروا عمليات مرتبطة بأمراض خلقية، وتحسينات في مؤشر (ODI) بين المرضى الذين أجروا عمليات استئصال الأورام، ولم يعانوا من اضطرابات هرمونية أو استخدام الكورتيزون قبل العمليات، بينما أظهرت تحسينات في مؤشر EQ-VAS بين المرضى الأصغر سنًا، والذين لم يستخدموا الباراسيتامول أو مرخيات العضلات قبل العمليات، وأظهرت تحسينات أفضل في مؤشر ESS بين المرضى الأكبر سنًا (القيمة الاحتمالية < 0.05).

الخلاصة: وجدت الدراسة الحالية تحسنًا كبيرًا بشكل عام بين مرضى جراحة الأعصاب في العمود الفقري في مقاييس (PROMs) المتعلقة بالألم، جودة الحياة، جودة النوم، والصحة النفسية. ارتبطت بعض التحسينات الملحوظة بعوامل ديموغرافية وصحية محددة. تتفق العديد من الدراسات مع نتائج الدراسة الحالية، مع وجود اختلافات في العوامل المؤثرة تعود إلى اختلافات في عينات الدراسة وخصائص السكان. يوصى بإشراك المرضى في برامج التثقيف قبل العمليات، وتخصيص الموارد، وإجراء تجارب سريرية عشوائية.

الكلمات المفتاحية: مقاييس النتائج المبلغ عنها من قبل المرضى؛ جراحة الأعصاب في العمود الفقري؛ الفقرات العنقية؛ الفقرات القطنية؛ الألم؛ جودة الحياة؛ جودة النوم؛ اضطرابات النوم؛ النعاس؛ الصحة النفسية.