SECONDARY COMPLICATIONS AMONG PERSON'S WITH SPINAL CORD INJURY AND BEST PRACTICES FOR LIFE CARE PLANNERS

A Dissertation

by

NOEL A. YSASI JR.

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COMMITTEE MEMBERS

Dr. Irmo Marini
Chair of Committee

Dr. Roy Chen
Committee Member

Dr. Bruce Reed
Committee Member

Dr. Ralph Carlson
Committee Member

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ABSTRACT

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The current study was intended to deliver life care planners with a guide as to whether or not secondary complications (SCs) should be included within the LCP, while obtaining the professional opinion of physiatrists as to the incidence rate of SCs. Each research question was designed to determine whether differences exist between life care planners (LCPs) and physiatrists in their knowledge regarding SCs while comparing their responses with empirical research. In addition, it was determined to investigate whether costs should be included in a LCP based on the reports given from certified and non-certified LCPs; even though it meets the possibility (less than 50%) threshold rather than the probable (51% or greater) threshold. Lastly, this researcher wanted to examine the ethical considerations of LCPs as to whether they ever felt pressure to include costs in an effort to secure future employment by attorneys.

The overall results revealed the vast majority of certified-LCPs reported favoring the inclusion of costs associated with probable SCs rather than possible; a clear indication that the standards of practice as set forth by various foundations for certification instills the principles necessary for the profession. Furthermore, the majority of all respondents reported conducting plans more so for plaintiff rather than for defense cases.

Subsequently, the vast majority of physiatrist-LCPs believed conducting a life care plan should only include costs recommended by a physician *rather* than both a medical professional in conjunction with the empirical literature that supports their position. Moreover, the vast majority of physiatrist LCPs and non-certified LCPs reported the use of empirical research as not warranted when developing plans, and do not believe empirical validation regarding whether to include possible complications versus probable complications to allow for consistency among the field as necessary. Additional findings are reported in addition to the limitations of the study, future research and suggestions are also discussed.

DEDICATION

My dissertation is dedicated to my family. To my fiancé, Ira Silva, thank you for steadfastly nurturing me throughout this journey and without complaint. You were always there to listen to me and support me throughout my journey. I am forever grateful and would not have accomplished such an overwhelming task had it not been for your beautiful soul that always comforted me. The past three years were not easy but with your love, patience, and encouragement, every day was promising. Thank you for always being there to lend a hand, and offer words of encouragement. I love you dearly.

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CHAPTER I

INTRODUCTION

Since the 1980s, a subspecialty of rehabilitation counseling called life care planning has grown considerably as one of the most effective case management methods for determining the long-term future medical care needs and related costs for individuals who have sustained severe and permanent injuries (Blackwell et al., 1997; Deutsch et al., 1989; Kitchen et al., 1989; Weed 2007; Weed & Sluis, 1990). A life care plan (LCP) is a comprehensive document that details and projects the prospective future medical and rehabilitative needs of individuals who have sustained a severe traumatic injury or illness (Priebe et al., 2007). The forensic specialization of life care planning and expert testimony is an adversarial arena where plaintiff experts and their opinions are often pitted against those on the defense. Ideally, if life care planners have abided by the same standard protocol methodology established by the International Academy of Life Care Planners, their overall opinions and relative costs for future medical care should be relatively the same. In reality however, life care planners are sometimes millions of dollars apart on their recommendations and subsequent cost projections for the injured party's medically reasonable and necessary future financial needs to care for their disability. With the field of life care planning growing by a number of differently trained professionals (i.e., rehabilitation counselors, nurses, physicians, etc.), the need for a standardized approach within the field regardless of educational background is critical to develop effective outcome measurements (Weed, 2010b).

In addition to a standardized approach, the process involved in life care planning requires an ethical responsibility to develop an objective or impartial document that accurately depicts the long-term future medical needs of the injured party (Sutton, Deutsch, Weed, & Berens, 2010). A critical component in determining future medically reasonable care needs involves the reliability of the life care plan as it provides a predictive outcome. It is here that the challenge arises as each person whom sustains a disability differs in age, type and severity of injury, pre-injury comorbid disabilities, and other demographics; all potential factors playing a key role as to the specific accommodations to be expected and any future prognosis likely to occur (Sutton et al., 2010).

In a study examining life care plans for 10 individuals with SCI, findings indicated a consistency among the LCPs with regards to the projected and anticipated outcomes (McCollom & Crane, 2001). This small study illustrates the ability for LCPs to produce reliable and valid life care plans. In addition, a similar study was conducted by Sutton et al. (2010) among 130 LCPs from 65 anonymous cases. The authors found no statistically significant differences using chi-square analyses in terms of home/facility care and future routine medical care. The findings indicated these experts developed their life care plans based on "need" instead of "cost." In addition, Sutton et al. (2010) recommended the need regarding additional research to be conducted among different life care planners with various levels of experience who likewise hold fast to norms of practice to determine whether there is consistency among them when developing these plans. Sutton et al. (2010) addressed the need for standardizing the life care planning process among all LCPs.

Life Care Plans and Expert Testimony in Litigation

Pre-1993, federal and state courts generally permitted expert opinion based on education, training, and experience often without question. During that period, opposing experts from the same discipline often gave vastly different opinions, some of which was purely conjecture without any empirical or peer support. As such, the courts rarely challenged an expert's opinion because he or she essentially was an expert on the subject matter (Johnston & Sartwelle, 2013). Such testimony however, was challenged in June 1993 in the case of *Daubert v. Merrill Dow Pharmaceuticals* ruling. Prior to *Daubert*, stringent standards were not required for those providing expert testimony. The case of *Daubert* involved the parents of Jason Daubert and Eric Schuller to prove the drug Bendectin ingested during pregnancy in an effort to alleviate morning sickness; this drug however was questioned as to whether it caused serious birth defects to both children (Johnston & Sartwelle, 2013; Solomon & Hacket, 1996). Although the plaintiff provided eight expert witnesses, the evidence was considered inadmissible by the court specifically due to the lack of empirical research that could be validated among the experts within their respective field. In addition, the experts retained by the plaintiff conducted experiments to conclude Bendectin did indeed cause the birth defects; however, their research was solely conducted to prepare for litigation (Johnston & Sartwelle, 2013).

Subsequently, the empirical support requirement ruling from the *Daubert* case to improve upon the reliability of expert testimony, required additional factors to be included as a "checklist" and have since been expected in most U.S. courts. These factors involved the need for (1) the argument or theory to be validated by one's peers within the scientific community when discussing the specific technique implemented; (2) publication involving the peer review process of theory and technique; (3) the rate of error should be considered and provided; (4) the method utilized for providing expert testimony should be accepted among the scientific community; and (5) whether the process of deriving to a particular conclusion has been done in a reliable fashion; (Hoyt & Aalberts, 2001; Johnston & Sartwelle, 2013). The *Daubert v. Merrill Dow Pharmaceuticals* court ruling created the foundation for those providing expert testimony.

After the *Daubert* ruling, litigation changed as other expert testimonials were required to adhere to similar standards. In 1999, the court ruling regarding *Kumho Tire Company v. Carmichael* ruled against the defense as the "checklist" provided from the *Daubert* ruling had not been fully applied. The case involved an automobile accident caused by a "blown tire" manufactured by Kumho Tires which left several injured and one killed. The testimonial provided by a "tire failure expert" claimed the tire was defective and the primary cause of the incident (Rutkin, 1999). The U.S. Supreme Court applied the *Daubert* case and acted as a "gatekeeper," stating the evidence provided by the tire failure expert was inadmissible in court as the methodology utilized was deemed unreliable (Hoyt & Aalberts, 2001; Rutkin, 1999).

The *Daubert* ruling continues to provide a standard to be implemented during litigation in an effort to promote reliable and unbiased expert testimony. "No longer would an expert's bare assurance that he or she had utilized generally accepted scientific methodology be sufficient. Nor would an expert's subjective belief or unsupported speculation be a substitute for real science" (Johnston & Sartwelle, 2013, p. 488). In developing life care plans, the expert's opinions must be in line with what is generally accepted in the field by his or her peers and must be validated by a scientific methodology with reliable empirical support.

Expert Testimony: **Possibility versus Probability**

In the legal arena regarding tort cases, experts must testify within a reasonable degree of life care planning certainty. This certainty revolves around the fact that, in this instance, in order for the inclusion of costs for a prospective secondary complication (SC), the life care planner's opinion must occur with a probability of 51% or greater chance of occurring one or more times over an individual's life expectancy. Instances where life care planners include costs for SCs that are only deemed possible (chance of occurring is less than 49%) would technically be classified as speculative because those opinions could be viewed as lacking empirical support in their probable occurrence. The insertion of such costs should ideally be supported by case specific medical evidence, medical opinions and/or empirical literature that's supports the probability of such complications occurring rather than their possibility. Problems in this area arise however, when opposing experts are referencing only selected empirical studies that support their respective opinion and whichever side (plaintiff or defense) has retained their services. Following the standard protocol, potential complications are indeed cited in the life care plan noting their relative costs; however, dollar amounts are not actually included in the overall life care plan costs because they do not exceed the probability threshold and, therefore, are viewed as possible but speculative (Reid, Deutsch, Kitchen, & Aznavoorian, 1997; Marini, 2012).

Secondary complications. As defined by the Institute of Medicine, "a secondary condition is a condition that is causally related to a disabling condition (i.e., occurs as a result of the primary disabling condition) and can be either a pathology, an impairment, a functional limitation, or an additional disability" (Pope & Tarlov, 1991, p. 214). Furthermore, it is the existence of a primary disability such as SCI that facilitates high risk factors for SC; therefore, a condition that does occur is specifically the result of the primary condition or it otherwise would not normally occur (Pope & Tarlov, 1991). For individuals with SCI, nearly 95% sustain at least one SC as a direct result of their injury. These can include, but are not limited to, urinary tract infections, respiratory illnesses, pressure sores, pain, spasticity, and fatigue (Anson & Shepherd, 1996; Hammell, Miller, Forwell, Forman, & Jacomsen, 2009). Secondary complications have been a significant and debated concern for life care planners as to the prevalence of specific health concerns, overall cost, and projections that should be included within the LCP (Myers, Andresen, & Hagglund, 2000).

Statement of the Problem

Secondary complications vary in frequency of occurrence and severity based on a number of factors that continue to have an inconclusive range of findings among medical researchers. (Consortium for Spinal Cord Medicine, 2000). A plethora of literature exits on SCI complications exploring differences between age of onset, minority status, smoking/alcohol use, gender, time since injury, comorbid disabilities, and severity and completeness of injury. The inclusion of such costs should ideally be supported by case specific medical evidence, medical opinions and/or empirical literature that support the probability of such complications; otherwise, following standard protocol, possible potential complications should be noted in the life care plan "without" these costs being included (Reid et al., 1997). The principle behind the exclusion of potential complications is based in part on the premise that the life care plan is meant to be a preventative-of-complications document. Recommendations outlined in the plan, when implemented, are intended to reduce the rate of SC (Deutsch & Reid, 2001). Without the preventative medical care outlined in the plan, the individual with the disability may have increased costs as a result of disability-related complications (Weed, 2002). In some respects, developing a proactive, preventative-of-complications life care plan can then seem counter-intuitive or contradictory to include possible complications and their costs regardless of preventative measures (Marini, 2012).

In addition, what may be considered the elephant in the room centers around ethics and expert opinions being pro-offered with bias leaning toward whichever side has retained them in an effort to increase the likelihood of future referrals and essentially more business for the expert from the same firm. Marini (2012) anecdotally discusses the statistical fact that plaintiff life care plans are most often more expensive in future medical care projections than defense life care plans regarding the same individual. Although an expert witness, in theory (and under oath by law), is supposed to provide objective, impartial opinions regardless of which side has retained him or her, this rarely appears to be the case. When an expert is caught "flip-flopping" his or her opinions for a similar disability working for the plaintiff one time and the defense another, his or her credibility and ethics come into question.

Although the specialization of life care planning has developed over the last 30 years establishing a standard, methodological protocol for developing life care plans (Reid et al., 1997; Weed, 2010), opinions still vastly differ regarding when and when not to include secondary complication costs. This is due in part to verifying medical expert opinions obtained through consultation as well as reliance upon a certain segment of the empirical literature while ignoring contradictory studies regarding the frequency of complications occurring. As a result, two opposing life care plans can be millions of dollars apart in overall costs because the opposing experts are relying upon different information. One way in attempting to resolve this problem is to survey the opinions of life care planners and physiatrists as to whether they believe the secondary complications of SCI are more probable than possible in one's lifetime. An exploration of overall expert opinions could provide life care planners with a consensus that can support their opinions in a court of law.

Need for the Study

One of the areas that have not been explored empirically in SCI cases is whether to include the cost of projected future SC medical treatment. The lack of research concerning the inclusion of financial costs imbedded within the LCP specific to SCIs and the possibility versus probability debate will be the central goal in da standardized approach when developing LCPs in an effort to prevent the over or underestimation of such costs. The risks of SCI secondary health complications include, but are not limited to: pressure ulcers (decubiti), deep vein thrombosis, autonomic dysreflexia, respiratory dysfunction, spasticity, upper extremity/repetitive motion overuse syndrome and chronic pain, urinary tract infections, heterotrophic ossification and others. This research will survey life care planners and physiatrists requesting their professional estimations regarding the inclusion of these SC, thus providing an empirically validated foundation for life care planners to know when or when not to include future medical care costs for such complications. As previously discussed, life care planners can be millions of dollars off in determining the overall costs future medical care.

Significance of the study. The literature regarding SCs among individuals with SCI does indeed exist; however, a limitation involves the lack of empirically explored SCI cases regarding the inclusion of expenditures of projected future SC's for medical treatment. This study intends to provide life care planners with a guide as to whether or not particular SC's should be included within the LCP. Additionally, results of the study will provide life care planners with additional support from other physiatrists as to whether the inclusion of a cost should be added for specific SCs.

The following research questions will be used to guide the research in the proposed study:

Research Questions for Life-Care Planners

RQ 1: Are there relationships between life care planner demographics and ratings concerning the possibility versus probability of secondary complication costs imbedded within the life care plan?

H_{o1}: There are no differences among life care planner ratings concerning the possibility versus probability regarding inclusion of secondary complication costs within the life care plan.

RQ 2: Are ratings of the likelihood of 13 secondary complications a function of life care planner demographics?

H_{o2}: Ratings of the likelihood of 13 secondary complications is not a function of life care planner demographics.

RQ 3: Are ratings of the frequency of 13 SCs requiring hospitalization and/or treatment a function of life care planner demographics?

H_{o3}: Ratings of the frequency of 13 SCs requiring hospitalization and/or treatment is not a function of life care planner demographics.

Research Questions for Physiatrists

RQ 4: Are there relationships between LCP-physiatrist demographics and ratings concerning the possibility versus probability of secondary complication costs imbedded within the life care plan?

H_{o4}: There is no relationship between LCP-physiatrist demographics and ratings concerning the possibility versus probability of secondary complication costs imbedded within a life care plan.

RQ 5: Are ratings of the likelihood of 13 SCs a function of physiatrist demographics?

H_{o5}: Ratings of the likelihood of 13 SCs is not a function of LCP-physiatrist demographics.

RQ 6: Are ratings of the frequency of 13 SCs requiring hospitalization and/or treatment a function of physiatrist demographics?

H_{o6}: Ratings of the frequency of 13 SCs requiring hospitalization and/or treatment is not a function of life care planner demographics.

RQ 7: Are ratings pertaining to the likelihood of SCs if preventative measures are taken/not taken a function of physiatrist demographics?

H_{o7}: Ratings pertaining to the likelihood of SCs if preventative measures are taken/not taken is not a function of physiatrist demographics?

Research Questions for the Comparison of LCPs and Physiatrists

RQ 8: Do LCP physiatrists and non-LCP physiatrists differ in their summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, after controlling for relevant demographic variables?

H_{o8}: There is no difference between LCP physiatrists and non-LCP physiatrist in their summary of ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, after controlling for relevant demographic variables.

RQ 9: Is there a difference between LCPs and non-LCP physiatrists in their summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, after controlling for relevant demographic variables?

H_{o9}: There is no difference between LCPs and non-LCP physiatrists in their summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, after controlling for relevant demographic variables?

RQ 10: Do LCPs and LCP physiatrists differ in their summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, after controlling for relevant demographic variables?

H_{o10}: There is no difference between LCPs and LCP physiatrists in their summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, after controlling for relevant demographic variables.

RQ 11: Is there a relationship between summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, life care planners versus LCP-physiatrists, and whether the bulk of life care plans are identified as plaintiff or defense cases?

H_{o11}: There is no relationship between summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, life care planners versus LCP-physiatrists, and whether the bulk of life care plans are identified as plaintiff or defense.

RQ 12: Do certified and non-certified LCPs and LCP-physiatrists differ on whether they have felt pressure to increase costs when developing plans for plaintiff cases?

H_{o12}: There is no difference between certified and non-certified LCPs and LCP-physiatrists on whether they have felt pressure to increase costs when developing plans for plaintiff cases.

RQ 13: Do LCP physiatrists and non-LCP physiatrists differ in their summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, after controlling for relevant demographic variables?

H_{o13}: There is no difference between LCP physiatrists and non-LCP physiatrists in their summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, after controlling for relevant demographic variables.

RQ 14: Do LCPs and non-LCP physiatrists differ in their summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, after controlling for relevant demographic variables?

H_{o14}: There is no difference between LCPs and non-LCP physiatrists in their summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, after controlling for relevant demographic variables.

RQ 15: Do LCPs and LCP physiatrists differ in their summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, after controlling for relevant demographic variables?

H_{o15}: There is no difference between LCPs and LCP physiatrists in their summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, after controlling for relevant demographic variables.

RQ 16: Is there a relationship between summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, life care planners versus LCP-physiatrists, and whether the bulk of life care plans are identified as plaintiff or defense cases?

H_{o16}: There is no relationship between summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, life care planners versus LCP-physiatrists, and whether the bulk of life care plans are identified as plaintiff or defense cases.

RQ 17: Do certified and non-certified LCPs and LCP-physiatrists differ on whether they have felt pressure to increase costs when developing plans for plaintiff cases?

H_{o17}: There is no difference between certified and non-certified LCPs and LCP-physiatrists on whether they have felt pressure to increase costs when developing plans for plaintiff cases.

Limitations of the Study

Several limitations can be found in this study. Because it is the first of its kind, the instrument being utilized to survey life care planners and physiatrists was developed for this study. To increase the reliability and validity, three experts within the field of life care planning and one physiatrist was asked to review the survey to assess for content, criterion, and face validity. In addition, a non-probability (convenience) sampling method to ensure a significant number of participants take part in the study is being implemented. Another limitation concerns survey research and the possibility of participants responding in a socially desirable fashion or with a laissez-faire attitude despite the surveys being anonymous. Finally, generalizability of findings will be limited by those life care planners and physiatrists who choose to take part in the study, but not account for those experts and their reasons for not wanting to take part.

Summary

The subspecialty of life care planning is one in which about one half of all certified life care planners are rehabilitation counselors by training. In the adversarial legal arena, the law now requires life care planners and other experts to give opinions that are based on a scientific and methodological foundation within one's field of expertise and supported by peer-reviewed empirical evidence. In developing life care plans for persons with SCI, retained experts on opposing sides sometimes have vastly different opinions that can amount to being millions of dollars apart in relation to the inclusion or lack thereof of potential secondary complication costs related to SCI. The primary goal of this first time present study is to survey life care planners and physiatrists to obtain their overall opinions on the 13 most common secondary complications of

SCI, and whether these experts believe these complications are more or less likely to occur with a certain degree of probability. These findings would be of practical significance for life care planners to cite when testifying and bolster (or negate) their opinions.

Definition of Terminology

Life Care Plan: An extensive document that lays out the prospective medical and rehabilitative requirements of the individuals who sustained a traumatic injury or illness (Priebe, 2007).

Secondary Complication: "a condition that is causally related to a disabling condition (i.e., occurs as a result of the primary disabling condition) and can be either a pathology, an impairment, a functional limitation, or an additional disability" (Pope & Tarlov, 1991, p. 214).

Probability of Secondary Complications: The likelihood a secondary complication will occur 51% of the time or greater over the lifetime for a person with SCI.

Possibility of Secondary Complications: The likelihood a secondary complication will occur less than or equal to 49% over a lifetime for a person with SCI.

Plaintiff: the plaintiff is referred to the person filing for compensation of monetary damages or a legal remedy for a disability they have sustained and represented by a plaintiff's attorney.

Defense: In personal injury cases, the defense generally represents a corporation for alleged product liability malfunction or a physician for medical malpractice.

CHAPTER II

REVIEW OF LITERATURE

Life care planning is a new subspecialty for rehabilitation counselors and related disciplines that emerged in the United States in the 1980's. The first appearance of the term "life care plan" appeared in a legal publication titled, *Damages in Tort Actions* (Deutsch & Raffa, 1981). The methodology of life care planning provided professionals with a consistent process of analyzing the direct and lifelong necessities of patients with catastrophic impairments or complex medical needs. In 1985, the life care plan was introduced to the rehabilitation community in the *Guide to Rehabilitation* and it remains the authoritative treaties to this day (Deutsch & Sawyer, 1985). Intended originally as a case management approach to disability, life care plans developed into guiding principles for assessing and determining the economic damages in civil litigation suits. With the continuous growth of the life care planning field, insurance companies, attorneys, judges, and families seeking an established protocol estimate regarding the long term medical care need costs of persons with a chronic illness or disability; the growing need for retaining life care planners to determine these needs has been used in both litigated and non-litigated cases (Weed, 2010a). In litigation, life care planners are retained by plaintiff and defense attorneys to develop a comprehensive plan that will assess the detailed costs of future medical needs and services (Weed & Field, 1994). The current definition of a life care plan was embraced at the 1998 International Association of Rehabilitation Professionals and is as follows (International Academy of Life Care Planners, 2006):

> A Life Care Plan is a dynamic document based upon published standards of practice, comprehensive assessment, data analysis and research, which provides an organized, concise plan for current and future needs with associated costs for individuals who have experienced catastrophic injury or have chronic health care needs. (p. 123).

Weed and Field (2001) noted the following examples of catastrophic injuries that often necessitate the development of a life care plan: Spinal cord injury, traumatic brain injury, cerebral palsy, blindness, severe burns, amputations, organ transplantation, and congenital abnormalities. Conditions such as diabetes, multiple sclerosis, stroke, and cardiopulmonary diseases that are chronic disabling conditions may also be considered for a life care plan. After the introduction of life care planning to the rehabilitation community in 1985, the first peer-reviewed journal article on the topic of life care planning was published in the *Journal of Private Sector Rehabilitation* in 1986 (Weed, 2010a). Over recent decades, organizations including the American Academy of Nurse Life Care Planners and the International Academy of Life Care Planners (IALCP) were formed for the specialty of life care planners (Gonzalez & Zotovas, 2014). Due in part to the multidimensionality in the field of life care planning, professionals from numerous disciplines have been attracted to the field. Professions include, but are not limited to, allied health, rehabilitation counseling, medicine, social work, nurses, physiatrists, case managers, psychology, physical therapy, and occupational therapy.

Certification and Standards of Practice

Currently, the life care planning industry continues to grow with the availability of professional certification and continuing education. In order to be qualified for certification, no state issues a license for life care planners, but a professional must have attained a certification or licensure in his or her primary discipline (Weed & Berens, 2010). The Commission on Health Care Certification (CHCC) developed the Certified Life Care Planner (CLCP) credential. It requires that applicants should have a minimum of three years' field experience within the five years preceding application for certification, complete a minimum of 120 hours of training specific to life care planning, effectively complete a peer reviewed life care plan or one year of supervision with a CLCP, and attain a passing score on the certification examination (Commission on Health Care Certification, 2012). CHCH requires training programs onsite and online to incorporate the following knowledge, skills and expertise into their curriculum: An orientation of life care planning and case management, assessment of rehabilitation potential, medical and rehabilitation aspects of disability, development of life care plans, consultation in life care planning, and professional and operations issues (Commission on Health Care Certification, 2012).

As an affiliate of the health care profession, life care planners must continue to take a practical approach upholding the ethical and standards of practice and remaining up to date with the most current information impacting the life care planning community (Weed, 2010). Life care planners are expected to uphold the appropriate standards of performance and practice by; preserving confidentiality, avoiding dual relationships, properly informing clients of the roles of the life care planner and maintaining competency in the profession (Weed, 2010). The *Standards of Practice for Life Care Planners* allude to standards of care and clinical practice guidelines from dependable sources as being one of the fundamentals of plan development research (International Academy of Life Care Planners, 2006). Furthermore, depending on the severity of disability, the life care planning approach includes 18 different areas of projected medical care needs and services to provide the most comprehensive plan. This foundation provides life care planning professionals the tools and standard methodology to make future projections and consult with multiple health care providers to develop the most precise care plan possible. Subsections of a life care plan, depending on the disability, may include:

- Projected evaluations
- Projected therapeutic modalities
- Diagnostic testing/education assessment
- Wheelchair needs
- Wheelchair accessories and maintenance
- Aids for independent functioning
- Orthotics/ prosthetics
- Home furnishing and accessories
- Drug/supply needs
- Home care/facility care
- Future medical care-routine
- Transportation
- Health and strength maintenance
- Architectural renovations
- Potential complications
- Future medical care/surgical intervention or aggressive treatment
- Orthopedic equipment needs
- Vocational/educational plan (Weed, 1998).

Life care planners ideally must abide by the standards of practice to project long term needs; future cost associated with the onset of the particular disability and secondary complications; effectively consult with treating health care professionals involved in the clients' continuum of care; and proactively plan for anticipated fluctuations throughout life expectancy (Weed, 2007). It is crucial that life care planners remain current on the most recent standards of practice in order to further validate the reliability and methodology of the field. Current empirical research is of high importance to the field of life care planning as it validates the recommendations in the life care plan information from the standpoint of life care planners and physiatrists with regards to what to include and/or exclude as reasonable and medically necessary current and future care and related costs. These recommendations must be made within a reasonable degree of life care planning probability defined legally as a 51% or greater likelihood of occurring or being needed.

The Daubert Ruling on Expert Testimony

Until 1993, expert witnesses were essentially permitted in the courts to Pro offer opinions based on their "education, training, and experience" regardless of whether their opinions were supported by their peers, empirically validated in their field, or had any scientific basis or foundation. As a result, expert witnesses often gave starkly different opinions depending on which side retained them. Ideally, expert witnesses are supposed to offer objective and impartial opinions regardless of which side retains them; however, many experts nevertheless offer improbable opinions with the hopes of future business from the retaining attorney.

This practice was abruptly curtailed with the 1993 *Daubert vs. Merrill Dow Pharmaceutical* federal ruling by the Supreme Court which allowed opposing attorneys the power to challenge an expert witnesses opinion if those opinions were not supported scientifically and/or by their peers in the field. Specifically, the ruling subjected expert opinions to a four-part test to evaluate the following: (a) can the theory or technique be tested; (b) has the theory or technique being subjected to peer review or publications; (c) what is the known error rate of the particular scientific method; and (d) is there an explicit identification and acceptance of the theory within a relevant scientific community (Field & Choppa, 2000). If the challenge is successful, expert witness opinions are struck in part or in total from the record, and the jury is not allowed to hear them.

Despite this ruling, life care planners and other discipline experts continue to offer opinions that may indeed have a possibility of occurring, yet, do not rise to the legal definition level of probability. When such cases involve spinal cord injury and the anticipation of future secondary complications, without a consistent body of empirical support and/or the opinions or some consensus of physiatrist specialists in the field, life care planners continue to open themselves up to a Daubert challenge.

Epidemiology of spinal cord injury. In the early 1970’s the model SCI care system program was federally funded; as part of the program, all funded model systems were required to contribute data on patients they treated to a national database. This database is now known as the National Spinal Cord Injury Statistical Center (NSCISC) Database (DeVivo & Chen, 2011). NSCISC aims for the collection, management and analysis of the world's largest and longest spinal cord injury research database. Published reports by the National SCI Statistical Center (2013) indicate the overall annual rate of hospitalized individuals with spinal cord injury is approximately 40 cases per every one-million or approximately 12,000 new cases each year in the United Sates. The prevalence of individuals who were alive in the United States in 2013 and who have SCI has been estimated to be approximately 238,000 to 332,000 persons (National SCI Statistical Center, 2013). As of 2013, the database has accumulated the medical histories for over 151,000 persons with SCI in the US since 1973. Epidemiological data shows that SCI primarily affects young adults with nearly half of all injuries occurred between the ages of 16 and 30.

Among individuals in the combined United States data set, the mean age at injury increased from 28.7 years during the 1970's to 37.1 years between 2005 and 2008 (DeVivo & Chen, 2011). Since 2010, the average age has continued to steadily increase and is now 42.6 years (National SCI Statistical Center, 2013).

When examining the etiology of SCI injuries, motor vehicles account for 36.5% of reported SCI cases in the U.S. followed by falls (28.5%), acts of violence (9.2%), and sports-related injuries (9.2%). In addition, when observing ethnicity, particular ethnic groups sustain a SCI at a higher rate in comparison to other groups and have been reported in the model system noting 67% are Caucasian, (24.4%) African American, (7.9%) Hispanics, (2.1%) Asian, and 0.8% are Native American (National SCI Statistical Center, 2013). Furthermore, the NSCIS (2013) reports the most frequent neurological category at the time of discharge of persons with SCI reported to the model SCI system is incomplete tetraplegia 40.6%, followed by incomplete paraplegia 18.7%, complete paraplegia 18.0%, and complete tetraplegia 11.6% .To understand SCI, it is important to first comprehend the functional limitations and basic anatomy of the spinal cord.

Anatomy of the Spinal Cord

Damage to the spinal cord has significant consequences on overall functionality including permanent changes to motor, sensory and autonomic functions (Winkler, Weed, & Berens, 2010). The spinal cord is a fundamental element of the central nervous system. It is an elongated, cylindrical structure that extends from the foramen magnum where it is continuous with the medulla to the level of the first or second lumbar vertebra (Sheerin, 2005). The three membranes (meninges) that enclose the spinal cord include the dura mater, arachnoid, and pia mater (Sheerin, 2005). The spinal cord receives sensory information from the somatic and visceral receptors and transmits signals downward from the brain along descending pathways and upward to the brain along ascending pathways (Sapru, 2011).

The spinal cord has been described as having 31 segments that include: 8 cervical, 12 thoracic, 5 lumbar, 5 sacral, and 1 coccygeal based on the 31 pairs of spinal nerves that run through the middle of the vertebrae (Sapru, 2011). The vertebral column is comprised of 33 vertebrae separated by intervertebral (IV) discs and is described as a stable structure that supports the upper appendicular skeleton and head while protecting the neurological tissue of the spine (Sheerin, 2005). The vertebrae column is divided into five segments:

- Cervical: The cervical spine is made up seven vertebrae (C1-C8). Of the five regions the cervical is the most flexible and mobile, providing support to the head.
- Thoracic: The thoracic spine is composed of 12 vertebrae (T1-T12) and it protects the ribs.
- Lumbar: The lumbar spine is made of five vertebrae (L1-L5). These are the largest vertebrae in the spinal column and their main function is to bear the weight of the body.
- Sacral: The sacral spine is made up five vertebrae which are fused together. The main function of the sacral region is to provide attachment for the hip bones and protect the pelvis organs.
- Coccyx: The coccyx or tailbone is made up of four fused bones forming the tailbone (Fisher, Smith, & Goldstein, 2011).

The intervertebral discs separate each vertebrae and serve as shock absorber providing flexibility to the spine, primarily in the cervical and lumbar regions. Numerous ligaments hold the vertebrae together and function to stabilize the vertebral column. The ligaments of the vertebral column can be organized by anterior longitudinal ligaments on the front of the vertebral bodies, posterior longitudinal ligaments on the back of the vertebral bodies, and functional ligaments that stabilize the IV discs and the vertebral arch (Fisher, Smith, & Goldstein, 2011).

SCI Terminology and Classification

Definitions and classifications have changed over the years with multiple revisions to reflect a more accurate terminology, organization, key dermatomes, and muscles tested (Kirshblum, Anderson, Kraussioukov, & Donovan, 2011). The American Spinal Injury Association (ASIA) and the International Medical Society of Paraplegia developed a classification system of SCI known as the ASIA Impairment Scale replacing the Frankel classification system (American Spinal Injury Association/ International Medical Society of Paraplegia, 2000). The ASIA classification system includes a level for sensory impairment and a level for the motor impairment, as well as a letter designation for the degree of completeness (Winkler, Weed, & Berens, 2010). The ASIA Impairment Scale (AIS) is utilized to describe degree of impairment (i.e. completeness) with five classes being recognized:

- Class A (Complete): No motor or sensory function is preserved below the level of injury.
- Class B (Sensory Incomplete): Sensation but no motor function preserved below the level of injury.
- Class C (Motor Incomplete): Motor function is preserved below the neurological level, and more than half of the key muscles below the neurological level have a muscle grade of less than 3 grades (grades 0-2). No functional motor strength.
- Class D (Motor Incomplete): Motor function is preserved below the neurological level, and at least half of the key muscles below the neurological level are graded at three or more. The person may be able to use the motor function, for example, for a brief transfer, or ambulance short distance.

- Class E (Normal: Complete return of all motor and sensory function below the level of lesion, but may have abnormal reflexes (Kirshblum et al., 2011).

Correspondingly, the following terminology has developed around the classification of SCI (American Spinal Injury Association, 2000).

- Tetraplegia: Preferred to the term quadriplegia, is defined as an impairment or loss of motor and sensory function in the cervical segments of the spinal cord with associated loss of muscle strength in all 4 extremities.
- Paraplegia: Refers to an impairment of motor and/or sensory functions in the thoracic, lumbar, or sacral segments, of the spinal cord secondary to damage of neural elements within the spinal canal with some impairment to the lower extremities only (Kirshblum et al., 2011).

Secondary Complications

Each year an estimated 12,000 individuals sustain a traumatic SCI within the United States alone. As reported by The National SCI Statistical Center (NSCISC, 2013), the incidence of traumatic SCI is about 40 per million persons per year, with an approximate average of 273,000 living survivors of traumatic SCI in 2013. Spinal cord injury produces a wide variety of changes in the individuals' body structure that can lead to a number of complications which impacts health, social activity, employment and quality of life (Van Den Berg, Castellote, Pedro-Cuesta, & Mahillo-Hernandez, 2010). Secondary complications (SCs) are long term medical problems that result after a SCI and play an important role in the continuum of care. Pope and Tarlov (1991) state that a "secondary condition is any additional physical or mental health condition that is casually related to a primary disabling condition and that can be either a pathology, an impairment, a functional limitation, or an additional disability" (p.214). According to the World Health Organization (WHO, 2013), persons with SCI often encounter various secondary medical complications that include, but are not limited to: respiratory complications, autonomic dysreflexia, deep vein thrombosis, urinary tract infections, spasticity, osteoporosis, pressure ulcers, upper extremity/repetitive motion overuse and chronic pain. Acute care, rehabilitation services and vigilant continuing health care are imperative for prevention and management of secondary complications.

An extensive range of SCs affecting the SCI population have been reported. Up until the mid-1970s, renal failure and other related urinary tract complications were reported to be the main cause of death in individuals with SCI (Freed, Bakst, & Barrie, 1966). Nonetheless, medical and technological advances have brought changes in mortality rates for the SCI population. Epidemiological studies assessing the incidence and prevalence of SCs affecting persons with SCI continue to be explored.

Frankel et al., (1998) examined long term survival in a population sample of 3,179 SCI survivors over a 50 year longitudinal study. The demographic characteristics included 81.4% males and 18.6% females with age at injury noted as 57% for the 0-30 age group, 22.2% for the 31-45 age group, 14.1% for the 46-60 age group, and 6.7% for the 61 and above age group. The study utilized the Frankel classification scale to determine the level of injury; A, B, and C include participants with minimal or no muscle control below their injury and Frankel D and E denotes participants that have useful motor function below their injury. The injury level was noted as follow: 4.2% tetraplegia (C1-4 ABC), 25.0% tetraplegia (C5-8 ABC), 44.1% paraplegia (ABC), and 26.7% as (All D). The study revealed the leading cause of death for the entire fifty-year period of the study was correlated to diseases of the respiratory system (pneumonia/influenza/other respiratory) at 23%, urinary deaths ranked second at 19%, followed by cardiovascular events (ischemic/non-ischemic heart disease) at 18%. Moreover, data demonstrated individuals with tetraplegia and paraplegia are 4.67 and 2.07 times more probable to die from pneumonia, influenza and other respiratory diseases than individuals classified as Frankel D injured at the same age. Additionally, males are 75% more likely to die of urinary tract diseases than females and individuals with tetraplegia and paraplegia are 4.35 and 2.20 times more likely to die from these causes than individuals classified as Frankel D (Frankel et al., 1998).

A similar study conducted by McKinley, Jackson, Cardeans and DeVivo (1999) reviewed data from the National SCI Statistical Center (NSCISC) and analyzed the incidence of long-term SCs among individuals with SCI. Annual evaluations were completed at 1, 2, 5, 10, 15 and 20 years post-injury with a sample size documented as: year 1, (n = 6,776); year 2, (n = 5,744); year 5, (n = 4,100); year 10, (n = 2,399); year 15, (n = 1,285); and year 20, (n = 500). Results revealed the development of pressure ulcers (PUs) as the most recurrent medical complication documented at 15.2% in the first annual follow-up year post injury and increased gradually during the subsequent evaluations; Year 1 (15.2%), Year 2 (17.8%), Year 5 (19.9%), Year 10 (23.3%), Year 15 (24.7%), and Year 20 (29.4%). Individuals with complete paraplegia had the highest total prevalence of Stages III and IV PUs at 9.1%, compared to tetraplegia-complete (6.6%), tetraplegia-incomplete (3.2%) and paraplegia-incomplete (2.4%). Autonomic dysreflexia was consistently the second most common SC reported; Year 1 (10.9%), Year 2 (10.6%), Year 5 (10.4%), Year 10 (10.6%), Year 15 (13.7%), and Year 20 (17.6%). Furthermore, the study revealed that complete tetraplegia was associated with increased risk of pneumonia/atelectasis and observed more frequently among individuals 60 years of age and older. Data reported for sample size include: Year 1 (3.5%), Year 2 (3.9%), Year 5 (3.0%), Year 10 (2.3%), Year 15

(2.5%), and Year 20 (1.87%) (McKinley et al., 1999). Additionally, an increased trend of abnormal renal testing was found for individuals with tetraplegia (complete or incomplete) at 1, 10, and 15 year evaluations with similar findings regarding age as a factor among persons 60 years of age and older.

Meyers et al. (2000) conducted a study to examine the most frequently occurring SCs among a sample of 117 individuals with predominately cervical level SCI noted at 87%. The participants included 69% males and 31% females, a mean age 38.5 years (*SD* =10.8), and a race distribution of 83% white and 17% nonwhite. The study revealed a mean of 6.5 (*SD* = 3.0) of the 17 SCs investigated. Among specific SCs, the most prevalent included muscle spasms (87%), UTI's (73%), skin breakdown (66%), fatigue (64%), chronic pain (49%), bowel problems (47%), autonomic dysreflexia (46%), anxiety (43%), and depression (42%), respiratory infections (21%), migraines (16%), contractures (13%), asthma (10%), and seizures (3%). It is imperative for the life care planner to have awareness of the prevalence, frequency, severity, symptoms/ implications, and costs associated with treatment of all secondary complications in the SCI population.

Decubitus Ulcer

Pressure ulcers (PU), also known as decubitus ulcers, ischemic ulcers, bed sores or skin sores have been defined by the National Pressure Ulcer Advisory Panel (NPUAP, 2007) as a "localized injury to the skin and/or underlying tissue usually over a bony prominence, as a result of pressure, or pressure in combination with shear and/or friction" (para. 4). The term identifies a wound developing within the upper layers of the skin as a result of continued pressure eventually enlarging radially into the profound tissue layers (Black et al., 2007). Similarly, the International Statistical Classification of Disease and Related Health Problems (ICD-10) notes a

PU refers to the diagnosis of decubitus ulcer (L89) which is inclusive to the category of the skin and subcutaneous tissue (World Health Organization [WHO], 2010).

The most widely recognized classification system for decubitus ulcers is composed of a four stage scale; the severity of Stages I through IV is based according to the depth of ulceration (Bansal, Scott, Stewart, & Cockerell, 2005). In 2007, the NPUAP redefined the description of a PU and the stages/categories of ulceration, including the four original stages and introducing two additional categories on deep tissue injury (DTI) and unstageable pressure ulcers. The NPUAP defined six stages/categories as follows: (1) Category/Stage I - Non-blanchable erythema: Beginning stage of developing ulcer with some redness; (2) Category/Stage II- Partial thickness: the skin has decreased in thickness with developing open ulcer with redness and may be ruptured or filled with serum; (3) Category/Stage III- Full thickness skin loss: occurring with loss of full thickness of skin while exposing fat tissue and recognized as a deep wound; (4) Category/Stage IV**-** Full thickness tissue loss**:** arising with full thickness of tissue loss exposing bone, muscle, and/or tendons that is visible to the naked eye; (5) Deep Tissue Injury (DTI) involving blood-filled blisters from pressure and/or previous laceration; and Unstageable/Unclassified appearing as an ulcer with full-thickness tissue loss and discoloration of the skin concealed by slough (NPUAP, 2007).

The most common sites for pressure ulcers after two years of injury include the feet 2%, malleolus 4%, heel 5%, sacrum 18%, trochanters 26% and the ischium 31% (Yarkony & Heinemann, 1995). The incidence rate of PU varies greatly with the health care setting and it has been reported to range from 0.4% to 38% in hospitals, 2.2% to 23.9% in skilled nursing facilities, and from 0-17% in home health agencies (Cuddigan, Ayello, & Sussman, 2001; Lyder & Ayello, 2008).

Pressure ulcers represent the most frequent medical complication among individuals with SCI occurring in approximately (34%) of individuals during the acute rehabilitation phase; with prevalence rates in subsequent years post-injury ranging from 14-46% (National Spinal Cord Injury Statistic Center [NSCISC], 2006). The high prevalence rate is due to the loss of sensation, poor motor control limiting repositioning and the loss of muscle and subcutaneous tissue making the bony prominences more vulnerable. Factors including age, gender, level of SCI lesion, and time since injury have been examined to identify whether these risk factors are related to pressure ulcer development.

McKinley, Jackson, Cardeans and DeVivo (1999) reviewed data on 20,804 participants from the National SCI Statistical Center (NSCISC) on annual evaluations performed at 1, 2, 5, 10, 15 and 20 years post-injury. The overall sample size for each year was recorded at: year 1, (*n* = 6,776); year 2, (*n* = 5,744); year 5, (*n* = 4,100); year 10, (*n* = 2,399); year 15, (*n* = 1,285); and year 20, (*n* = 500). Participants were stratified in three age groups (1-30 years; 40-59 years, and 60+ years) with neurological classifications of (tetraplegia-complete; tetraplegia-incomplete; paraplegia-complete; and paraplegia-incomplete). Results revealed the development of PU as the most recurrent medical complication (*n* = 739; 15.2%) within the first annual follow-up year post injury and increased gradually during the subsequent evaluations at year 2, (*n* = 614; 17.8%); year 5, (*n* = 416; 19.9%); year 10, (*n* = 250; 23.3%); year 15, (*n* = 112; 24.7%), and year 20, (*n* = 30; 29.4%). Moreover, among participants who developed pressure ulcers, those with tetraplegia-complete averaged 1.64 PU per person, paraplegia-complete1.62 PU, tetraplegia-incomplete 1.4 PU, and paraplegia-incomplete 1.27 PU per person. In addition, participants with paraplegia-complete had the highest percentage of Stages III and IV pressure ulcers at (9.1%), in comparison to tetraplegia-complete (6.6%), tetraplegia-incomplete (3.2%) and paraplegia-incomplete (2.4%). McKinley et al. (1999) noted age was not a factor for pressure ulcer development. In relation to gender, the percentage of males presenting with more than one pressure ulcer was statistically different in comparison to females at annual year 1 (males,15.8%; females, 12.6%) and year 2 (males,18.5%; females, 14.2%).

Chen, DeVivo, and Jackson (2005) conducted a similar longitudinal regression study examining the time trends in prevalence of pressure ulcers in post injury years (1, 2,5,10, and 15) among 3,361 community residents with SCI registered with the National Spinal Cord Injury Database. Participants included (*n* = 2,788 males; *n* = 575 females) with a mean age at injury of 31.3 years and disclosing their ethnicity as follows: Caucasians (*n* = 1,886; 56%); African American (*n* = 1,012; 30%); Hispanic (*n* = 413; 12%); and other (*n* = 50; 2%). The level of injury was noted as tetraplegia (*n* = 1,603; 48%) and paraplegia (*n* = 1,752; 52%) with neurological classification of ASIA A, (*n* = 1,800; 54%), ASIA B, (*n* = 438; 13%), ASIA C, (*n* = 502; 15%), and ASIA D, (*n* = 607; 18%). Findings revealed the prevalence of PU remained steady during the first ten years after injury; year 1, (11.5%); year 2, (13.2%); year 5, (13.1%); year 10, (14.3%); however, it increased significantly after 15 years post injury at (21.0%). Furthermore, Stage II PU accounted as the most severe resulting in 859 visits (53%), followed by Stage III in 426 visits (27%), and Stage IV in 310 visits (20%). Additional findings indicated odds ratios (OR) greater than 1.0 resulted an increased risk of PU; correspondingly PU were most common among males (OR 1.3), African Americans (OR 1.7), participants with less than a high school education (OR 1.3), and in persons with complete SCI (1.0).

A retrospective review of 144 medical records from the UK Spinal Injuries Unit (SIU) was completed by Ash (2002) to evaluate the occurrence of pressure ulcer development in the period between injury, admission, and discharge. The sample characteristic included males (*n* =

115) and females *(n* = 29) with an average age of 40 years old. The average length of time from injury to admission to SIU was 14 days while the average length of stay between injury and discharge was 152 days. The level of injury among the participants was noted at Tetraplegia/ neck injury, (*n* = 78; 54%) and Paraplegia/back injury, (*n* = 66; 46%); with neurological classification of ASIA A, (*n* = 49; 34%) and ASIA B-E, (*n* = 95; 66%). Findings demonstrated (32%; *n* = 32) of all patients already had a PU on admission, (38%; *n* = 54) suffered an ulcer during their hospital stay, and only (2%; *n* = 3) had an ulcer on discharge. The overall incidence rate for all grades (Grade 1 -3) of PU's between injury and discharge was noted at (56%; *n* = 80). A total of 153 PU's were recorded among all the participants, with the most common sites located at the sacral (*n* = 70; 46%), heel (*n* = 30; 20%), occipital (*n* = 12; 8%), penis (*n* = 9; 6%), and hip (*n* = 9; 6%).

Participants with complete lesions (ASIA-A) were 37% more prone to develop PU than in comparison to individuals with incomplete lesions (ASIA B-E; Ash, 2002). Furthermore, 80% of individuals with neurologically complete injuries presented a PU at some stage between injury and discharge. The author noted level of lesion (tetraplegia vs. paraplegia) was not significant to PU incidence. Other findings indicated 60% of males were more like to develop a pressure ulcer than females (38%; *n* = 11) and the average age of participants developing PU's was 40 years of age; although the author indicates the difference was not statistically significant when comparing data to individuals who had not developed a PU. Ash (2002) recommends a holistic approach that manages pressure ulcer risk and shifts the responsibility of pressure ulcer prevention from healthcare providers to patients (Ash, 2002).

Gender and age have been considered a risk factor in pressure ulcer development among individuals with SCI. However, there are a few studies that specifically address this issue. Eslami et al. (2012) completed a cross sectional study investigating the prevalence of PUs based on the patient's age and time passed since injury in a population sample of 7,489 persons with SCI. The sample was composed of (*n* =4,993) males and (*n* =2,493) females with the median age group between 21 and 30 years. At the time of injury, (*n* = 7,095; 76.8%) participants were more than 10 years old and (*n* = 394; 5.3%) were older than 50 years. A total of (*n* = 5,897) participants were injured for more than one year and (*n* = 815) for less than one year, while the levels of SCI included; cervical (16.5%), thoracic (22.7%), and lumbar (57.9%). Based on the level of injury, paraplegia accounted for (66.8%) of the participants, followed by quadriplegia (9.6%), paraparesia (11.1%), and quadriparesia (3.7%). Overall, findings indicated PUs were prevalent among 34.6% of the sample, in individuals age ≥ 11 years (38%), and in participants with a level of injury noted as paraplegic. Additionally, the prevalence of PU's in participants with less than one year since acquiring a SCI was noted at 45% in comparison to participants who acquired a SCI lasting more than one-year since time of injury at 35%.

To further explore age, gender, and level of injury Garber, Rintala, Hart, and Fuhrer (2000) conducted a longitudinal two panel study of Phase 1 (first year) and Phase 2 (3 years later) among 118 men with SCI. The mean age at Phase 1 was noted at (40.49 years) while at Phase 2 (43.53 years). The level of injury included: tetraplegia ABC, (*n* = 49; 41.5%); paraplegia ABC, (*n* = 52; 44.1%); and tetraplegia or paraplegia D, (*n* = 17; 14.4%). Overall, findings indicated of the 118 participants, (*n* = 38; 32.2%) reported having at least one PU in the year prior to Phase 1 and (*n* = 37; 31.4%) in the year prior to Phase 2. Other predictors of PU occurrence were younger age at onset of SCI, greater level of impairment, and longer duration of SCI; although no prevalence results were indicated in the study.

Similarly, Saladin and Krause (2009) identified the racial/ethnic difference in pressure ulcer prevalence after SCI among 475 participants with a race distribution of Caucasian (*n* = 127), Hispanics (*n* = 122), African Americans (*n* = 121), and American-Indian (*n* = 105). The sample was comprised of (*n* = 190) females and (*n* = 185) males) with an average of 12.8 years since injury. The level of injury included: C1-C4/non-ambulatory, (11.6%); C5-C8/non-ambulatory, (29.1%); Non-cervical/non-ambulatory, (39.7%); and ambulatory, (19.6%). Findings indicated 15% of the participants reported a current PU while 32% reported a PU within the last 12 months. Furthermore, of the PU accounted within the last 12 months, 16% reported an occurrence of only one PU, 8% developed two PU, and 3.4% reported three or more. While examining the incidence rate in relation to race and ethnicity American-Indians had the highest percentage of pressure ulcers at 49.5 %, followed by African-American 35.8%, Caucasian 24.6%, and Hispanic 23.1%. See table 1 for a summary of PU study findings.

Table 1

Incidence of pressure ulcers in spinal cord injured patients

Author	TSI	Age	Males	Fem.	Level of Injury	Incidence
Ash (2002)	14 days	*M* = 40	n=115 (80%)	n=29 (20%)	ASIA A, n=49 (34%) and ASIA B-E, n=95 (66%)	n=80 (56%)
Chen et al. (2005)		*M* = 31.3	n=2,788 (83%)	n=575 (17%)	Para, n=1752 (52%) Tetra, n=1603 (48%)	Yr. 1: n=329 (11.5%) Yr. 2: n=269 (13.2%) Yr. 5: n=168 (13.1%); Yr. 10: n=65 (14.3%) Yr. 15: n=17 (21.0%)
Eslami et al. (2012)	<1 Yr. >1 Yr.	10-50+ Med. age 21-30	n=4,996	n=2,493	Cerv. (16.5%); Thor. (22.7%) Lumb. (57.9%)	n=2,591 (34.6%)
Garber et al. (2000)	Phase 1: 11.95 *M*	*M* = 40.49	n=118	N/A	Para ABC (44.1%) Tetra ABC (41.5%) Tetra or Para D (14.4%)	n=38 (32.2%)
	Phase 2: 14.99 *M*	*M* = 43.53	n=118	N/A	Para ABC (44.1%) Tetra ABC (41.5%) Tetra or Para D (14.4%)	n=37 (31.4%)
McKinley et al. (1999)	Yr. 1	1-60+	Total n=6,776		Para Tetra	I (5.6%); C (22.3%) I (9.3%); C (25.2%)
	Yr. 2		Total n=5,744		Para Tetra	I (8.3%); C (24.5%) I (10.2%); C (26.4%)
	Yr. 5		Total n=4,100		Para Tetra	I (10.9%); C (25.5%) I (11.5%); C (27.2%)
	Yr. 10		Total n=2,339		Para Tetra	I (14.5%); C (28.2%) I (18.4%); C (25.1%)
	Yr. 15		Total n=1,285		Para Tetra	I (18.4%); C (26.7%) I (20.8%); C (27.6%)
	Yr. 20		Total n=500		Para Tetra	I (12.5%); C (29.8%) I (13.3%); C (40.6%)
Saladin and Krause (2009)	*M* = 12.8 yrs.	*M* = 29.3	AI n=105; AA n=121; C n=127; H n=122		C1-C4 (11.6%); C5-C8 (29.1%); Non-cervical (39.7%); Amb (19.6%	AI n=52 (49.5%); AA n=43 (35.8%); C n=31 (24.6%); H n=28 (23.1%);

Note. TSI = Time Since Injury; I = Incomplete; C = Complete; AI=American-Indian, AA=African-American, C=Caucasian, H=Hispanic, Para = paraplegia, Tetra = tetraplegia, Amb. = Ambulatory, *M* = mean, Med. = median, Cerv. = cervical, Thor., = thoracic, Lumb. = Lumbar, X-Sect. = cross-sectional, Long. = longitudinal, Retro. = retrospective.

Respiratory Dysfunction

Respiratory dysfunction among persons with SCI encompasses a variety of complications that include but are not limited to: aspiration, atelectasis, bronchitis, lung abscess, pneumonia, ventilator failure, and infection of the respiratory system (Jackson & Groomes, 1994; Jha & Charlifue, 2011). The increased risk for this secondary complication (SC) include higher level of injury (i.e., complete tetraplegia, incomplete tetraplegia, followed by paraplegia) and being of older age at the time of injury (Jha & Charlifue, 2011). Respiratory dysfunctions are one of the leading causes of hospitalization and mortality among those with either acute or chronic SCI (Burns, 2007; Hitzig et al., 2008). After conducting a thorough review of literature, most if not all studies incorporated pneumonia, atelectasis, and aspiration as the primary causes for respiratory dysfunction.

In a five-year study by five Model Regional SCI Care Systems to identify the incidence of respiratory dysfunction, 14 specific complications were included to examine the effects in relation to level of injury (Jackson & Groomes, 1994). Of these 14, three were reported as having the highest incidence for complications (i.e., aspiration, atelectasis, and pneumonia). Aspiration is defined in which the airway draws in a substance (e.g., food) or a procedure to remove something from the body which specifically involves the airway. Atelectasis is a condition in which airflow is significantly reduced while pneumonia encompasses infection and inflammation within the lungs.

Demographic information of the 261 participants in the study by the SCI Model Care Systems included persons with a C1-C4 level injury (*n* = 56; 22%), C5-C8 level injury (*n* = 123; 47%), and T1-T12 level of injury (*n* = 81; 31%); the mean age for all groups was 29.1 (Jackson & Groomes, 1994). A total number of 175 patients (67%) involving all levels of injury experienced 544 respiratory complications. The incidence for respiratory complications since time of injury involved the following conditions: Atelectasis (36%) occurring 17.7 days' time since injury (TSI), followed by pneumonia (31%) occurring 24.5 days TSI, and ventilator failure (22%) occurring 4.5 days TSI.

As with other SCs, the level of injury is a significant factor for respiratory complications occurring among 84% of patients with C1-C4 lesions in comparison to 60% of persons with a C5-C8 level of injury and 65% of persons with a T1-T12 level of injury. The incidence for pneumonia, ventilator failure, and atelectasis among persons with a C1-C4 injury was rated at 63%, 40%, and 40% respectively. For those with a C5-C8 level of injury, the same three complications were the most frequently occurring; however, atelectasis occurred most frequently (34%), followed by pneumonia (28%), and ventilator failure (23%). For those falling within the T1-T12 level of injury group, atelectasis was reported at 37% while aspiration developed sooner (2 ± 3.8 days TSI) than any other condition for all cervical and thoracic groups. Aspiration was documented as one of the least occurring respiratory complications with an incidence of 1.2% to 7.3% for all groups (i.e., cervical and thoracic).

Dysphagia increases the risk for aspiration due to the difficulty with swallowing. Researchers Chaw, Shem, Castillo, Wong, and Chang (2012) conducted a study to identify the risk factors associated with this condition and respiratory dysfunction. A total of 68 participants (57 males and 11 females) were involved in the study with levels of SCI as follows: C1-C4 complete ($n = 28$); C4-C8 incomplete ($n = 40$) with an average of 31.8 days TSI. Among all participants, a total of 21 patients (30.9%) were diagnosed with dysphagia as assessed by the bedside swallowing evaluation (BSE) with 4 (5.9%) diagnosed with aspiration. The level of injury and gender was not a risk factor for dysphagia although those diagnosed with this complication had acquired pneumonia (56%) in comparison to those without (16.7%) and had lengthier hospital stays (48 days vs. 39 days).

Individuals with spinal cord injuries are at an increased risk for frequent hospitalizations as well as for hospital-acquired infections (HAI). According to the Center for Disease Control and Prevention (CDC) National Nosocomial Infection Surveillance System (NNIS) a HAI is defined as “a localized or systemic condition resulting from an adverse reaction to the presence of an infectious agent(s) or its toxin(s) that was not present on admission to the acute care facility” (Center for Disease Control and Prevention, 2014, p. 2). Evans et al., (2008) completed a retrospective review of 226 medical records of veterans with SCI and examined the risk for contracting a HAI during hospitalization. The sample was composed of 224 males and two females with a mean age of 58.3 years. The ethnicity distribution included: non-Hispanic white, (126; 56%); African American, (*n* = 75; 33%); Hispanic, (*n* = 7; 3%); and unknown, (*n* = 18; 8%). The mean duration of injury was noted at 20.9 years while the levels of injury consisted of: tetraplegia, (*n* = 113; 50%); paraplegia, (*n* = 103; 46%); and unknown, (*n* = 10; 4%). A total of 657 HAI’s occurred during the study, and 6.5% (*n* = 43) of the cases accounted for respiratory infections. Furthermore, the incidence rate for respiratory infections was noted at 2.3 (per 1,000 patient-days). The level of injury, duration of injury, and ethnicity yielded no significant differences on HAI status.

Frankel et al., (1998) conducted a 50 year longitudinal study among 3,179 SCI survivors and examined the causes of death over the decades following the injury from 1943 through 1990. The demographic characteristics included (81.4% males and 18.6% females) with age ranging from 1-61 years and over. The study utilized the Frankel classification scale to determine the level of injury and included: tetraplegia, C1-4 ABC (*n* = 133; 4.2%); tetraplegia, C5-8 ABC (*n* = 795; 25%); paraplegia, ABC (*n* = 1,402; 44.1%); and all D (*n* = 849; 26.7%) level injuries.

Researchers found pneumonia, influenza, and other respiratory conditions (not specified) as the leading causes of mortality (incidence of 23%) throughout the 50-year study. In earlier decades of the study (1943 through 1972) respirator deaths accounted for 19% in comparison to 34% in the period of 1973 through 1990. Moreover, data demonstrated individuals with tetraplegia and paraplegia are 4.67 and 2.07 times more probable to die from pneumonia, influenza and other respiratory diseases than individuals classified as Frankel D injured at the same age.

Subsequently, Garshick et al., (2005) studied a sample of 361 males with SCI for at least one year after injury and assessed the mortality risk for respiratory disease. The racial distribution included: Caucasians (93%), African American (5%), and other races (2%). The mean age among the participants was 50.6±15 years and the time since injury was noted at 17.5 ± 12.8 years. Of the participants 92% of SCI were due to traumatic injuries. The level of injury among the participants included: cervical, (*n* = 75; 20.7%); T1-T4, (*n* = 52; 14.4%); T5-T12, (*n* = 47; 13%); others, (*n* = 38; 10.5%); cervical ASIA C, (*n* = 41; 11.3%); cervical ASIA D, (*n* = 42; 11.6%); other ASIA C, (*n* = 31; 8.5%), and other ASIA D, (*n* = 35; 9.6%). The participants completed a respiratory health questionnaire centered on the ATS DLD-78 adult respiratory questionnaire (Ferris, 1978), a history of respiratory symptoms, cigarette usage, and comorbid medical conditions. Additionally, individuals participated in a pulmonary function testing and a neurological exam. At the end of the study a total of 37 participants were deceased. The authors discovered respiratory systems accounted for 24.3% of underlying and contributing cause of death among the participants. Other findings indicated specific respiratory deaths included: pneumonia (*n* = 4), chronic airway obstruction (*n* = 3), pleural effusion (*n* = 1), and unspecified respiratory complications (*n* = 1).

To further examine the incidence of pneumonia and atelectasis, two additional studies were investigated. The overall incidence for upper respiratory infections, specifically pneumonia, was reported at 3% to 3.5% per 1,000 veteran patients while lower respiratory infections ranged between 2.19% and 3.2% per 1,000 (Smith et al., 2007). Furthermore, pneumonia and/or atelectasis were found to range between 1.3% and 2.1% among persons with paraplegia in comparison to 9.9% for persons with tetraplegia within a 20-year period (McKinley, et al. 1999). The level of injury was investigated; however, the overall incidence rate regardless of injury did not reach the probability threshold for these two studies. Although respiratory complications have been reported by various researchers as of significant concern for persons with SCI, the incidence for these two complications tends to be very low. See table 2 for a summary of respiratory dysfunction study findings.

Table 2

Incidence of respiratory dysfunction (Including Pneumonia, Aspiration, and Atelectasis)

Author	Gender	Age	TSI	Level of Injury	Respiratory Incidence n (%)	Pneumonia Incidence n (%)	Aspiration Incidence n (%)	Atelectasis Incidence n (%)
Chaw et al. (2012)	M: 57 F: 11	*M* = 43	31.8 days	C1-C4 Comp & C4-C8 Incom (Total: n = 68)	N/A	25 (37.8%)	4 (12.1%)	N/A
Evans et al. (2008)	M: 224 F: 2	*M* = 58.3	20.9	Tetra (n = 113; 50%); Para (n = 103; 46%) & UK (n = 10; 4%)	43 (6.5%) of 657 HAI cases	N/A	N./A	N/A
Frankel et al. (1998)	M: 2,588 F: 591	1-60+ Yrs.	NS	Tetra (C1-C4; N = 133; 4.2%); Tetra (C5-C8; n = 795; 25%); Para (n = 1,402; 44.1%); All D (n = 849; 26.7%)	N = 205 (23%) of 886 deceased participants	N/A	N/A	N/A
Garshick et al. (2005)	M: 361	50.6 ± 15 Yrs.	17.5 ± 12.8 Yrs.	Comp (n = 212); Incom (n = 149)	n = 9 (24.3%) of 37 deceased	n = 4 (10.8%) of 37 deceased	N/A	N/A
Jackson and Groomes (1994)		*M* = 29.1	24.5 ± 1.7	C1-C4 (n = 56) C5-C8 (n = 123) T1-T12 (n = 81)	47 (84%) 74 (60%) 53 (65%)	36 (63.2%) 34 (27.6) 12 (14.8)	5 (8.8%) 9 (7.3) 1 (1.2)	23 (40.4) 42 (34.2) 30 (37.0)

Note: TSI = Time since injury; Comp = Complete; Incom = Incomplete; F = Females; M = Males; UK = Unknown; Tetra = Tetraplegia; Para = Paraplegia; HAI = Hospital acquired infection; NS = Not specified.

Metabolic Disorders

Osteoporosis and heterotopic ossification (HO) are two of the most common metabolic disorders among people with SC. After acute SCI, a decrease in bone tissue and mass start to develop below the level of injury as bone resorption occurs. Specifically, bone resorption allows the body to break down the bone and send minerals through the blood stream allowing for new bone to develop throughout the body, a process known as osteoclasts (Gater & Pai, 2011). Through the natural aging process, resorption continues to take place; however, the body's ability to replace the bone as quickly as it breaks down no longer occurs increasing the risk for osteoporosis (Manolagas, 2000). Two common occurrences take place following acute SCI: Osteoporosis often occurs below the level of injury, most commonly within the pelvic region and below for person's with paraplegia, and a decrease in bone density within the upper extremities for persons with tetraplegia (Garland, Adkins, Stewart, Ashford, & Vigil, 2001; Garland et al. 1992) In addition to osteoporosis, heterotopic ossification (HO) becomes an additional secondary complication (SC) for this population as abnormal bone formation (typically around the joint) starts to set in; thus leading to pain and swelling around the affected area with an inability to lean forward while sitting (Rakovchik & Bryce, 2010). The review of literature provided below is focused on osteoporosis and HO, however, the incidence of bone fractures as a result of osteoporosis is also discussed.

The incidence of osteoporosis is estimated to be above 70% among people with SCI while reports of fractures below level of injury is estimated at 31% and 33% (Eser, Frotzler, Zehnder, Schiessl, & Denoth, 2005; Frisbie, 1997; Vestergaard, Krogh, Rejnmark, & Mosekilde, 1998). A study conducted to identify the incidence and management of osteoporosis among 128 medical practitioners (i.e., physicians, nurses, physician assistant, etc.) by Morse et al. (2008) indicated a probability rather than possibility of this secondary condition of occurring. Findings revealed 54% of practitioners had ordered medication for treating bone-loss associated with SCI and 78% had ordered physical therapy as a preventative measure for osteoporosis. Moreover, 79% reported treating patients for osteoporosis fractures following acute SCI while 72 respondents reported treating between one and 10 patients for fractures within the past year since time of study.

To further explore the nature of this complication, Lazo et al. (2001) conducted a study that included 41 male patients to assess for decreased bone density and fractures after acute SCI. Of the 41 participants, 61% (*n* = 25) met the criteria for osteoporosis, 19.5% had acquired a decrease in bone mass not considered within normal range, although not significant enough to be classified as osteoporosis (osteopenic) and 19.5% did not meet the symptoms of any bone disorder. Age was shown to be a factor for those not meeting the criteria for osteopenia as this particular group tended to be significantly younger (median age = 45) while those meeting the criteria had a mean age of 59.75. Lastly, 34% (*n* = 14) had acquired a fracture following acute SCI with 84.6% occurrence within the lower limbs, 62.5% below the knee with falls reported as the primary cause of fractures; however, of the 14 participants, 85.7% (*n* = 12) had osteoporosis, and 7.1% (*n* = 1) had osteopenia.

Researchers Gifre et al. (2014) conducted a 10-year follow-up study after 63 patients (50 males and 13 females) had acquired a SCI with a mean of 6.4 ± 2.4 years post injury. Primary causes of fractures (70%) were due to low impact injuries; otherwise the specific cause was unknown. Among the 63 participants, 10 participants or 16% developed 18 bone fractures with level of injury (i.e., ASAI A/thoracic level; 80%) as a predictor for increased risk of injury (cervical, *n* = 2; thoracic, *n* = 7; lumbar, *n* = 1) with femur and tibia as the most common site for fracture.

Although Lazo et al. (2001) conducted a significant study in identifying the incidence of this complication occurring, a lack of female participants was a limitation of their research. However, the majority of patients with SCI tend to be male limiting researchers the ability to identify differences between gender and complications.

Vestergaard et al. (1998) conducted a study to identify fracture rates and predicting causes for fractures among persons with SCI. When comparing 438 individuals with SCI (*n* = 129 females and *n* = 309 males) versus 654 without (*n* = 322 females and *n* = 332 males), males with SCI had a minimally higher rate of osteoporosis in comparison to their male counterpart (13 versus 6). Overall, findings revealed a fracture rate of 2% a year for persons with SCI in comparison to 1% a year for those without a SCI. No differences were found in relation to gender and SCI rate.

Melton, Chrischilles, Cooper, Lane, and Riggs (1992) led an epidemiologic study to define the incidence of osteoporosis among men and women without SCI. Their findings revealed 39.7% of white women age 50 had developed osteoporosis related fractures in comparison to white males at 13.1%. Melton et al. (1992) reported fractures occurring were due to a decrease in bone mass. For people with SCI, bone mineral density (BMD) decreases within weeks following injury regardless of gender or age increases the risk for osteoporosis and related fractures (Biering-Sorensen, Bohr, & Schaadt, 1990; Chantraine, Nusgens, & Lapiere, 1986; Garland et al., 1992; Wilmet, Ismail, Heilporn, Welraeds, & Bergmann, 1995); therefore, the likelihood of this complication occurring among women would exceed 39.7% as a result of menopause and SCI. Complications associated with fractures and management can lead to enlarged costs, lengthy hospitalizations and increased severity of the disability (Lazo, et al., 2001).

To further examine the incidence of BMD loss and fractures, Zehnder et al. (2004) led a study with SCI participants ranging from 3 months to 30 years since time of injury. Demographic characteristics consisted of 100 men with paraplegia with total motor and sensor loss (T1 – L3; stage A of the Frankel scale; *n* = 94) and those with total motor and partial sensory loss (T1 – L3; stage B of the Frankel scale; *n* = 6). Participants mean age was 38.0 ± 0.97 with time since injury at a mean of 10.4 ± 0.79 years; reported mean time of hours sitting in a wheelchair was 13.5 ± 0.3 with 51% involved in some form of weight bearing activity (i.e., using a standing device). The outcome of their research detected mean time for acquiring their first fracture was 8.9 ± 1.4 years since time of injury; progression of fracture incidence increased from 1% within the first year to 4.6% after 20 years; mean incidence of fractures was reported at 2.2% a year. Location of site, specifically lower extremities, was correlated with BMD loss and occurred within 1 to 3 years post injury. See below table 3 for a summary of bone fracture study findings.

Table 3

Incidence of bone fractures in spinal cord injured patients

Author	TOS	TSI	Male	Female	Age	Incidence
Comarr, Hutchinson, and Bors (1962)	X-sect.		1,363 total			11%
Frisbie (1997)	X-sect.	21.1 ± 12.1 years	120		20-79	33%
Gifre et al. (2014)	Follow-up	6.4 ± 2.4 years	50	13	36±20	25% (Cerv., n=2; Thor., n=7 (80%); Lumb., n=1)
Ingram, Suman, and Freeman, (1989)	X-sect.	> 1 years	526		13-70	5%
Lazo et al. (2001)	X-sect.	1.1 – 43.1 years	49		27-83	34%
Ragnarsson and Sell (1981)	X-sect.	9 years (mean)	578		4-71	4%
Vestergaard et al. (1998)	X-sect.		309	129	17-80	2%/year
Zehnder et al. (2004)	X-sect.		100		18-60	
		< 1 year	16			1%/year
		1-9 years	38			1.3%/year
		10-19 years	31			3.4%/year
		20-29 years	13			4.6%/year

Note. Reprinted/Adapted from "Osteoporosis after spinal cord injury," by S. D. Jiang, L. Y. Dai, and L. S. Jiang, 2005, *Journal of Osteoporosis International, 17*, p. 184. Copyright 2014 by Springer Publishing.

When addressing the frequency of HO and SCI, a majority of studies conducted focus primarily on prevention and treatment. However, of those focusing on treatment some have addressed the rate of person's acquiring HO. Specifically, occurrence of HO towards those who have acquired a SCI is estimated at 20% (van Kuijk, Geurts, & van Kuppevelt, 2002; Wittenberg, Peschke, & Bötel, 1992). However, various reports by researchers have given a range of 5% and 60% diagnosed with HO depending on the nature of the study, time since injury, age, and additional demographic factors (i.e., level of injury) with multiple joints involved (Bravo-Payno, Esclarin, Arzoz, Arroyo, & Labarta, 1992; Riklin, et al., 2003; Silver, 1969; Stover, Niemann, & Tulloss, 1991; Wittenberg, Peschke, & Bötel, 1992).

Location of HO primarily tends to occur below level of injury, specifically, the anterior and interior hip region (60%) as demonstrated by Genêt et al. (2011). Researchers retrospectively surveyed patients between years1993 and 2009 for HO related occurrences after central nervous system (CNS) damage involving 539 surgeries among persons with traumatic brain injury (TBI), stroke, SCI, and cerebral anoxia. Their findings revealed the primary cause for HO related surgeries were due to patients with TBI (n = 199; 55.7%) followed by patients with SCI (n = 86; 24.1%; males, n = 81; females, n = 5; paraplegic, n = 56; tetraplegic, n = 30). Specific to persons with SCI, primary location for HO related surgeries were of the lower limbs (total =129) and is indicated as follows: hip surgery (n = 96; 74.4%) and knee (n = 19; 14.7%); incidence of HO sites within the anterior and internal hip region was highest among those who had sustained a stroke (74.4%) followed by persons with SCI (70.7%). The upper-limb HO surgical site was highest for those with SCI with elbow (n = 12; 9.3%) and shoulder (n = 2; 1.6%). Lastly, the average time from CNS damage until surgery was 24.1 months.

Riklin et al. (2003) conducted a retrospective study from 1998 to 2000 to determine the incidence of deep vein thrombosis (DVT) and HO. Researchers identified those who had been newly diagnosed with paralysis as “first rehabilitation” (specifics towards time since injury not disclosed) and participants requiring treatment at least two months after injury as “re-rehabilitation.” Of the 1,209 patients identified with a SCI, findings revealed 275 “first rehabilitation” participants (mean age, 49.7) and 934 “re-rehabilitation” participants (mean age, 45.6). The incidence for all participants whom acquired HO was 1.82% (i.e., first rehabilitation and re-rehabilitation) while those who had been recently diagnosed with SCI had an incidence of 8%. Specifics towards gender, time since injury, and rate of complication were not addressed.

As demonstrated from the previous findings, the rate of HO varies and as a result, Jaovisidha et al. (1998) attempted to address the concern of reports failing to identify osteoporosis due to the increase in bone density caused by HO. After the removal of participants due to confounding characteristics (e.g., hip replacement), a total 107 SCI patients remained in the study. The overall incidence of HO was 18% (*n* = 19) and highest among persons aged 20 and 39 years (14/19; 73%). Overlapping locations of HO among the 19 patients was reported as follows: femoral neck (*n* = 15; 79%), followed by trochanteric (*n* = 14; 74%), and, Ward's triangles (*n* = 7; 37%).

These findings are similar with a case-control study conducted by Citak et al. (2012) as they discovered a 21.9% incidence among 111 males (84.1%) and 21 females (15.9%). Patients who had sustained a traumatic SCI between years 2002 and 2010 were utilized as part of the study with 110 having complete level of injury and 22 incomplete. Persons under the age of 18, those having a non-traumatic SCI, and time since development of HO (more than 125 days from injury) were removed from the analysis. Lastly, the authors reported age, gender, level of injury, particular secondary complications (i.e., DVT and pressure sores) and length of time hospitalized were not factors for the development of HO. However, spasticity, pneumonia, trauma to the thoracic region, tracheostomy, UTI, and patients who abused nicotine was at increased risk towards the development of HO. See table 4 for a summary of heterotopic study finding).

Table 4

Incidence of heterotopic ossification in spinal cord injured patients

Author	TSI	Males	Fem.	Age	Incidence n (%)
Banovac and Gonzalez (1997)	27 ± 14 days	59	4	28 ± 9 yrs.	36 (57)
Citak et al. (2012)	< 125 days	111	21	Mean 43.4 yrs.	21.9%
Damanski, M. (1961)	54 admitted within 14 days of SCI	Total: 162		47 (29%)	
Genêt et al. (2011)	*M* (2 years)	81	5	Mean 27.1 yrs.	Incidence of surgery site: Hip, n = 96 (14.7); knee, n = 19 (14.7); shoulder n = 2 (1.6); elbow, n = 12 (9.3)
Jaovisidha et al. (1998)	31.1 ± 15.9 years	107		20-78 When aged 20 - 39	19 (18) 14/19 (73)
Riklin et al. (2003)	*M* (113 days) X-sectional	877 275 acute SCI	322	Mean 46.6 yrs. Mean 49.7 yrs.	1.82% all patients 8% acute SCI

Note. *M* = Mean; yrs. = Years; Fem. = Females; TSI = Time since injury; X-sectional = Cross sectional.

Cardiovascular Disease

Several contributing factors leading to cardiovascular disease (CVD) among individuals with SCI have been outlined throughout the literature. These include, but are not limited to: obesity, sedentary lifestyle, loss of physical functioning as a direct result of paralysis, disturbance of the autonomic cardiovascular control mechanisms, hypertension, hyperlipidemia, autonomic dysreflexia (AD), low HDL cholesterol, increase body fat, smoking, psychosocial factors (e.g., depression) and deep vein thrombosis (DVT; Bauman, Kahn, Grimm, & Spungen, 1999b; Mathias & Frankel, 1988; Ragnarsson, 2010). Complications surrounding heart disease develop through a process called atherosclerosis. Atherosclerosis primarily affects the coronary arteries and occurs as plaque builds up along the walls of the artery restricting blood flow and increasing the risk for a heart attack or stroke (American Heart Association, 2014).

Within the United States, CVD is one of the primary causes of mortality with over one million deaths in 1995 alone; one in six of these deaths occurring among a population under the age of 65 (American Heart Association, 2014; Groah, Weitzenkamp, Sett, Soni, & Savic, 2001). Subsequently, half of all mortality rates among those with CVD is contributed to coronary heart disease (CHD). Cardiovascular disease affects more than 58 million Americans and CHD affecting more than 14 million with an increased risk for those with SCI (American Heart Association, 2014; Groah et al., 2001). As activity level becomes an apparent concern for this population, so does the risk for developing SCs. For individuals with reduced physical activity, the incidence of cardiovascular disease CVD is increasingly higher, in particular for individuals with SCI (Dishman, Heath, & Lee, 2013). As such, the physical inactivity leads to muscle atrophy and increased body fat that become contributing factors of CVD (Groot, Post, Snoek, Schuitemaker, & van der Woude, 2013; Kocina, 1997). Two additional factors that contribute to CVD and result from the latter include dyslipidemia (abnormal amount of lipids) and obesity, a common occurrence among persons with SCI when compared to the general population (Groot at al., 2013). Furthermore, individuals with SCI tend to be at an increased risk for developing CVD as blood pressure irregularity may contribute to injuries within the vascular wall resulting in a greater likelihood for developing this complication (Steins, Johnson, & Lyman, 1995).

Groot et al. (2013) determined risk factors of CVD within the first five years post SCI among 130 participants (70% male and 34% female) with an average age of 40.1 ± 13.8 years. Lesion characteristics were assessed according to the International Standards for Neurological Classification of Spinal Cord Injury; neurological levels below TI were defined as paraplegic and levels at or above T1 were defined as tetraplegia. Levels of injury among the participants included: paraplegia, (66%; n = 86); and tetraplegia, (34%; n = 44). Furthermore, 65% of the participants were classified as AIS A&B and considered motor complete injuries in comparison to 35% classified as AIS C&B motor incomplete. The study found high body mass index (BMI) or High-Density Lipoprotein (HDL) as contributing factors of CVD. High BMI among the participant (63-74%) was at greater risk of CVD along with high density lipoprotein (HDL) found in 66-95% of the participants; although this percentage tended to drop after patients were discharged five years from inpatient rehabilitation. The authors recommend focusing on improving BMI as an intervention or preventative measure of CVD along with early education on risks of obesity among the SCI population. Lastly, when investigating "self-care" items, those who reported maintaining an exercise regimen and/or maintaining an active lifestyle had a favorable lipid profile. A favorable lipid profile is one in which all cholesterol levels are within a healthy range and does not create blockage of the arteries causing a concern for CVD.

Davies and McColl (2002) investigated the correlation between lifestyle risks factors (i.e., alcohol and cigarette usage, physical activity, body mass index) and cardiovascular disease by conducting a cross sectional study of 97 participants with SCI. The sample population was comprised of 87 males and 10 females with a mean age of 47.5 years. The levels of injury included: paraplegia (*n* = 57, 55%); quadriplegia (*n* = 41, 42%), and undetermined (*n* = 1, 1%). The time since injury was noted at 15.9 (*M*) years. Cardiovascular morbidity was assessed using the London School of Hygiene Questionnaire on Chest Pain and Intermittent Claudication (LSH-QCPIC). The LSH-QCPIC questionnaire revealed 13.4% of the participants reported a cardiovascular morbidity. Subsequently, the authors found the prevalence CVD increased in SCI patients at 3.7% with each additional year of age and 3.1% with each year of cigarette smoking. Individuals who smoked for a longer period of time were at greater risk for developing CVD than non-smokers with spinal cord injury. Additional findings indicated physical activity, body mass index (BMI), and alcohol consumption were not substantial predictors of CVD in this study.

Seeking to explain why individuals with SCI appear to be at an increased risk for developing cardiovascular disease, Groah et al. (2001) conducted a study among 545 individuals with subgroups divided by level of injury according to the Frankel/ASIA scale; tetraplegia ABC; (18%), paraplegia ABC; (52%), and all D level injuries (30%). All participants were at least 20 years post-injury with a gender distribution of 86% males and 14% females. Of the subgroup, there were 458 recorded CVD events during the 20 year period; 24% involving coronary heart disease, 21% hypertension, 16% dysrhythmias, 15% peripheral vascular disease, 8% congestive heart failure, 7% valvular disease, and 2% atrial fibrillation. Subsequently, the age-adjusted rate of CVD by neurologic category was noted as followed: tetraplegia ABC; 35.2, paraplegia ABC; 29.9, and all D groups; 21.2 per 1000 individuals with SCI. Those with tetraplegia, revealed a 16% increase in all CVD, were five times more likely to develop cerebrovascular disease (decrease in blood supply to the brain) however, 70% were less likely to have CHD in comparison to individuals with paraplegia. Furthermore, age tended to be a contributing factor as the incidence of CVD increased among all subgroups with greater risks for the tetraplegia ABC and paraplegia ABC group (statistically significant at the .04 level) and evident by age 40 in comparison to the All D group. Those with a complete level of injury (i.e., total loss of function) were at a 44% and greater risk of CVD.

In a similar study to evaluate whether a correlation exists between CVD and SCI, Cragg, Noonan, Krassioukov, and Borisoff (2013) compiled data from 60,959 individuals utilizing the national Canadian Community Health Survey (CCHS), with a proportionate gender sample of 49.3% males and 50.8% females. Findings revealed 72% of cases with CVD accounted for individuals over the age of 60 with a prevalence of heart disease higher for individuals with SCI (17.1%) in comparison to those without (4.9%). The lack of neurological level, completeness of injury, and class of heart disease were a primary limitation of the study. However, the study revealed males in general with CVD was higher in comparison to their counterparts. Consequently, heart disease was four times greater among individuals with SCI and after adjusting for age and gender (males at greater risk); the odds were 2.72 greater in comparison to people without SCI.

In terms of mortality from cardiovascular causes, large cohorts of participants with SCI have been observed. Whiteneck et al. (1992) reviewed 843 medical records with a post injury time of 30 or more years to assess long term health complications in the SCI population. Participants were separated into groups based on survival status to assess for mortality and morbidly outcomes; results indicated n = 362 (43%) of the participants had expired during the study. Demographically, 87% were males and 13% females with an age distribution of 15 to 55 years old at the time of injury. The level of injury was noted as cervical (31%), thoracic (52%), and lumbar/sacral (17%) with a Frankel classification of paraplegia ABC, quadriplegia ABC, and All D or E level injuries. Data revealed that among the 362 participants who had expired during the study, n = 84 (23.2%) were associated with CVD (n = 38 myocardial infarctions, n = 31 other diseases of the heart, n = 10 cases of cerebrovascular disease, and n = 5 cases of other circulatory problems). Furthermore, CVD was the leading cause of death for individuals with paraplegia ABC (n = 48, 23.2%) followed by All D & E levels; (n = 28, 28.3%) and quadriplegia ABC; (n = 8, 14.1%). Subsequently, CVD related deaths in SCI patients became more frequent with aging and time since injury, accounting for 46% of all deaths for individuals 30 years post injury and 35% of all deaths in individuals over 60 years of age. The incidence of heart/circulatory diagnoses increased with age (episodes per 100 cases per year); participants <30 years of age showed an incidence of 2.0%, for individuals aged between 30 and 39 years, an incidence of 2.9%, an incidence of 5.2% for those aged 40-49 years, an incidence of 8.1% aged 50-59, and lastly 19.3% for those aged 60+ years. (See table 5 for a summary of cardiovascular disease study findings).

Table 5

Incidence of cardiovascular disease in spinal cord injured patients

Author	TSI	Age	Males	Fem.	LOI	Incidence
Cragg et al. (2013)	Not Spec.	Med = 40-44 yrs.	Total = 354		Not Specified	n=60 (17.1%)
Davies & McColl, (2002)	*M* = 15.9 yrs.	*M* = 47.5yrs.	n=87 (90%)	n=10 (10%)	Quad, n=41 (42%); Para, n=55 (57%); UNDETM=1(1%)	n=13 (13.4%)
Groah et al. (2001)	29 ± 6 yrs.	27 ± 9 yrs.	n=469 (86%)	n=76 (14%)	Tetra, ABC n=99 (18%) Para, ABC n=285 (52%) All D n=161 (30%)	Tetra ABC n=64; Adj. Rate 35.2 Para ABC n=279; Adj. Rate 29.9; All D n=115 Adj. Rate 21.2
Groot et al. (2013)	Immed. after D/C	*M* = 40.1	n=91 (70%)	n=39 (30%)	Tetra n= 44 (34%) Para n=86 (66%)	n=125 (63%) at risk for CVD/BMI; n=124 (95%) at risk for CVD/HDL
	1 yrs.					n=116 (68%) at risk for CVD/BMI; n=109 (88%) at risk for CVD/HDL
	5 yrs.					n=97 (74%) at risk for CVD/BMI; n=74 (66%) at risk for CVD/HDL
Whiteneck (1992)		15–60+ yrs.	n=726 (87%)	n=108 (13%)	Cervical n=258 (31%) Thoracic; n=431 (52%), Lumbar/Sacral n=145 (17%)	
	<10 yrs.					n=24 (2.9%)
	10-19 yrs.					n=45 (5.4%)
	20-29 yrs.					n=83 (10.0%)
	30+ yrs.					n=118 (14.2%)

Note. TSI = Time Since Injury; Immed. = Immediately; X – Sect. = Cross Sectional; Long. = Longitudinal Study;Yrs. = Years; Avg. = Average; LI= Level of Injury; SD=Standard Deviation; *M* = Mean; Med = Median; CVD=Cardiovascular Disease; BMI= Body Mass Index; HDL=High-Density Lipoprotein; T = Tetraplegia; Para = Paraplegia; Comp = Complete; Inc = Incomplete; LOI = level of injury; TOS = type of study

Autonomic Dysreflexia

Other cardiovascular complications associated with CVD include AD occurring among individuals with a traumatic SCI injured at T6 and above (some incidence reported in SCI as low as T8 to T10; Hagen, Faerestrand, Hoff, Rekand, & Gronning, 2011; Myers, Lee, & Kiratli, 2007; Popa et al., 2010). According to the Autonomic Standards Committee established by the American Spinal Injury Association (ASIA) and International Spinal Cord Society (ISCoS), AD is defined as a rise of blood (20 mmHg) above the baseline in SCI patients; the associated symptoms of AD include headache, nasal congestion, nausea, flushing and sweating above level of injury, vasoconstriction below lesion level, bradycardia, cardiac arrhythmia, and anxiety; however, AD can also be asymptomatic (Erickson, 1980; Krassioukov et al., 2007; Lindan, Joiner, Freehafer, & Hazel, 1980; Ma & Bryce, 2010; Mathias & Frankel, 2002). In life-threatening cases, paroxysmal hypertension (occurring 50-90% of person's with tetra/paraplegia respectively) can trigger loss of consciousness, cerebral and spinal hemorrhaging, seizures, and pulmonary edema can occur (Rabchevsky, & Kitzman, 2011; Vaidyanathan et al., 2012).

The prevalence of AD has been shown to occur in 48% to 90% of patients with a SCI at or above the T6 level with 92% of cases occurring within the first year post-injury. However, reports of 15.4% and lower have been documented following acute SCI (Kurnick, 1956; Lindan et al., 1980; Myers et al., 2007; Ragnarsson, Hall, Wilmot, & Carter, 1995). Garstang and Walker (2011) addressed the lower incidence of AD and stated the result could be due to shorter hospital stays following acute SCI in recent years. As previously discussed, majority of AD complications occur within the first year; therefore, detecting this particular complication can prove to be a challenge. Although AD is characteristic in the chronic stage of SCI or above the T6 level, there is evidence of early episodes in 5.2% cases appearing within the first month after injury (Claydon, Steeves, & Krassioukov, 2006; Krassioukov, Furlan, & Fehlings, 2003; Silver, 2000)

As previously stated, a critical aspect affecting the prevalence of AD in SCI patients is the degree of completeness as well as the neurological level of injury. Curt, Nitsche, Rodic, Schurch, and Dietz (1997) conducted a cross sectional study and analyzed the occurrence of AD during urodynamic examination in a sample of 31 chronic paraplegic and tetraplegia participants less than six months post injury. The sample was composed of (81%) males and (19%) females younger than 65 years old with a level of injury noted as complete tetraplegia (n = 11), incomplete tetraplegia (n = 11), and complete paraplegia (n = 9). The authors found 42% of the aggregate sample exhibited signs of AD and no paraplegic patient (level of SCI < T6) exhibited symptoms in comparison to 59% of the tetraplegia group. Consequently, of the participants in the tetraplegia group, AD was three times more prevalent in patients with complete injuries (91%), in contrast to those with an incomplete injury (27%).

Chen, Apple, Hudson, and Bode (1999) examined the occurrence of AD during the rehabilitation phase following a SCI using a sample of 1,649 participants (79% males; 21% females) entered into the National SCI Statistical Center (NSCISC) from 1996 through 1998. The mean number of days from injury to admission was noted at 19 days. The ethnic distribution of the study population included Caucasians (59.6%), African Americans (28.9%), and Hispanics (11.7%) with a mean age of 36.5 years at the time of injury. The neurological level of the participants included incomplete tetraplegia (30.7%) followed by complete paraplegia (29.3%), complete tetraplegia (20.1%), and incomplete paraplegia (18.7%). Researchers found the frequency of AD was significantly greater in higher level and complete neurological injuries. Twenty-nine individuals with complete tetraplegia and (12.8%) of persons with neurological complete injuries experienced AD, followed by those incomplete with sensory preservation (8.7%), and incomplete with poor motor preservation (4.3%). Moreover, data demonstrated a higher incidence of AD among males (8.3%) in comparison to (6.4%) in females. Additional findings indicated the prevalence of individual developing AD by the year of admission was noted at 6.9% (year 1996), 9.4% (year 1997), 6.6% (year 1998), and (7.9%) accounting for all years of inpatient rehabilitation. In a follow-up study McKinley, Jackson, Cardeans and DeVivo (1999) analyzed the incidence rate of long-term medical complications among 6,776 SCI patients utilizing the NSCISC database. Participants were divided by the neurological classification and level of injury according to the ASIA scale. The authors discussed AD as the second most common SC reported during annual follow-ups and are as follows: Year 1; (10.9%), year 2; (10.6%), year 5; (10.4%), year 10; (10.6%), year 15; (13.7%), and year 20; (17.6%). Additionally, participants using indwelling and condom catheters reported more AD than those utilizing an intermittent catheterization program (ICP).

There are several contributing factors associated with AD that include, but are not limited to, bladder distention which is considered to be the most occurring of all associated factors (75%-80% of cases), noxious stimulus (damages tissue and may cause pain) below the level of injury, over-distended bladder as a result of Foley catheter kinking, and insufficient replacements of intermittent catheterization (Krieger & Krieger, 2000). Multiple studies have examined the AD reaction during urodynamic evaluation and actual bowel program among the SCI population (Furusawa et al., 2007; Furusawa et al., 2009; Giannantoni et al., 1998; Linsenmeyer, Campagnolo, & Chou, 1996).

Utilizing 571 SCI patients from the Rosai Hospital registry, Furusawa et al. (2011) investigated the relationship among the different bowel and bladder management methods and the prevalence of AD during hospitalization. The demographic characteristics included (81.6%) males and (18.4%) females with a mean age of 52.3± 18.8 at discharge. The level of injury among the participants included; C1-C4 (31.7%; *n* = 181), C5-C8 (60.6%; *n* = 346), T1-T4 (1.7%; *n* = 27), and T5-T6 (3.0%; *n* = 17). Participants were also classified utilizing the AIS impairment scale and included: AIS A (29.4%; *n* = 168), AIS B (6.1%; *n* = 35), AIS C (22.2%; *n* = 127) and AIS D (42.2%; *n* = 241). The authors noted a 24.7% prevalence of symptomatic AD from the total sample, accounting for 24.2% (*n* = 113) in men versus 26.7% (*n* = 28) in women. Others findings revealed AD was diagnosed in participants with SCI above the T5 segment; it was most common among participants with AIS A lesion (43.5%) followed by AIS B (40%), AIS C (25.2%) and AIS D at (10%). In relation to bladder management methods the highest incidence of symptomatic AD was seen in patients who used reflex voiding (43.3%) followed by indwelling-supra-pubic catheterization (40%), and indwelling urethral catheterization (35.4%). Conversely, the highest incidence according to bowel management included patients using manual removal of stool (39.4%) followed by those on rectal medications (27.4%).

Patient and caregiver education related to secondary complications following a SCI, such as AD, is a vital component for an effective transition. Schottler, Vogel, Chafetz, and Mulcahey (2009) conducted a cross-sectional study investigating the awareness and incidence of AD in 215 patients with SCI and their caregivers. In this study, participants were assessed based on the level of injury, severity of injury, injury etiology, gender and race. The sample population was composed of 59% males and 41% females, with a race distribution of Caucasians (76%), Hispanic (11%), African-American and (2%) and Asian (2%). The type of injury among the participants included 54% tetraplegia and 46% paraplegia, with a level of injury of T6 and above (78%) and below T6 (22%). The authors stated 40% of patients and 44% of caregivers reported the patient did experience or was symptomatic for AD. Respectively, there was no substantial association found between incidence of AD and gender, race, or time since injury. However, AD was significantly more prevalent in traumatic etiologies (44%), in injuries at or above T6 (48%), and in participants injured between 14 and 21 years of age (56%). (See table 6 for a summary of autonomic dysreflexia study findings).

Table 6

Incidence of autonomic dysreflexia in spinal cord injured patients

Author	TSI	Age	Males/Fem.	LOI	Incidence
Chen et al. (1999)	Yr. 1996	*M* 36.5 SD 16.9	Total: 702	Inc. Tetra (30.7); Comp. Para (29.3); Comp. Tetra (20.1) Inc. Para (18.7)	48 (6.9%)
	Yr. 1997		Total n=716		67 (9.4%)
	Yr. 1998		Total n=231		15 (6.6%)
	All Yrs.		Total n=1,649		130 (7.9%)
Curt et al. (1997)	>6 Mon.	<65	M = 25 (81); F = 6 (19)	Comp. Tetra 11 (35.5); Inc. Tetra11 (35.5) Comp. Para, 9 (29)	13 (42%)
Furusawa et al. (2011)	4 Mon.	*M* ±SD age at discharge 52.3±18.8	M = 466 (81.6) F = 105 (18.4)	ASIA A n=168 (29.4) B n=35 (6.1) C n=127 (22.2) D n=241 (42.2)	141 (24.7) ASIA; A, 73 (43.5%) B, 14 (40%) C, 32 (25.2%) D, 22 (10%)
McKinley et al. (1999)	Yr. 1	1-60+	Total: 6,776	NS	717 (10.9%)
	Yr. 2		Total: 5,744		585 (10.6%)
	Yr. 5		Total: 4,100		412 (10.4%)
	Yr. 10		Total: 2,339		242 (10.6%)
	Yr. 15		Total: 1,285		168 (13.7%)
	Yr. 20		Total: 500		85 (17.6%)
Schottler et al. (2009)	4.3 Yrs.	9.1 *M*	M = 127 (59) F = 88 (88)	T6 and above 168 (78) Below T6, 47 (22)	86 (40%) T6 and above, 81 (48) Below T6, 5 (12%)

Note. TSI = Time Since Injury; Immed. = Immediately; X – Sect. = Cross Sectional; Long. = Longitudinal Study;Yrs. = Years; Avg. = Average; LI= Level of Injury; SD=Standard Deviation; *M* = Mean; Med = Median; Tetra = Tetraplegia; Para = Paraplegia; Comp = Complete; Inc = Incomplete;

Deep Vein Thrombosis

Patients with acute SCI are at an increased risk for development of deep vein thrombosis (DVT) as loss of muscle tone (particularly calf and thigh muscle) decreases blood flow enabling blood clots to form (U. S. Department of Health and Human Services [HHS], National Institute of Health [NIH], National Heart, Lung, and Blood Institute [NHLBI], 2011). As the clot develops, it can break off from where it originated and travel to the lungs creating a blood clot; this restricts blood flow resulting in a potentially fatal pulmonary embolism (PE) that damages organs (HHS, NIH, NHLBI, 2011). Three factors leading to DVT according to Virchow's triad include stasis, hypercoagulability, and intimal change (Miranda & Haussoni, 2000). The incidence of DVT among acute SCI has been examined in early prospective studies with the incidence ranging between 5.4% and 90% (Green et al., 1990; Joffe 1975; Merli et al., 1988; Perkash, Prakash, & Perkash, 1978; Rossi, Green, Rosen, Spies, & Jao, 1980; Todd et al., 1976). However, more recent and widespread studies place the incidence of DVT between 10% and 30% (Aito, Pieri, D'Andrea, Marcelli, & Cominelli, 2002; Li et al., 2012; Powell, Kirshblum, & O'Connor, 1999).

Perkash et al. (1978) conducted a retrospective review of records and analyzed the incidence of DVT in 51 males with acute spinal cord injury. The interval between the time of injury and admission ranged from four to 90 days with a level of clinical lesion varying from C4 to L3 and a segment distribution of cervical (n = 27), thoracic (n = 18 , and lumbar (n = 5). Findings indicated the total incidence of DVT was 18%; however, one patient developed pulmonary embolism without detectable DVT. Therefore, the diagnosed incidence of DVT was 16%. The researchers also observed the period between injury and diagnosis of DVT ranged from 10 to 160 days with 27% (n = 3) of the eleven episodes occurring twelve weeks post-injury.

In addition, the study also found that age and level of injury had no correlation with DVT. In a related study, Sugimoto et al. (2009) examined 52 patients with acute spinal cord injury who had been admitted within twenty four hours after injury and assessed two to thirteen days after injury (average 4.7 days) for DVT using color Doppler US. According to the American Spinal Injury Association Impairment Scale (AIS) at admission, 32 participants were grade A or B and 20 were grade C or D. The sample was comprised of 40 participants less than seventy years of age and 12 participants seventy years and older with an average age of 54 years at the time of injury. Results indicated (21%) of the participants developed DVT with a higher incidence among males (24%) in comparison to females at (9%). In relation to age, 18% of the participants who were ≤69 years old had DVT in contrast to (33%) of individuals ≥70 years of age. Lastly, the prevalence of DVT was greater in participants with motor complete injuries AIS A or B (22%) whereas motor incomplete injuries AIS C or D were noted at (20%).

Deep vein thrombosis has been reported as early as 72 hours post-injury; the likelihood of experiencing this complication peaks within the first two-weeks and reduces within three months post-injury (Green et al., 1990; Merlie, Crabbe, Paluzzi, & Fritz, 1993; Popa et al., 2010; Rossi et al., 1980). In a study by Powell et al. (1999) to determine the incidence of DVT among 189 SCI patients admitted for rehabilitation post-injury by utilization of duplex ultrasound yielded the following: at time of admission, 22 patients (11.6%) had been diagnosed with DVT. However, the level of injury was not a factor for the development of DVT. When providing prophylaxis (preventative measures) such as warfarin (medication to prevent blood clotting) and low-molecular weight heparin (anticoagulant), prophylaxis decreased the risk of developing DVT among patients (4.1%) in comparison to those who had not received any preventative measure (16.4%). Various forms of prophylaxis have been shown to assist in decreasing the risk of DVT making it a possible rather than probable SC if preventative measures are taken immediately following injury. However, the incidence of DVT increases from 47% to 100% when no form of preventative measure is taken (Geerts, Code, Jay, Chen, & Szalai, 1994; Geerts, Heit, Pineo, & Clagett, 2001; Merli et al., 1988; Myllynen et al., 1985).

Aito et al. (2002) similarly studied a sample of 275 participants with SCI and evaluated the incidence of DVT based on pharmacological approaches in combination with mechanical methods. All participants were examined by Color Doppler Ultrasonography (CDUS) of lower limbs and pelvis on admission and again after 45-60 days to detect the presence of DVT. The prophylactic treatment was given to 99 of the patients within 72 hours from trauma and classified in the group of Early Admitted Patients (EAP). Whereas the second group categorized as Late Admitted Patients (LAP) initiated treatment from their date of admission, in a period fluctuating from eight to 28 days post-injury (mean 12 days). The treatment administered to all participants during the first 30 days post injury included subcutaneous nadroparine, a low molecular weight heparin (LMWH), early mobilization, continuous gradient elastic stockings (PGES), and external sequential pneumatic compression (ESPC) of the lower limbs. The complete prophylactic treatment lasted at least 30 days after injury and was continued by ESPC and LMWH for two months depending on the patient’s progress. The authors reported the incidence of DVT in the group of participants treated early (EAP) who immediately received prophylactic protocol was 2%, while the incidence in participants treated later (LAP) was 26%. Conversely, the incidence of DVT in the LAP group was higher among males (30%) in contrast to (9%) in females. In addition 36% of participants classified as ASIA A developed DVT, followed by ASIA B, (27%); ASIA C, (21%); and ASIA D, at (7%). Furthermore, of the DVTs that occurred, 60% were detected at the time of later admission (eight to 28 days), while the remaining 40% developed within six weeks of hospitalization. The study concluded early adoption of pharmacological approaches plus combined mechanical treatments produces a significant reduction of DVT and hospitalization cost during the early period of rehabilitation following a SCI.

Attempting to analyze the incidence of DVT among acute SCI patients who utilized physical therapy measures and therapeutic prophylaxis, Agarwal and Mathur (2009) conducted a randomized study of 297 participants who were separated into a study and control group. The study group was composed of 166 patients who received unfractionated low-dose heparin (ULDH), subcutaneously from the day of admission until three months after injury while the 131 patients in the control group were not administered ULDH. All participants received physical therapy measures that included passive range of motion exercise and light massage therapy. In addition participants were consecutively examined by Color Doppler study on admission and during the three month follow up to assess incidence of DVT. The majority of the sample entered into the study within 10 days after injury with a mean of eight days ranging from three to 40 days. The researchers discovered DVT was recorded in three participants (1.8%) in the study group within six to 10 days after injury; two participants were classified as ASIA grade A and one in ASIA grade D. In the control group, DVT developed in four patients (3%), within five to 28 days post-injury, and all four were classified as ASIA grade A. According to the researchers, the level of injury, ASIA grading, day of admission as well as heparin prophylaxis did not have a significant correlation with the incidence of DVT.

In conjunction with the findings from AD by Chen et al. (1999), the authors subsequently identified that the incidence of DVT occurred in 9.8% of the sample throughout the rehabilitation phase by utilizing Doppler ultrasound. Moreover, the prevalence of DVT by the time of admission consisted of year 1996, (11.4%); year 1997, (9.8%); and year 1998, (5.2%). Other findings indicated DVT developed higher in males (10.4%) versus females (7.2%). Additionally, the prevalence of DVT was slightly higher in individuals with paraplegic injuries (9.9%) that in those with tetraplegia injuries (6.5%) and it was higher in participants with neurological complete injures (13.2%). Although the research notes the differences were not statistically significant in relation to gender and level of injury. Chen and colleagues recommend a close observation of secondary complications and improvements in preventative measures to assist individuals with SCI during their recovery process.

In addition to encouraging an active lifestyle, physician should instill a psychoeducational approach when working with the SCI population. Furthermore, follow-up visits should be encouraged for the management and detection of high blood pressure, DVT, AD, CAD, hypertension, and CVD (Myers et al., 2007).Routine consultations with a nutritionist tailored to the individual with a SCI are recommended and can assist in maintaining a healthy weight and lipid profiles. See table 7 for a summary of deep vein thrombosis study findings.

Table 7

Incidence of deep vein thrombosis in spinal cord injured patients

Author	TSI	Age	Males n (%)	Fem. n (%)	LOI n (%)	Incidence n (%)
Aito et al. (2002)	72 hours	*M*: 41.3	79 (79)	20 (21)	ASIA A n=33 (33%) B n=25 (24%) C n=20 (21%) D n=15 (15%)	2 (2)
	M: 12 days	*M*: 42.3	142 (81)	34 (19)	ASIA A n=67 (38%) B n=44 (25%) C n=36 (21%) D n=29 (16%)	46 (26)
Agarwal and Mathur (2009)	8 days	*M*: 32	Total: n=166 Study Group		ASIA A-D Not Specified	3 (1.8)
			Total: n=131 Control Group		ASIA A-D Not Specified	4 (3)
Chen et al. (1999)	19 days	*M* 36.5 SD 16.9	1303 (79)	346 (21)	Incom. Tetra (30.7%) Com. Para (29.3%) Comp. Tetra (20.1%) Incom. Para (18.7%)	161 (9.8)
Perkash et al. (1978)	4-90 days	19-62	50	0	Cerv. 27 (54) Thor. 18 (36) Lum. 5 (10)	9 (18)
Powell et al. (1999)		*M*: 44	Total n=189	ASIA (A, B) 99 (52.4) ASIA (C, D) 90 (47.6)	22 (11.6)	22 (11.6)
Sugimoto et al. (2009)	*M*: 4.7 days	*M*: 54	41 (79)	11 (21)	AIS Grade A or B n=32 C or D n=20	11 (21)

Note: TSI = Time Since Injury; Yrs. = Years; Avg. = Average; LOI= Level of Injury; SD=Standard Deviation; M = Mean; Med = Median; Tetra = Tetraplegia; Para = Paraplegia; Comp = Complete; Inc = Incomplete; NS = not specified; Cerv. = Cervical; Thor = Thoracic; Lum. = Lumbar.

Syringomyelia

Syringomyelia is a condition in which a cyst (syrinx) forms and expands within the spinal cord creating pressure within the intracranial space and spinal column (Brodbelt & Stoodley, 2003). Various symptoms associated with this complication include pain, muscle rigidity, loss of bowel and bladder function, pain, weakness and the inability to feel extreme temperatures (i.e., hot and cold) throughout the body (Klekamp & Samii, 2002; Ko et al., 2012). The incidence for this SC tends to be low with reports falling within the range of 0.3% and 3.4% (Umbach &

Heilporn, 1991; El Masry & Biyani, 1996). Currently, few studies have focused on the prevalence of syringomyelia; however, attention has been given to the treatment and management (i.e., surgery and medications), diagnosis (i.e., magnetic resonance imaging, MRI), and predictive factors (i.e., level of injury).

Rossier, Foo, Shillito, and Dyro (1985) conducted a study to identify the rate of syringomyelia among 951 persons with SCI. Overall findings resulted in $n = 22$ (4.5%) of 488 individuals with paraplegia as the reported level of injury in contrast to $n = 8$ (1.7%) of 463 individuals with tetraplegia. In a related study, El Masry and Biyani (1996) studied 815 patients with traumatic SCI between 1990 and 1992. Of the total participants in the study, a diagnosis of posttraumatic syringomyelia (PTS) was found in $n = 9$ (1.10%) persons with an incomplete SCI in comparison to 19 (2.3%) participants with a complete level of injury (total of 3.4% of 815 participants); mean time since injury and diagnosis was 6.9 and 9.4 years respectively.

Similar findings were revealed by Schurch, Wichmann, and Rossier (1996) when investigating syringomyelia among 449 patients with tetraplegia and paraplegia. Specifics with regards to the level of injury (i.e., number and percentage of cervical, thoracic, lumbar, and sacral) were not discussed. Of the total number of participants, PTS was found in 20 (4.45%) of patients as identified by an MRI. Level and incidence for this complication included $n = 16$ (3.56%) and $n = 4$ (0.89%) participants with complete and incomplete SCI who had been diagnosed with PTS respectively. The average time since injury and symptoms for syringomyelia was 7.2 years while diagnosis for PTS and time since injury was 9.4 years.

Through the increased use of MRI as a method of diagnosis, the incidence of PTS has been reported to range from 12% to 22% (Vannemreddy, Rowed, & Bharatwal, 2002). Utilizing a sample of 502 SCI patients who underwent follow-up MRI examinations, Ko et al. (2012)

completed a retrospective study and evaluated the incidence of post-traumatic syringomyelia within five years after injury. The sample was composed of 407 (81%) males and 95 (19%) females with a mean age of 46.2 years. The level and completeness of injury was noted as: cervical, (*n* = 237; 47%); thoracic (*n* = 265; 53%); complete, (*n* = 225; 45%); and incomplete (*n* = 277; 55%). Results indicated syringomyelia developed in 37 (7.3%) of the participants within five years after injury. In addition, syringomyelia was diagnosed as early as two months after a SCI (ranging from two to 54 months) while the mean time for diagnosis was noted at 38.8 months. Other findings indicated the incidence of syringomyelia was proportionate in terms of level (8.4% cervical versus 6.4% thoracic) and completeness of injury (8% complete versus 6.9% incomplete).

In a related study, Perrouin-Verbe et al. (1998) assessed the occurrence of syringomyelia among 75 participants with SCI. The participants included 62 males and 13 females with at average age of 41 years. Participants were categorized according to the neurological classification: tetraplegia complete, (*n* = 9; 12%); tetraplegia incomplete, (*n* = 12; 16%); paraplegia complete, (*n* = 45; 60%); and paraplegia incomplete, (*n* = 12; 16%) with a mean duration since injury of eight years. Participants completed a clinical and radiological examination (i.e., X-ray, CT scan, and MRI). The researchers discovered the prevalence of syrinx accounted for 28% of the sample population and developed higher in males (18; 86%) in comparison to females (3; 14%). Furthermore, participants with paraplegia (33.3%) were at a higher risk of developing a syrinx in comparison to persons with tetraplegia (14.2%). See table 8 for a summary of syringomyelia study findings.

Table 8

Incidence of syringomyelia (Including Post Traumatic Syringomyelia: PTS)

Author	Gender: n (%)	Age (M)	TSI	Level of Injury: n (%)	Incidence: n (%)
El Masry and Biyani (1996)	Gender NS Total: 815	17-45 Yrs.	8.6 Yrs. for dx	Inc. n = 390 Com. n = 425	9 (1.0) 19 (2.3)
Ko et al. (2012)	M: 407 (81) F: 95 (19)	46.2 ± 12.3 Yrs.	5 Yrs.	Cerv. 237 (47) Thor. 265 (53) Com. 225 (45) Inc. 277 (55)	Overall, 37 (7.3)
Perrouin-Verbe et al. (1998)	M: 62 (83) F: 13 (17)	41 Yrs.	8 Yrs. (*M*)	Tetra, 21 (28) Para, 54 (72)	Overall, 21 (28)
Rossier et al. (1985)	Gender NS Total: 951	NS	NS	Tetra, 463 (49) Para, 488 (51)	8 (1.7) 22 (4.5)
Schurch et al. (1996)	Gender NS Total: 449	32.2	NS	Inc. NS Com. NS	Overall, 20 (4.45) Inc. 4 (0.89) Com. 16 (3.56)

Note: TSI = M = Males; F = Females; TSI = Time Since Injury; *M* = Mean; Com. = Complete; Inc.= Incomplete; dx = diagnosis; NS = Not specified; Tetra = Tetraplegia; Para = Paraplegia; Cerv = cervical; Thor = Thoracic

Neuropathic Pain

For individuals who acquire a SCI, neuropathic pain (NP) tends to be a significant concern and is associated with poorer health, reduced quality of life, and depression (Wollaars, Post, van Asbeck, & Brand, 2007). This SC is defined as pain acquired due to a lesion or disease from the somatosensory nervous system (Jensen et al., 2011). Persons experiencing NP describe various symptoms (i.e., burning, aching, cramping, stinging, etc.) with an incidence generally falling below 50%. After a thorough review of literature, the vast number of studies focusing on NP investigated the characteristics of pain and location (i.e., shoulder, arms, back, hip, legs, etc.) rather than the overall incidence. As a result, the report for this complication was limited; however, studies published and reported below provided significant contributions in identifying the prevalence for NP.

In a five year retrospective study among 402 non-traumatic and traumatic SCI patients admitted for the first time within 1995 and 2000, Werhagen, Budh, Hulting, and Molander (2004) investigated predictive factors of NP. Criterion variables included age, time since injury, gender, level of injury, and complete versus incomplete with development of at level or below level of injury as the outcome variable. Mean time since injury was reported at six years, with age divided into five groups with individuals primarily falling within the 0 – 39 range (*n* = 291) in comparison to their counterpart aged 40 – 50+ (*n* = 110). Level of injury was classified as either complete (ASIA A; *n* = 157; 39%) and incomplete (ASIA B – D; *n* = 245; 61%), and paraplegia (*n* = 234; 58%) and tetraplegia (*n* = 168; 42%) was included in their report for further clarification. The operational definition for pain was classified as either at-level pain (indicating pain was at level of injury) or below-level pain (pain was described as occurring below level of injury). Of all participants who reported NP, only two indicated above-level injury pain.

Demonstrated findings by Werhagen et al. (2004) revealed 162 (40%) met the diagnostic criteria for NP; of this group, 34% were at-level pain and 66% below-level pain. With regards to age, the incidence of this condition was found primarily among persons of older age (> 50; 58%) while those within the age group 0-19, NP was reported less frequently (26%). When measuring gender to predict NP, 48% (*n* = 40) of 83 females reported pain in comparison to 38% of males (*n* = 115). With regards to level of injury, 42% (*n* = 66) of persons with complete SCI (ASIA A) and 39% (*n* = 96) of individuals with incomplete SCI (ASIA B – D) reported NP. Tetraplegia and paraplegia NP was reported at 41% (*n* = 69 of 168) with 16% at-level pain versus 26% below-level pain and 40% (*n* = 94 of 234) with 11% at-level pain versus 29% below-level pain, respectively. Age was the primary predictor for NP with no significant findings/differences among the other criterion variables. Lastly, of all individuals who had met the criteria for NP, 72% reported this condition as having an effect on their overall quality of life.

Werhagen, Hulting, and Molander (2007) enhanced their previous study in identifying the prevalence of NP among 95 non-traumatic SCI patients between the years 1995 and 2000.

Using the same predictor variables (age, gender, complete versus incomplete level of injury, etc.) in addition to gathering patient's opinion of their pain in relation to their daily life, their findings were as follows. Neuropathic pain was reported among 38% (*n* =36) of the participants with 61% (n= 22) accounting for below-level pain and 39% (n = 14) at-level pain. With regards to gender, no significant differences with findings reported at 51% for women (*n* = 18 of 35) and 30% for males (*n* = 18 of 60) reported NP. In addition, there was no significant difference between age groups up to 39 years (*n* = 16; 36%) versus 40 years and above (*n* = 20; 47%). Level of injury revealed similar frequency findings between those with a complete (ASIA A; *n* = 4 of 11; 36%) and incomplete lesion (ASIA B – D; *n* = 32 of 84; 38%); no differences were found with regards to the prevalence of tetraplegia (*n* = 12 of 27; 44%) and paraplegia (*n* = 24 of 68; 35%). When addressing patient's opinion of their pain in relation to their daily life, 24 of 36 (67%) indicated NP as a severe problem or a problem effecting their daily lives in comparison to those indicating no interference (*n* = 8/36; 33%). The overall report when addressing the prevalence of NP among persons with SCI was 38%, similar to the researcher's previous study.

Siddall, Taylor, McClelland, Rutkowski, and Cousins (1999) conducted a longitudinal cohort study investigating the prevalence of pain experienced by 100 SCI patients immediately following injury up until six months post injury. The study was composed of 83% males and 17% females with a mean age of 38 years. The neurological level of injury among the participants included: tetraplegia, (51%); paraplegia, (49%); cervical, (51%); thoracic, (25%); lumbar, (23%); and sacral, (1%); the degree of degree of completeness was noted at (64%) incomplete and (36%) complete. Participants were assessed throughout the duration of the study on the prevalence and severity of the pain utilizing the International Association for the Study of Pain (IASP) classification system. The IASP classification system identifies the main pain categories arising after a SCI injury and labels pain into the following: musculoskeletal, visceral, neuropathic at-level, and neuropathic below-level (Siddall, Yezierski, & Loeser, 2000).

Siddall et al. (1999) reported 64% of participants experienced some type of pain with the incidence varying significantly when examining time and different categories of pain. Musculoskeletal pain was noted as the most common type and was reported in 66% of the participants two weeks post-injury and tended to decrease with an incidence of 40% six months post-injury. Neuropathic at-level pain was present in 38% after two weeks and the prevalence remained constant throughout the study. The prevalence of neuropathic pain below-level was noted at 14% after two weeks and increased to 19% six months post injury.

Only 5% of the sample reported visceral pain at any stage of evaluation. Additional findings indicated a higher prevalence of musculoskeletal pain in individuals with thoracic level injuries (92%) when compared to the total sample (72%; Siddall et al., 1999). The authors reported no other significant findings in the overall prevalence of pain and among the four categories when examining the level of lesion and completeness.

To expand upon their previous findings, Siddall, McClelland, Rutkowski, and Cousins (2003) further investigated the original participants from the 1999 study to assess the prevalence of NP five-year post injury. The same identifying categories of pain and participants (*n* = 73) were included in the study. The mean age of the participants was 40 years with a gender distribution of 82%) males and 18% females. The neurological level of injury (tetraplegia: *n* = 36; 49% and paraplegia: *n* = 37; 51%) and degree of completeness (complete: *n* = 28; 38% and incomplete: *n* = 45; 62%) was similar to the original study group. Research findings indicated 59 (81%) of the participants reported the presence of some pain, (*n* = 43; 59%) experienced musculoskeletal pain, (*n* = 30; 41%) experienced at-level neuropathic pain, (*n* = 25; 34%)

experienced below-level neuropathic pain, and (*n* = 4; 5%) experienced visceral pain.

Individuals with below-level neuropathic pain reported experiencing *more severe* or *excruciating pain* than individuals with at-level neuropathic pain (Siddall et al., 1999). Specifically, 60% of individuals with below-level neuropathic pain experienced *severe* or *excruciating pain*, whereas only 48% of individuals with at-level neuropathic pain experienced the same symptoms; the mean time of onset for any type of pain was 1.6 years after injury, musculoskeletal pain 1.3 years, NP at-level 1.2 years, and NP below-level 1.8 years after injury. The incidence of musculoskeletal, visceral, at-level neuropathic pain, below-level neuropathic pain, and overall pain was not related to completeness or level of injury. However, when individual pain categories were examined, neuropathic below-level pain was present in 50% of the tetraplegic group versus 18% of the paraplegic group. See table 9 for a summary of neuropathic pain study findings.

Table 9

Incidence of neuropathic pain in spinal cord injured patients

Author	Gender: n (%)	Age	*M* TSI	Lvl. of Injury n (%)	Incidence: n (%)
Siddall et al., (1999)	M: 83 (83); F: 17 (17)	*M* 38 Yrs.	6 Mon.	Tetra 51 (51); Para 49 (49)	NP: 64 (64); NP at Lvl: 38 (38); NP blw. Lvl: 19 (19)
Siddall et al., (2003)	M: 60 (82); F: 13 (18)	*M* 40 Yrs.	5 Yrs.	Tetra 36 (49); Para 37 (51)	NP: 59 (81); NP at Lvl: 30 (41); NP blw. Lvl: 25 (34)
Werhagen et al. (2004)	M: 302 (79); F: 83 (21)	0 – 50+	6 Yrs.	Com. ASIA A: 157 (39)	NP: 66 (42); NP at Lvl: (9); NP blw. Lvl: (33)
				Inc. ASIA B – D: 245 (61)	NP: 96 (39); NP at Lvl: (15); NP blw. Lvl: (24)
				Tetraplegia: 234 (58)	NP: 69 (41); NP at Lvl: (16); NP blw. Lvl: (26)
				Paraplegia: 168 (42)	NP: 94 (40); NP at Lvl: (11); NP blw. Lvl: (29)
Werhagen et al. (2007)	M: 60 (63); F: 35 (37)	0 – 50+	9.6 Yrs.	Com. ASIA A: 11 (12)	NP: 4 (36); NP at Lvl: (9); NP blw. Lvl: (33)
				Inc. ASIA B – D: 84 (88)	NP: 32 (38); NP at Lvl: (27); NP blw. Lvl: (23)
				Tetraplegia: 27 (28)	NP: 12 (44); NP at Lvl: (30); NP blw. Lvl: (26)
				Paraplegia: 68 (72)	NP: 24 (35); NP at Lvl: (9); NP blw. Lvl: (15)

Note. *M* = Mean; TSI = Time since injury; Lvl. = Level; Blw. = Below; M = Males; F = Females; NP = Neuropathic pain; Com = Complete; Inc = Incomplete; Mon = Months

Urinary Tract Infection

Urinary tract infections (UTIs) are one of the leading causes of morbidity and mortality in SCI patients and the method of urinary drainage has been shown to be significant risk factor for UTI development (Goetz et al., 2013). Urinary tract infections is characterized by the onset of various symptoms as a result from bacteria and leukocyturia (lack of hemoglobin in blood cells) and identified with a positive urine culture (National Institute on Disability and Rehabilitation, 1992). Various symptoms of UTI include testicular pain, fever, involuntary leakage, lethargy, cloudy urine, back and bladder pain, autonomic dysreflexia, dysuria (pain from urination), and spasticity (Goetz et al., 2013). The risk for developing UTIs has been associated with drainage devices (i.e., catheters). Although some devices (e.g., intermittent catheterization) have been shown to reduce the frequency for this complication but the incidence nevertheless tends to be high. The frequency of UTI identified by Whiteneck et al. (1992) within the first 50 days since time of injury for persons with SCI was reported at 22% while Singh et al. (2011) reported yearly episodes at 18.4. Studies provided below identify the incidence of UTI from five studies to determine the consistency and overall prevalence.

Esclarin de Ruiz, Garci Leoni, & Herruzo Cabrera (2000) prospectively evaluated a cohort of 128 acute SCI patients hospitalized at an average of 19 days after injury and investigated the prevalence of UTIs associated with different drainage methods. The participants included (*n* = 100 men; *n* = 28 women) with a median age of 32.41 years. The level of injury and degree of completeness among the participants was recorded at: C4-C8, (*n* = 48; 37.5%); D1-D6, (*n* = 22; 17%); D7-L2, (*n* = 48; 37.5%); L3-caudequina syndrome, (*n* = 10; 8%), complete, (*n* = 69; 53.5%); incomplete, (*n* = 47; 36.5%); and incomplete sensitive plus complete motor injuries, (*n* = 12; 10%). A UTI was defined as a colony count of 10^5 colony forming unites per milliliter or greater with a fever of 38º plus of the following symptoms: lower abdominal pain, urinary incontinence, increased spasticity, suprapubic pain, frequent urination, dysuria, foul smell in urine, and cloudy urine. Participants with significant bacteriuria but no fever or clinical complaints were considered to have asymptomatic bacteriuria (ASB).

Esclarin de Ruiz, Garci Leoni, & Herruzo Cabrera (2000) reported "100 person-days" as an operational definition and equivalent to 100 persons followed for one day who was free of UTIs or bacteriuria throughout the day. A total of 1, 717 urine cultures were performed during the study, of which 724 revealed asymptomatic bacteriuria and 183 reported UTIs. The incidence of UTIs for all drainage methods was 0.68 episodes per 100 person-days. The incidence of UTI by specific drainage method was noted at: indwelling (2.72) episodes/100 person-days, clean intermittent (0.41), condom (0.36), suprapubic catheterization (0.34), and normal voiding (0.06). In relation to level of injury, the researchers noted patients with cervical level injuries had similar frequency counts (2.99 odds ratio) to patients with injuries at all other levels. Additional findings revealed the incidence of bacteriuria for all drainage methods was 2.72/100 person-days; indwelling accounted for (5) episodes/100 person-days, clean intermittent (2.95), condom (2.41), suprapubic catheterization (0.96), and normal voiding (0.33).

Evans et al., (2008) studied 226 participants with a SCI to identify the most occurring hospital-acquired infection (HAI's). The sample consisted of 224 males (98%) with a mean age of 58.3 years with a mean time since injury of 37.0 years. Level of injury for individuals with a HAI included paraplegia incomplete and complete (19.1% and 28.2% respectively), tetraplegia incomplete and complete (27.3% and 20.0% respectively). Of the 226 patients, nearly half acquired at least one HAI with a mean of six HAIs. The most frequent HAI was UTI and accounted for 164 (25%) of the 657 incident cases with a rate of 8.9 per 1,000 patient-days followed by bloodstream infections (16.9%) and bone and joint infection (15.7%).

Singh et al. (2011) investigated the prevalence of UTIs and asymptomatic bacteriuria (ASB) in 545 participants with SCI and compared the incidence in the different bladder management subgroups. The gender distribution was composed of 386 (71%) males and 159 (29%) females with a mean age of 35.4 ± 16.2 years. Participants were classified according to the American Spinal Injury Association Impairment Scale (AIS) and neurological level of injury. A total of 381 (70%) complete AIS A were recorded followed by 164 (30%) incomplete AIS B, C, and D neurological injuries. The level of injury among the participants included: C4-C8, (*n* = 185; 34%); D1-D10, (*n* = 93; 17%); D11-L2, (*n* = 202; 37%); and below L2, (*n* = 65; 12%). The authors reported a UTI incidence of 0.64 episodes per 100 hundred persons-days in all drainage methods, whereas the ASB incidence was noted at 1.70 episodes 100 persons-days respectively. Additionally, the incidence of UTI reported by particular bladder management included: indwelling catheterization (2.68) episodes/100 person-days, suprapubic cystostomy (0.56), reflex voiding (0.44), normal voiding (0.32), clean intermittent catheterization, condom drainage, and reflex voiding (0.34). Other findings indicated a total of 1801 positive urine cultures among the participants; *Escherichia coli* 298(16.5%), followed by *Kebsiella* in 217 (12%), *Staphylococcus aureus* in 144 (8%), and *Pseudomonas aeruginosa* in 144 (8%) cultures.

Togan, Azap, Durukan, and Arslan (2014) conducted a retrospective study to investigate the prevalence of UTIs among persons with a SCI. Their research involved a sample of 93 patients (*n* = 78 males; *n* = 15 females) with a mean age of 35.65. Level of injury included cervical (30.5%), thoracic (63%), and lumbar (6.5%) with 78.5% (*n* = 70) individuals identified as paraplegic and 18.3% (*n* = 17) tetraplegic. Findings revealed 67.5% of patients (*n* = 93) were diagnosed with asymptomatic bacteriuria and 22.6% (*n* = 21) had acquired a UTI. Hospitalization and having a history of UTIs was found to be strongly correlated for the development of this complication; however, the authors did not indicate the percentage and correlational strength for hospitalization, history of UTI, and development of UTIs among participants.

Prior to the previously discussed studies, Reid and Howard (1997) set out to investigate whether prophylactic antimicrobial therapy reduced the frequency of UTIs in comparison to those not receiving treatment. After reviewing 30 patient files (22 males and 8 females) of individuals using intermittent catheterization, 22 participants had been prescribed antimicrobial therapy. Within 157 weeks (for individuals receiving prophylaxis), and 165 weeks (for individuals not receiving prophylaxis) the incidence of UTI was significantly lower (44 UTIs) in comparison to eight participants not receiving treatment (72 UTIs). Therefore, the findings of 72 UTIs among the eight participants in < 4 years indicate a high incidence for this SC if preventative measures are not taken. Reported results did indicate whether gender, age, time since injury, and level of injury was a contributing factor towards increased frequency of UTIs. See table 10 for a summary of urinary tract infection study findings.

Table 10

Incidence of urinary tract infection and asymptomatic bacteriuria

Author	Gender: n (%)	*M* Age	*M* TSI	LOI: n (%)	Inc. UTI: n (%)	Inc. ASB
Esclarin et al. (2000)	M:100 (78); F: 28 (22)	32.41 ± 14.52 Yrs.	19 days	C4-C8: 48 (37.5) D1-D6: 22 (17) D7-L2: 48 (37.5) L3-caudequina syndrome: 10 (8)	0.68 episodes /per 100 persons-days	2.72 episodes /per 100 persons-days
Evans et al. (2008)	M: 224 (98); F: 2 (2)	58.3 Yrs.	20.9 Yrs.	Tetra: 113 (50) Para: 103 (46) UK: 10 (4)	8.9 cases/ per 1,00 patient-days	N/A
Reid and Howard (1997)	M: 22 F: 8	38 Yrs.	N/A	Tetra: 15; Para 14; Cerv. 1	Rec. Treat. (Freq. of 44 out of 22 Patients); Non-Treat. (Freq. of 72 of 8 patients) < 4 Yrs.	
Singh et al. (2011)	M: 386 (71); F: 159 (29)	35.4 ± 16.2 Yrs.	20.6 ± 9.2 Months	C4-C8: 185 (34) D1-D10: 93 (17) D11-L2: 202 (37) Below L2: 65 (12)	0.64 episodes /per 100 persons-days	1.70 episodes /per 100 persons-days
Togan et al. (2014)	M: 78 (84); F: 16 (16)	35.65 ± 13.11 Yrs.	NS	Cervical: 28 (30.5) Thoracic: 59 (63) Lumbar: 6 (6.5)	Overall: 21 (22.6)	Overall: 63 (67.7)

Note. *M* = Mean; TSI = Time since injury; Tetra = Tetraplegia; Para = Paraplegia; Cerv. = Cervical; UK = Unknown; Avg. = Average; ASB = asymptomatic bacteriuria; Rec. = received; Treat. = treatment; Freq. = frequency; LOI = level of injury, Inc. = Incidence

Repetitive Motion Injury

Repetitive motion injury and pain is a common occurrence among persons with SCI due to the overuse of upper extremities from wheelchair transfers, propulsion, and activities of daily living. The prevalence has shown to range from 31-73% and can impact the quality of life among this population (Gellman, Sie, & Waters, 1988; Pentland & Twomey, 1991; Nichols, Norman, & Ennis, 1979; Sie, Waters, Adkins, & Gellman, 1992). After a thorough review of literature, a significant number of researchers have primarily focused on pain and *not* the specific cause of pain (e.a., rotator cuff tear, subacromial impingement syndrome, etc.). Therefore, it’s important to make a distinction between pain and the cause as both are very distinct from one another. Pain can occur from daily overuse of the shoulder and can subside with time if appropriate rest is taken; whereas injury can be a long-term issue exhibiting symptoms of pain unless surgery or therapy is implemented. The literature review provided below was intended to primarily focus on injury and their cause; however, incidence of pain as a result from injury is discussed and reported.

To understand the consequence of shoulder pain due to injury, Samuelsson, Tropp, and Gerdle (2004) conducted a cross-sectional study among 56 individuals with paraplegia. For those who reported pain, group mean age was 52.4 ± 17.0 (n = 21) in comparison to a group mean age of 46.8 ± 17.4 (n = 35) years for those who indicated no pain. Mean time since injury for the group who reported pain was 16.2 ± 11.2 years while their group counterpart was 12.5 ± 10.5. Overall findings demonstrated a prevalence of pain at 37.5% (n = 21) with impingement syndrome and tendinitis listed as the primary cause for discomfort (n = 9, 17%; n = 7, 13%). The researcher's impression of the results listed activities of daily living (e.g., independent transferring) as a primary cause for repetitive shoulder injury.

Boninger, Towers, Cooper, Dicianno, and Munin (2001) conducted a study using magnetic resonance imaging (MRI), radiographs, questionnaires, and physical examinations to identify the incidence of shoulder injury among persons with paraplegia. Demographics for the sample included 28 individuals (19 males and 9 females) with a mean age and time since injury of 35 and 11.5 years respectively. Descriptive statistics indicated 36% had reported shoulder pain (n = 9) within one month prior of the study, 29% (n = 8) had at some point visited a physician due to shoulder pain, and 13% (n = 5) had to modify their daily routine to accommodate their pain. Findings revealed no differences between age, years since time of injury, weight, or body mass index (BMI) and injury. Of the 55 shoulders examined, only one had acquired a rotator cuff tear. However, the researchers noted, time of injury could be a factor for their findings being significantly lower than other research conducted and the increasingly higher incidence. Subsequently, further findings revealed an incidence of 13% for osteolysis (progressive resorption/degeneration) of the shoulder. The consequences of shoulder injury, therefore, were limited to rotator cuff tear and osteolysis with a prevalence falling within the possibility threshold (< 50%).

For those with a SCI, preventative measures of SCs have been recommended to avoid further difficulties associated with the injury. Various articles have briefly discussed obesity as it relates to an increased number of SCs that include repetitive motion injury. In a study to determine whether a relationship exists between obesity and SCs, Hetz, Latimer, Arbour-Nicitopoulos and Ginis (2011) studied 695 participants using subjective measures to assess for relationships of weight and SCs. Two groups central to the study were categorized as self-reported "overweight" (n = 209) and "*not* overweight" (n = 483). The findings indicated a strong relationship existing among persons classified as overweight and subjective reports of overuse injuries (n = 115; 55%) in comparison to their counterpart (n = 213; 44.1%). However, the prevalence for this SC was 67.9% when combining both groups. Therefore, the overall prevalence for this SC reveals a probability threshold (i.e., ≥ 51%) regardless of weight as a predictive factor. Assessing for differences based on level of SCI and overuse injury was not reported.

Escobedo, Hunter, Hollister, Patten, and Goldstein (1997) evaluated the prevalence of rotator cuff tears (RCT) in 23 paraplegic patients with an average of 26 years since injury utilizing (MRI) examinations. The mean age of the participants was recorded at 59 years old and the level of injury for all participants ranged from T3 to L2. The authors reported of the 37 shoulders images completed between the participants 20 (54%) showed rotator cuff tears.

Furthermore, when assessing the positions of the tears results indicated (*n* = 3; 16%) were located posteriorly, (*n* = 5; 26%) were anterior in position, and (*n* = 11; 58%) involved both anterior and posterior portions of the rotator cuff. In addition the researchers also found a significant relationship of RCT in relation to the time since injury. The mean duration of a SCI was 13 years in patients showing no RCT (*n* = 17), 19 years for those with single-tendon RCT (*n* = 10), 33 years for participants with multiple tears without bicep tendon tears (*n* = 4), and 38 years for patients with multiple tendon tears and bicep tendon rupture or dislocation (*n* = 6).

Utilizing a retrospective analysis of medical records and MRI imaging, Eriks-Hogland, Engisch, Brinkhof, and van Drongelen (2013) similarly investigated the prevalence of acromioclavicular (AC) joint arthrosis in 68 SCI participants (53 males and 15 females) in relation to the able-bodied population. The mean age recorded among study population was 51 years with a time since injury (TSI) of 23 years. Participants were grouped according to the level of injury and the neurological classification according to the ASIA Impairment Scale (AIS). As a result the sample included paraplegia, (*n* = 49; 72%); tetraplegia, (*n* = 19; 28%); AIS A, (*n* = 54; 80%); AIS B, (*n* = 6; 9%); AIS C, (*n* = 5; 7%); AIS D, (*n* = 2; 3%), and unknown, (*n* = 1; 1%). Participants underwent a magnetic resonance images (MRI), followed by a clinical examinations (i.e., palpitation of the AC joint test, cross-body adduction, lift-off, and empty-can) to assess for AC joint arthrosis and rotator cuff tears (RCT). The incidence of AC joint arthrosis and bone edema was evaluated using the Shubin-Stein classification system (Shubin-Stein, Ahman, Pfaff, Bigliani, & Levine, 2006); whereas the rotator cuff muscles and long tendons of the biceps were graded based on the tendinopathy, partial, transmural, or complete rupture.

Research findings indicated the prevalence of AC joint arthrosis and RCT using MRI diagnosis was reported at 99% and 74% respectively (Eriks-Hogland et al., 2013). However, in clinical examination the prevalence for AC joint arthrosis and RCT was significantly lower at 19% to 27%, correspondingly. Additionally, supaspinatus muscle/tendon (SSP) was present in (*n* = 42; 62%) of the participants, followed by subscapularis muscle/tendon (*n* = 42; 62%), infraspinatus muscle/tendon (*n* = 25; 37%), and bone oedema (*n* = 9; 13%). Other significant findings indicated the adjusted odds ratio of severe joint arthrosis was nearly four times higher (3.82) in persons with SCI in comparison to the able-bodied population. In relation to gender and age the authors discovered the odds of severe joint arthrosis were 72% lower in females as compared to males and increased 10% per each additional year of age. The authors reported no other significant findings in the overall prevalence of shoulder related injuries when examining the level of lesion neurological classification, and times since injury. See table 11 for a summary of repetitive motion injury study findings.

Table 11

Incidence of repetitive motion injury/overuse syndrome

Author	Gender: n (%)	*M* Age	*M* TSI	Level of Injury: n (%)	Incidence: n (%)
Boninger et al. (2001)	M: 19 (68) F: 9 (32)	35 Yrs.	11.5 Yrs.	Paraplegia	RCT: 1 (3.57) Osteolysis: 5 (13)
Eriks-Hogland et al. (2013)	M: 53 (78) F: 15 (22)	51 Yrs.	23 Yrs.	AIS A: 54 (80) AIS B: 6 (9) AIS C: 5 (7) AIS D: 2 (3) Unknown: 1 (1)	AC joint arthrosis: 67 (99) RCT: 50 (74) SSP: 42 (62) ISP: 25 (37) SSC: 42 (62) BO: 9 (13)
Escobedo et al. (1997)	Total: 23	56 Yrs.	26 Yrs.	Para: 23 (100)	RCT: 20 (54) of 37 shoulders images
Hetz et al. (2011)	M: 531 F: 164	46.3 ± 13.4	15.29 ± 11.1	C1-C4: 75 (10.8) C5-C8: 184 (26.5) T1-S5: 255 (36.7)	OS: Overall: 328 (69.7)
Samuelsson et al. (2004)	M: 44 (79) F: 12 (21)	49 ± 18	13.9 ± 10.8	N/S	Pain: 21 (37.5) IS: (17) Tendinitis: (13)

Note. M = Mean; TSI = Time since injury; OS = overuse syndrome; NS = not specified; acromioclavicular = (AC); RCT = rotator cuff tear; SSP = supaspinatus muscle/tendon; ISP = infraspinatus muscle/tendon; SSC, subscapularis muscle/tendon; BO = bone oedema; Para = paraplegia; Tetra = tetraplegia.

The purpose of the literature review encompassing all SCs most common among persons with a SCI was to provide LCPs with a guide and to compare the findings provided in chapter four with the empirical research previously discussed. These SCs are long term medical problems that result after a SCI and play an important role in the continuum of care. However, as the empirical research demonstrates, all but neuropathic pain, cardiovascular disease, and bone fractures meet the probability threshold and should be considered when developing a life care plan for persons with a SCI.

CHAPTER III

METHODOLOGY

This chapter includes information regarding the research design of the present study, selection of participants, instrumentation, variables, procedure, and data analysis procedures. This is a non-experimental exploratory survey research design. Life care planner and physiatrist responses were analyzed utilizing a within-group and between-group design for group differences. Separately, responses were compared for differences and similarities between life care planners and physiatrists concerning the inclusion of secondary complications within a life care plan when accounting for the probability versus possibility of these occurrences over an individual's lifetime. Primary focus was to assess for differences regarding frequencies of secondary complications and hospitalization within a lifetime due the secondary complications included in the survey. This was a quantitative study with only one question asking participants to provide additional comments or professional opinions as related to the study. The field of life care planning currently experiences a large inconsistency of expert opinions in life care plan development regarding this grey area subject, often leading to plaintiff and defense life care planners separated by millions of dollars in their cost analysis.   Because little empirical research exists on what should and should not be included in considering the projected future secondary complications of spinal cord injury, this was the primary focus of the study.

The purpose of the present research study is to determine how life care planners incorporate or omit costs associated with potential complications when developing life care plans. In addition to life care planners, physiatrists were surveyed to account for their medical opinion regarding the likelihood of potential secondary complications related to catastrophic spinal cord injuries as well. The subspecialty of physiatry or rehabilitative medical experts includes those physicians who generally have more specialized education, training, and experience working with individuals with SCI.

Population and Sample

The sample population of analysis in this study included two distinct groups: Life care planners and physiatrists. In order to account for any differences between and within groups, both certified and non-certified life care planners were surveyed. In order to serve as a practicing life care planner in the United States, being certified is presently not a requirement. Life care planners were notified of the research study in a variety of ways including email and requesting access to their listserv with a link to access the survey via Qualtrics™. Prospective participants' contact information was obtained through the International Association of Rehabilitation Professionals – International Academy of Life Care Planners mailing list. In addition, participants from the American Association of Nurse Life Care Planning were solicited. Aside from life care planners, board-certified and non-certified physiatrists were solicited for participation in the study. The prospective participants were contacted from The Association for Academic Physiatrists which includes over 10,000 board certified members, The American Board of Physical Medicine and Rehabilitation and the American Academy of Physical Medicine and Rehabilitation. Physiatrists were notified of the research study and sent surveys via email with a link to access the survey via Qualtrics™.

Instrumentation

There were two similar but different surveys developed for this research study (See appendix). Both surveys were referred to experts in the field for review and recommended revisions in order to increase content validity. The *Survey for Life Care Planners* consisted of seven demographic questions concerning gender, percentage of plaintiff versus defense life care plans developed, approximate number of life care plans developed, type of certification or licensure status, and employed full or part-time developing life care plans. There were eight additional questions with four point Likert scale responses (strongly agree, agree, disagree, strongly disagree) regarding life care planner's beliefs on including potential secondary complication costs into the life care plan regardless of whether they are possible or probable. The third section of the survey was a case scenario for an individual with C5-C6 tetraplegia and queries respondents on a four-point Likert scale (0%, 1%-25%, 26%-50%, 51%-75%, and 76%-100%) regarding 13 secondary complications of SCI and their legally defined possibility versus probability of occurring. The fourth section asked participants for written responses (and drop-down menu using Qualtrics™ online survey) regarding how frequently an individual may require hospitalization for one of the 13 secondary complications over their lifetime, if any. The fifth and sixth section of the survey were identical to three and four, except the case scenario represented an individual with aT6 paraplegia. Finally, an open-ended question was provided for any remaining opinions.

The *Survey for Physiatrists* also contained a demographic section requesting gender, age, race/ethnicity, board certified or not, whether they ever worked at a SCI Model System Rehabilitation Hospital, whether worked at a university hospital, and employment status (i.e., part-time or full-time physiatrist or part-time or full-time physiatrist that does LCP). If a physiatrist selected they conducted life care plans, then they were directed to answer the percentage of plaintiff versus defense life care plans developed if any, approximate number of life care plans (total to date specifically for SCI), how many patients with SCI they have seen per year on average, whether they included possible future secondary complication costs within the life care plan (49% occurrence or lower), or probable secondary complication costs (51% occurrence or greater), with four additional four-point Likert scale scenarios identical to section three through six for life care planners. Whether physiatrists selected the option for employed as a LCP or not, they were then directed to describe their knowledge regarding the prevalence of secondary complications related to spinal cord injuries, the likelihood for secondary complications to occur if preventative measures were taken, and the likelihood of secondary complications were to occur if preventative measures are not taken. Physiatrists were then given three scenarios for an otherwise healthy male with a C5-C6 complete tetraplegia in which they were to provide their professional opinion on whether any of the 13 secondary complications were likely to occur within one's lifetime, and then the likelihood and frequency of future hospitalizations and/or treatment if complications were to occur. The second case scenario involved the same example as the male with C5-C6 complete tetraplegia, except these involved an otherwise healthy male with T6 complete paraplegia. Lastly, physiatrists had an open comment option in which they were able to provide further clarification on any scenario they wished.

Although there are various publications regarding the reliability of life care planning, the focus of this research was specific to SCI and the possibility versus probability (empirical support) for cost inclusion within the LCP for the 13 secondary complications noted. The development of the survey instrument was a prerequisite for the investigation of the six research questions. Likert scale questions based on the literature regarding the most prevalent secondary complications of SCI were included. The instrument developed to investigate the hypothesis was developed by Dr. Irmo Marini based on his over 20 year experience as a certified and practicing life care planner. Content validity was also obtained by Drs. Paul Deutsch, Christine Reid, and Sherie Kendall as well as Susan Riddick- Grisham, all nationally known life care planning experts and board members on the Foundation for Life Care Planning Research. The physiatrist's survey was reviewed for content validity by Dr. Lori Wasserburger, a physiatrist with over 20 years' experience specializing in spinal cord injury as well as reviewing life care plans and testifying as an expert regarding their reasonability. Since this was first time utilizing these surveys, obtaining construct validity beyond that found in the literature was not an option.

Research Questions and Hypotheses

Research Questions for Life-Care Planners

RQ 1: Are there relationships between life care planner demographics and ratings concerning the possibility versus probability of secondary complication costs imbedded within the life care plan?

H_{o1}: There are no differences among life care planner ratings concerning the possibility versus probability regarding inclusion of secondary complication costs within the life care plan.

RQ 2: Are ratings of the likelihood of 13 secondary complications a function of life care planner demographics?

H_{o2}: Ratings of the likelihood of 13 secondary complications is not a function of life care planner demographics.

RQ 3: Are ratings of the frequency of 13 SCs requiring hospitalization and/or treatment a function of life care planner demographics?

H_{o3}: Ratings of the frequency of 13 SCs requiring hospitalization and/or treatment is <u>not a function</u> of life care planner demographics.

<u>Research Questions for Physiatrists</u>

RQ 4: Are there relationships between LCP-physiatrist demographics and ratings concerning the possibility versus probability of secondary complication costs imbedded within the life care plan?

H_{o4}: There is <u>no relationship</u> between LCP-physiatrist demographics and ratings concerning the possibility versus probability of secondary complication costs imbedded within a life care plan.

RQ 5: Are ratings of the likelihood of 13 SCs a function of physiatrist demographics?

H_{o5}: Ratings of the likelihood of 13 SCs is <u>not a function</u> of LCP-physiatrist demographics.

RQ 6: Are ratings of the frequency of 13 SCs requiring hospitalization and/or treatment a function of physiatrist demographics?

H_{o6}: Ratings of the frequency of 13 SCs requiring hospitalization and/or treatment is <u>not a function</u> of life care planner demographics.

RQ 7: Are ratings pertaining to the likelihood of SCs if preventative measures are taken/not taken a function of physiatrist demographics?

H_{o7}: Ratings pertaining to the likelihood of SCs if preventative measures are taken/not taken is <u>not a function</u> of physiatrist demographics?

Research Questions for the Comparison of LCPs and Physiatrists (Including LCP-Physiatrists and Non-LCP-Physiatrists)

RQ 8: Do LCP physiatrists and non-LCP physiatrists differ in their summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, after controlling for relevant demographic variables?

H_{o8}: There is no difference between LCP physiatrists and non-LCP physiatrist in their summary of ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, after controlling for relevant demographic variables.

RQ 9: Is there a difference between LCPs and non-LCP physiatrists in their summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, after controlling for relevant demographic variables?

H_{o9}: There is no difference between LCPs and non-LCP physiatrists in their summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, after controlling for relevant demographic variables?

RQ 10: Do LCPs and LCP physiatrists differ in their summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, after controlling for relevant demographic variables?

H_{o10}: There is no difference between LCPs and LCP physiatrists in their summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, after controlling for relevant demographic variables.

RQ 11: Is there a relationship between summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, life care planners versus LCP-physiatrists, and whether the bulk of life care plans are identified as plaintiff or defense cases?

H_{o11}: There is no relationship between summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, life care planners versus LCP-physiatrists, and whether the bulk of life care plans are identified as plaintiff or defense.

RQ 12: Do certified and non-certified LCPs and LCP-physiatrists differ on whether they have felt pressure to increase costs when developing plans for plaintiff cases?

H_{o12}: There is no difference between certified and non-certified LCPs and LCP-physiatrists on whether they have felt pressure to increase costs when developing plans for plaintiff cases.

Research Questions for the Comparison of LCPs and Physiatrists (Including LCP-Physiatrists and Non-LCP-Physiatrists)

RQ 13: Do LCP physiatrists and non-LCP physiatrists differ in their summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, after controlling for relevant demographic variables?

H_{o13}: There is no difference between LCP physiatrists and non-LCP physiatrists in their summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, after controlling for relevant demographic variables.

RQ 14: Do LCPs and non-LCP physiatrists differ in their summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, after controlling for relevant demographic variables?

H_{o14}: There is no difference between LCPs and non-LCP physiatrists in their summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, after controlling for relevant demographic variables.

RQ 15: Do LCPs and LCP physiatrists differ in their summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, after controlling for relevant demographic variables?

H_{o15}: There is no difference between LCPs and LCP physiatrists in their summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, after controlling for relevant demographic variables.

RQ 16: Is there a relationship between summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, life care planners versus LCP-physiatrists, and whether the bulk of life care plans are identified as plaintiff or defense cases?

H_{o16}: There is no relationship between summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, life care planners versus LCP-physiatrists, and whether the bulk of life care plans are identified as plaintiff or defense cases.

Research Design

The present research study involved a non-experimental exploratory survey research design. Both qualitative and quantitative information was obtained in the mixed method design. Quantitative data was collected by implementation of inferential statistics (conducting multiple t-tests, ANOVAs and logistic regression. Both within-group and between-group designs were implemented. Within-group design was implemented when assessing for differences among life care planner responses. In addition, same method and procedures were employed among physiatrists. Between-group design was conducted to see the differences between life care planners and physiatrists when comparing responses of the two case scenarios imbedded within both surveys. Qualitative data was gathered for life care planners and physiatrists through a short response option that is provided, which allowed for further clarification or explanation towards any response given by the participants. Responses provided were compared and recorded; however, many were not comparable to each group or did not provide an elaborative response to any of the survey questions (LCP or physiatrist).

Operational Definitions

Prior to the presentation of the procedures and data analysis of the study, a thorough description is provided for the following operational definitions:

Employment (Part-time and Full-time): Part-time equates to less than 40 hours per week. Full-time employment equates to 40 or more hours per week.

Board Certified in Physical Medicine and Rehabilitation: Physicians who have completed four years of a specialty area (i.e., brain injury medicine) plus an additional year of clinical work. Certified physicians must be Board Certified by the American Board of Physical Medicine and Rehabilitation and complete any additional training required by the Board (American Board of Medical Specialties, 2012).

SCI Model System: A medical center that provides innovative and current research to improve the lives of individuals with SCI.

Knowledge towards experience: Number of individuals with SCI a physiatrist will see per year.

Life Care Plan: An extensive document that lays out the prospective medical and rehabilitative requirements of the individuals who sustained a traumatic injury or illness (Priebe, 2007).

Probability of Secondary Complications: The likelihood a secondary complication will occur 51% of the time or greater over the lifetime for a person with SCI.

Possibility of Secondary Complications: The likelihood a secondary complication will occur less than or equal to 49% over a lifetime for a person with SCI.

Plaintiff: the plaintiff is referred to the person filing for compensation of monetary damages or a legal remedy for a disability they have sustained and represented by a plaintiff's attorney

Defense: In personal injury cases, the defense generally represents a corporation for alleged product liability malfunction or a physician for medical malpractice.

Procedures

Subsequent to IRB approval, the researcher obtained membership listings for the associations previously described and implemented a non-probability (convenience) sampling method to ensure a significant number of participants took part in the study. Although probability sampling (simple random sampling, cluster sampling, purposive sampling, etc.) is a preferred method to provide results that can be generalized to the population, this research is unique as it requests participation from LCPs and physiatrists from all over the country; therefore, the likelihood of the validity being affected of this study was not a threat. The two surveys were uploaded on Qualtrics ™ and after Association listserv approval, solicitation notices were periodically sent out with reminders every two weeks when permission was granted. Concomitantly, potential participants were contacted by telephone and email to obtain the required response for 80% power. Also, as part of a request for funding from the Foundation of Life Care Planning Research, financed ads were placed in the *Journal of Life Care Planning, Journal of Nurse Life Care Planners*, *Journal of Spinal Cord Injury Medicine,* and other relevant physiatrist journals. An initial low response rate from both groups was anticipated; therefore, a second reminder for continued participation among life care planners and physiatrists were solicited. Careful documentation of both groups has been kept on file. The process continued for 10 weeks with a total number of 120 LCPs and 123 physiatrists participating in the study.

All incoming information was coded and analyzed using SPSS version 21 and the STATA software application. The primary file was held by the principal investigator with backup Excel files on two USB flash drives. Hardcopy survey responses obtained were secured in the principal investigator's office under lock and key. All surveys remained anonymous since the participant name is not required.

Data Analysis

The present study was designed to measure 3 *sets* of research questions: (1) life care planners (within-group design), (2) physiatrists (within-group design), and (3) life care planners and physiatrists (between-group design). A total of 16 research questions were developed for this study. However, after conducting a preliminary analysis, various research questions had to be combined due to the variable distributions for particular research questions which were not "normally" continuous/distributed (often very skewed, bimodal, etc.). Although particular analyses were run as originally planned, the results were not useful due to the violation of too many assumptions (combined with a small sample size). Therefore, the following research questions were intended to be analyzed and an explanation of the statistical methods is provided below.

Research question one focused on life care planners to determine whether there are differences of ratings concerning the possibility versus probability regarding the inclusion of secondary complications within the LCP. Secondary complications incurred by persons with spinal cord injuries was measured by Likert-scale items corresponding to question number 12-16 on the Survey for Life Care Planners. A high score on this section of the survey indicated LCPs are more likely to include costs for a plan only if it is probable (51% or more) that a secondary complication will occur. The intended analysis method was generalized ordered logit model (gologit) to determine if a significant difference exists regarding the possibility (49% or lower) versus probability (51% or greater) of inclusion of secondary complications. The dependent variable is ordinal and will be the scores for the Likert scale questions L8 – L15. Simultaneous entry of IVs with each DV analyzed separately (total of 8 DVs). Question 9 – 15 involved Likert scale answer choices that included: Strongly disagree, disagree, agree, and strongly agree. Specifically, the questions in the survey included the following:

8. When developing an SCI life care plan, I often <u>include costs</u> that are associated with:
   - ☐ Possible Secondary Complications (49% likelihood of occurrence or lower)
   - ☐ Probable Secondary Complications (51% likelihood of occurrence or higher)
   - ☐ Possible (49% or less) and Probable (51% and greater) Secondary Complications.

9. I believe that life care plans should include costs for future secondary complications related to spinal cord injury and other conditions even if they are only possible so the funds will be there.

10. When developing life care plans, I typically (more than 51% of the time) include costs for future secondary complications related to spinal cord injury and other conditions only if they are deemed probable (51%) by empirical statistics.

11. When developing life care plans, I typically (more than 51% of the time) include costs for future secondary complications related to spinal cord injury and other conditions only if they are deemed probable (51%) by a treating physician specialist**.**

12. When developing life care plans, I typically (more than 51% of the time) include costs for secondary complications related to spinal cord injury and other conditions only if they are deemed probable (51%) by empirical statistics AND a treating physician specialist.

13. When developing life care plans, I typically (more than 51% of the time) include costs for secondary complications related to spinal cord injury and other conditions only if they are deemed probable (51%) by empirical statistics OR a treating physician specialist.

14. I always consult a physician, physiatrist, or other relevant expert to determine the likelihood and validity of potential secondary complications related to spinal cord injury life care plans.

15. I believe the field of life care planning would benefit from empirical validation regarding whether to include possible complications versus probable complications to allow for consistency among the field.

Table 12

Research Question #1: Is there a difference between LCP demographics and ratings concerning the possibility versus probability of SC costs imbedded within a LCP?

IV item	*IV variable*	*IV measurement*	*DV item(s)*	*#DVs*	*DV measurement*
L3	Certified LCP or Non-Certified LCP	Recoded - dichotomous	L8 – L15	8	Ordinal
L7	Knowledge of SCs Related to SCI	Ordinal			
L4	Employment Status (PT or FT)	Dichotomous			
L5	# of LCPs developed for SCI	Ordinal			
L6	# of SCI Patients seen per year	Ordinal			
L20	Percentage of LCPs that are Plaintiff Cases	Ordinal			

Note. Method: Generalized ordered logit with simultaneous entry of IVs and each DV analyzed separately. Total # of DVs = 8.

Research question two involved whether there were differences in 13 secondary complication ratings among life care planners when comparing demographic variables (i.e., gender, experience, and discipline). Secondary complication ratings were measured using percentiles for each of the 13 complications ranging from 0% to 100%. A high percentage (more than 51%) indicates it is probable that a secondary complication among individuals with SCI is likely to occur. Descriptive statistics and gologit were implemented to investigate whether ratings of secondary complications are a function of life care planner demographics relative to plaintiff and defense cases. The independent variables include: Certified LCP or non-certified LCP and recoded as dichotomous; knowledge of SCs related to SCI and is an ordinal IV; employment status (PT or FT) and coded as an ordinal IV; number of LCPs developed for SCI and is an ordinal IV; number of SCI patients seen per year and is an ordinal DV; and percentage of LCPs that are plaintiff cases with the IV as ordinal. Simultaneous entry of IVs is expected and the two dependent variables will be ratings of secondary complications (L16A – L16M and L18A – L18M). The designated "L" represents the LCP survey.

The two scenario questions in the survey included the following (starting with question L16): *For the FIRST of two case scenarios, please consider an otherwise healthy lifestyle male in his mid-20s with a C5-C6 complete tetraplegia, of average height and weight with no pre-injury medical conditions or diseases. In your professional opinion, how likely will it be that the following secondary complications will occur at least once in one's lifetime if reasonable and medically necessary life care planning preventive care and treatment measures are taken?*

The second scenario question involved question L18 and included the following: *For the SECOND case scenario, please consider an otherwise healthy lifestyle male in his mid-20s with a T6 complete paraplegia of average height and weight with no pre-injury medical conditions or diseases. In your professional opinion, how likely will it be that the following secondary complications will occur at least once in one's lifetime if reasonable and medically necessary life care planning preventive care and treatment measures are taken?*

The dependent variables total of 13 for each question [total of 26] for both scenario questions included the following: (1) skin breakdown, decubitus ulcers, or pressure sores requiring surgery; (2) skin breakdown, decubitus ulcers, or pressure sores requiring home wound care; (3) pneumonia, atelectasis, aspiration; (4) heterotopic ossification; (5) autonomic dysreflexia; (6) deep vein thrombosis; (7) cardiovascular disease; (8) syringomyelia; (9) neuropathic/spinal cord pain; (10) respiratory dysfunction; (11) urinary tract infections; (12) osteoporosis/fractures; and (13) repetitive motion injury/overuse syndrome. Answer choices given included the following: 0%; 1-25%; 26-50%; 51-75%; and 76-100%.

Table 13

Research Question #2: Are ratings of 13 SCs a function of LCP demographics?

IV item	*IV variable*	*IV measurement*	*DV item(s)*	*#DVs*	*DV measurement*
L3	Certified LCP or Non-Certified LCP	Recoded - dichotomous	L16A–L16M	13	Ordinal
L7	Knowledge of SCs Related to SCI	Ordinal	L18A-L18M	13	Ordinal
L4	Employment Status (PT or FT)	Dichotomous			
L5	# of LCPs developed for SCI	Ordinal			
L6	# of SCI Patients seen per year	Ordinal			
L20	Percentage of LCPs that are Plaintiff Cases	Ordinal			

Note. Method: Generalized ordered logit with simultaneous entry of IVs and each DV analyzed separately. Total # of DVs = 26.

Research question three for life care planners is to assess whether frequency of SCs requiring hospitalization is a function of life care planner demographics. Ordinal least squares (OLS) regression with simultaneous entry of IVs was intended as the primary statistical analysis. The IVs consisted of the following: Certified LCP or non-certified LCP (dichotomous variable); knowledge of SCs related to SCI (ordinal variable); employment status (PT or FT; dichotomous variable), number of life care plans developed for SCI (ordinal measurement); number of SCI patients seen per year (ordinal measurement); and percentage of LCPs that are plaintiff cases (ordinal variable). The DV measurement is considered ordinal as each number given (i.e., 1 – 25+) representing its own category.

Specifically, the two scenario questions given to life care planners included the following starting with scenario one part two: Considering our same patient in scenario ONE with a C5-C6 injury, how often are the following conditions likely to occur that require hospitalization and/or treatment in one's lifetime if reasonable and medically necessary life care planning care & treatment preventive measures are taken?

The second scenario question involved question L19 and included the following: Considering our same patient in scenario TWO with a T6 injury, how frequently are the following conditions likely to occur that require hospitalization and/or treatment in one's lifetime if reasonable and medically necessary life care planning preventive care and treatment measures are taken?

Table 14

Research Question # 3: Is frequency of SCs requiring hospitalization a function of LCP demographics?

IV item	IV variable	IV measurement	DV item(s)	#DVs	DV measurement
L3	Certified LCP or Non-Certified LCP	Recoded - dichotomous	L17A–L17M	13	Ordinal
L7	Knowledge of SCs Related to SCI	Ordinal	L19A-L19M	13	Ordinal
L4	Employment Status (PT or FT)	Dichotomous			
L5	# of LCPs developed for SCI	Ordinal			
L6	# of SCI Patients seen per year	Ordinal			
L20	Percentage of LCPs that are Plaintiff Cases	Ordinal			

Note. Method: OLS regression with simultaneous entry of IVs; each DV analyzed separately. Total DVs = 26.

Research question four was designed to determine whether there is a relationship between LCP-physiatrist demographics and ratings concerning the possibility versus probability of SC costs imbedded within a LCP. As shown in the table below, the IVs include the following:

Certified LCP or non-certified LCP (dichotomous variable); knowledge of SCs related to SCI (ordinal variable); experience working at a SCI model system (dichotomous IV); number of LCPs developed for SCI (ordinal variable); number of SCI patients seen per year (ordinal IV); and percentage of LCPs that are plaintiff cases (ordinal variable). The dependent variables include six items asking the respondents opinion on the likelihood of SCs occurring and whether costs should be included within a LCP and involve questions question 8-13 (P8 – P13). Question 9 – 13 involved answer choices that included: Strongly disagree, disagree, agree, and strongly agree. Specifically, the questions in the survey include the following:

8. When developing an SCI life care plan, I often include costs that are associated with:
   - ☐ Possible Secondary Complications (49% likelihood of occurrence or lower)
   - ☐ Probable Secondary Complications (51% likelihood of occurrence or higher)
   - ☐ Possible (49% or less) and Probable (51% and greater) Secondary Complications.
9. When developing life care plans, I typically (more than 51% of the time) include costs for future secondary complications related to spinal cord injury and other conditions only if they are deemed probable (51%) by a treating physician specialist.

10. I believe that life care plans should include costs for future secondary complications related to spinal cord injury and other conditions even if they are only possible (49%) so the funds will be there.

11. When developing life care plans, I typically (more than 51% of the time) include costs for future secondary complications related to spinal cord injury and other conditions only if they are deemed probable (51%) by empirical statistics.

12. When developing life care plans, I typically (more than 51% of the time) include costs for future secondary complications related to spinal cord injury and other conditions only if they are deemed probable (51%) by empirical statistics AND a treating physician specialist.

13. When developing life care plans, I typically (more than 51% of the time) include costs for secondary complications related to spinal cord injury and other conditions only if they are deemed probable (51%) by empirical statistics OR a treating physician specialist.

Table 15

Research Question # 4: Are there relationships between LCP-physiatrist demographics and ratings concerning the possibility versus probability of SC costs imbedded within a LCP?

IV item	*IV variable*	*IV measurement*	*DV item(s)*	*#DVs*	*DV measurement*
P3	Certified LCP or Non-Certified LCP	Recoded - dichotomous	P8 – P13	6	Ordinal
P17	Knowledge of SCs Related to SCI	Ordinal			
P4	Ever worked at SCI model system or not	Recoded dichotomous			
P7	# of LCPs developed for SCI	Ordinal			
P6	# of SCI Patients seen per year	Ordinal			
P14	Percentage of LCPs that are Plaintiff Cases	Ordinal			

Note. Method: Generalized ordered logit (gologit). Simultaneous entry of IVs; each DV analyzed separately. Total DVs = 6.

Research question five was to assess whether ratings of 13 SCs are a function of physiatrist demographics. As shown within the following table, the IVs to be used in this analysis included the following: Board certified versus non-board certified (dichotomous variable); knowledge of SCs related to SCI (ordinal variable); experience working at a SCI model system (dichotomous variable); and LCP physiatrist versus non-LCP physiatrist (dichotomous variable).

Specifically, question 20 asked physiatrists the following: *For the FIRST of two case scenarios, please consider an otherwise healthy lifestyle male in his mid-20s with a C5-C6 complete tetraplegia, of average height and weight with no pre-injury medical conditions or diseases. In your professional opinion, how likely will it be that the following secondary complications occur at least once in one's lifetime if reasonable and medically necessary life care planning preventive care and treatment measures are taken?*

Question 22 asked physiatrists the following: *For the SECOND case scenario, please consider an otherwise healthy lifestyle male in his mid-20s with a T6 complete paraplegia of average height and weight with no pre-injury medical conditions or diseases. In your professional opinion, how likely will it be that the following secondary complications occur at least once in one's lifetime if reasonable and medically necessary life care planning preventive care and treatment measures are taken?*

The dependent variables total of 13 for each question [total of 26] for both scenario questions included the following: (1) skin breakdown, decubitus ulcers, or pressure sores requiring surgery; (2) skin breakdown, decubitus ulcers, or pressure sores requiring home wound care; (3) pneumonia, atelectasis, aspiration; (4) heterotopic ossification; (5) autonomic dysreflexia; (6) deep vein thrombosis; (7) cardiovascular disease; (8) syringomyelia; (9) neuropathic/spinal cord pain; (10) respiratory dysfunction; (11) urinary tract infections; (12) osteoporosis/fractures; and (13) repetitive motion injury/overuse syndrome. Answer choices given included the following: 0%; 1-25%; 26-50%; 51-75%; and 76-100%.

Table 16

Research Question 5: Are ratings of the likelihood of 13 SCs a function of physiatrist demographics?

IV item	IV variable	IV measurement	DV item(s)	#DVs	DV measurement
P3	Board Certified vs. Non-Board Certified	Dichotomous	P20A–P20M	13	Ordinal
P17	Knowledge of SCs Related to SCI	Ordinal	P22A–P22M	13	Ordinal
P4	Ever worked at SCI model system or not	Recoded dichotomous			
P5	LCP physiatrist vs. Non-LCP physiatrist	Recoded Dichotomous			

Note. Method: Generalized ordered logit (gologit). Simultaneous entry of IVs; each DV analyzed separately. Total DVs = 26.

Research question six was to determine whether frequency of 13 SCs requiring hospitalization and/or treatment was a function of physiatrist demographics. The statistical analysis intended for this research question involves OLS regression with the following as the IVs: Board certified versus non-board certified (dichotomous variable); knowledge of SCs related to SCI (ordinal variable); experience working at a model system (dichotomous variable); and LCP physiatrist versus non-LCP physiatrist (dichotomous variable). The two scenario questions (dependent variables) involve question 21 and 22 (P21A – P21M and P23A – P23M) with the answer choices ranging from 1 -25+.

Specifically, question 21 asked the following: Considering our same patient in scenario ONE with a C5-C6 injury, how frequently are the following conditions likely to occur that require hospitalization and/or treatment in one's lifetime if reasonable and medically necessary life care planning care and treatment preventive measures are taken?

Question 22 asked the following: Considering our same patient in scenario TWO with a T6 injury, how frequently are the following conditions likely to occur that require hospitalization and/or treatment in one's lifetime if reasonable and medically necessary life care planning preventive care and treatment measures are taken? The two survey items included answer choices ranging from 1-25+.

Table 17

Research Question 6: Are ratings of the frequency of 13 SCs requiring hospitalization and/or treatment a function of physiatrist demographics?

IV item	*IV variable*	*IV measurement*	*DV item(s)*	*#DVs*	*DV measurement*
P3	Board Certified vs. Non-Board Certified	Dichotomous	P21A–P21M	13	Ordinal
P17	Knowledge of SCs Related to SCI	Ordinal	P23A–P23M	13	Ordinal
P4	Ever worked at SCI model system or not	Recoded dichotomous			
P5	LCP physiatrist vs. Non-LCP physiatrist	Recoded Dichotomous			

Note. Method: OLS regression. Simultaneous entry of IVs; each DV analyzed separately. Total DVs = 26.

Research question seven focused only on physiatrists and not life care planners and included the following survey item: Are ratings pertaining to the likelihood of SCs if preventative measures are taken/not taken a function of physiatrist demographics? Statistical analysis intended for this research question included gologit and descriptive statistics. The intended IVs prior to testing for assumptions were as follows: Board certified versus non-board certified (dichotomous variable); knowledge of SCs related to SCI (ordinal variable); experience working at a model system (dichotomous variable); and LCP physiatrist versus non-LCP physiatrist (dichotomous variable). The two survey items included answer choices ranging from 0%; 1-25%; 26-50%; 51-75%; and 76-100%. The two questions are as follows:

18. Generally, how likely are secondary complications to occur if preventive are measures (regular MD visits, diagnostics, diligent home health care, diet, etc.) are taken?
19. Generally, how likely are secondary complications if preventive measures are NOT taken?

Table 18

Research question 7: Are ratings pertaining to the likelihood of SCs if preventative measures are taken/not taken a function of physiatrist demographics?

IV item	*IV variable*	*IV measurement*	*DV item(s)*	*#DVs*	*DV measurement*
P3	Board Certified vs. Non-Board Certified	Dichotomous	P18-P19	2	Ordinal
P17	Knowledge of SCs Related to SCI	Ordinal			
P4	Ever worked at SCI model system or not	Recoded dichotomous			
P5	LCP physiatrist vs. Non-LCP physiatrist	Recoded Dichotomous			

Note. Method: Generalized ordered logit (gologit). Simultaneous entry of IVs; each DV analyzed separately. Total DVs = 2.

Research question eight compares LCP-physiatrists and non-LCP physiatrists within the analysis. The following was the intended research question prior to the preliminary analysis: Do LCP physiatrists and non-LCP physiatrists differ in their summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, after controlling for relevant demographic variables? The intended IVs prior to testing for assumptions were as follows: Board certified versus non-board certified (dichotomous variable); knowledge of SCs related to SCI (ordinal variable); experience working at a model system (dichotomous variable); and LCP physiatrist versus non-LCP physiatrist (dichotomous variable). Two survey items included answer choices ranging from 0%; 1-25%; 26-50%; 51-75%; and 76-100% for along an additional two survey items with scores ranging from 1-25+; intended DV measurement involved combining variables and summing scores for each scenario question (total of 4).

Table 19

Research question 8: Do LCP physiatrists and non-LCP physiatrists differ in their summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, after controlling for relevant demographic variables?

IV item	*IV variable*	*IV measurement*	*DV item(s)*	*#DVs*	*DV measurement*
L3/P3	Certified or Non-Certified	Variables combined; Recoded - dichotomous	L16A-16M / P20A-P21M	1	Variables combined; scores summed; Continuous
L7/P17	Knowledge of SCs Related to SCI	Variables combined; Ordinal	L17A-17M / P21A-21M	1	Variables combined; scores summed; Continuous
L4	Employment Status (PT or FT)	Dichotomous	L18A-18M / P22A-22M	1	Variables combined; scores summed; Continuous
P4	Employed SCI model system	Recoded dichotomous	L19A-19M / P23A-23M	1	Variables combined; scores summed; Continuous
MAIN IV:	Group: LCP-physiatrist vs. non-LCP physiatrist	Recoded dichotomous			

Note. Method: OLS regression. Hierarchical entry of IVs (step1: demographics, step2: group); each DV analyzed separately. Total DVs = 4.

Research question nine was intended to identify if there was a differences between LCPs and non-LCP physiatrists in their summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, after controlling for relevant demographic variables. The intended IVs prior to testing for assumptions were as follows: Board certified versus non-board certified (dichotomous variable); knowledge of SCs related to SCI (ordinal variable); experience working at a model system (dichotomous variable); and LCPs versus non-LCP physiatrist (dichotomous variable). Two survey items included answer choices ranging from 0%; 1-25%; 26-50%; 51-75%; and 76-100% for along an additional two survey items with scores ranging from 1-25+; intended DV measurement involved combining variables and summing scores for each scenario question (total of 4).

Table 20

Research question 9: Do LCP and non-LCP physiatrists differ in their summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, after controlling for relevant demographic variables?

IV item	*IV variable*	*IV measurement*	*DV item(s)*	*#DVs*	*DV measurement*
P3	Board Certified vs. Non-Board Certified	Dichotomous	L16A-16M / P20A-P21M	1	Variables combined; scores summed; Continuous
P17	Knowledge of SCs Related to SCI	Ordinal	L17A-17M / P21A-21M	1	Variables combined; scores summed; Continuous
P4	Employed SCI model system or not	Recoded dichotomous	L18A-18M / P22A-22M	1	Variables combined; scores summed; Continuous
P5 Main IV	Group: LCP vs. Non-LCP physiatrist	Recoded Dichotomous	L19A-19M / P23A-23M	1	Variables combined; scores summed; Continuous

Note. Method: OLS regression in addition to ANOVA. Hierarchical entry of IVs (step1: demographics, step2: group); each DV analyzed separately. Total DVs = 4.

Research question ten was intended to assess whether a difference exists between LCPs and LCP-physiatrists in their summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, after controlling for relevant demographic variables. The intended IVs prior to testing for assumptions were as follows: Board certified versus non-board certified (dichotomous variable); knowledge of SCs related to SCI (ordinal variable); experience working at a model system (dichotomous variable); and LCPs versus LCP physiatrist (dichotomous variable). Two survey items included answer choices ranging from 0%; 1-25%; 26-50%; 51-75%; and 76-100% for along an additional two survey items with scores ranging from 1-25+; intended DV measurement involved combining variables and summing scores for each scenario question (total of 4). Statistical analysis originally intended included OLS regression in addition to ANOVA with hierarchical entry of IVs.

Table 21

Research question 10: Do LCPs and LCP physiatrists differ in their summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, after controlling for relevant demographic variables?

IV item	*IV variable*	*IV measurement*	*DV item(s)*	*#DVs*	*DV measurement*
P3	Board Certified vs. Non-Board Certified	Dichotomous	L16A-16M / P20A-P21M	1	Variables combined; scores summed; Continuous
P17	Knowledge of SCs Related to SCI	Ordinal	L17A-17M / P21A-21M	1	Variables combined; scores summed; Continuous
P4	Employed SCI model system or not	Recoded dichotomous	L18A-18M / P22A-22M	1	Variables combined; scores summed; Continuous
P5	Group: LCP vs. LCP physiatrist	Recoded Dichotomous	L19A-19M / P23A-23M	1	Variables combined; scores summed; Continuous

Note. Method: OLS regression in addition to ANOVA. Hierarchical entry of IVs (step1: demographics, step2: group); each DV analyzed separately. Total DVs = 4.

Research question eleven was to identify whether a relationship exists between summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, LCPs versus LCP-physiatrists, and whether the bulk of life care plans are identified as plaintiff versus defense. The intended IVs prior to testing for assumptions were as follows: LCP versus LCP physiatrist (dichotomous variable); and plaintiff versus defense (dichotomous variable). Two survey items included answer choices ranging from 0%; 1-25%; 26-50%; 51-75%; and 76-100% for along an additional two survey items with scores ranging from 1-25+; intended DV measurement involved combining variables and summing scores for each scenario question (total of 4). Statistical analysis originally intended included OLS regression with hierarchical entry of IVs.

Table 22

Research question 11: Is there a relationship between summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, LCPs versus LCP-physiatrists, and whether the bulk of life care plans are identified as plaintiff versus defense?

IV item	*IV variable*	*IV measurement*	*DV item(s)*	*#DVs*	*DV measurement*
L21/P15	LCPs vs. LCP-physiatrist	Variables combined; dichotomous	L16A-16M / P20A-P21M	1	Variables combined; scores summed; Continuous
	Plaintiff vs. defense	Recoded dichotomous	L17A-17M / P21A-21M	1	Variables combined; scores summed; Continuous
			L18A-18M / P22A-22M	1	Variables combined; scores summed; Continuous
			L19A-19M / P23A-23M	1	Variables combined; scores summed; Continuous

Note. Method: OLS regression. Each DV analyzed separately. Total DVs = 4.

Research question twelve was intended to determine if a difference exists between certified and non-certified LCPs and LCP-physiatrists on whether they ever felt pressure to include costs when developing life care plans for plaintiff cases. The intended IV variables prior to preliminary analysis included the following: Certified and non-certified LCP and group (combined subjects without accounting for certification) LCP or physiatrist LCP. The dependent variables intended included survey items (L22/P16) representing the survey item for either LCP or physiatrist ("L" designated for LCP survey and "P" designated for physiatrist survey). Survey items included the following question: "When developing life care plans, have you ever felt the need or pressure to include any and all complications that are possible of occurring to increase cost when developing plans for plaintiff cases to obtain future employment by attorneys? Note: Once again, this survey is strictly confidential. Your honest opinion and answer can help the life care planning community." Answer choices included either Yes or No. The intended method of analysis prior to preliminary analysis included logistic regression and/or chi-square cross-tabulations with one DV.

Table 23

Research question 12: Do certified and non-certified LCPs and LCP-physiatrists differ on whether they have felt pressure to increase costs when developing life care plans for plaintiff cases?

IV item	*IV variable*	*IV measurement*	*DV item(s)*	*#DVs*	*DV measurement*
L3/P3	Certified or Non-Certified	Variables combined; Recoded - dichotomous	L22 / P16	1	Variables combined; scores summed; Continuous
	Group: LCP or physiatrist LCP	Recoded dichotomous			

Note. Method: Logistic regression and/or chi-square cross-tabulations. Total DV = 1.

Research question thirteen was intended to assess whether a difference exists between LCP-physiatrists and non-LCP physiatrists in their summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, after controlling for relevant demographic variables. The intended IVs prior to testing for assumptions/preliminary analysis were as follows: Board certified versus non-board certified (dichotomous variable); knowledge of SCs related to SCI (ordinal variable); experience working at a model system (dichotomous variable); and LCP physiatrist versus non-LCP physiatrist (dichotomous variable) number of life care plans developed for persons with SCI; number of patients seen with SCI per year; and percentage of life care plans that are plaintiff cases. Two survey items included answer choices ranging from 0%; 1-25%; 26-50%; 51-75%; and 76-100% for along an additional two survey items with scores ranging from 1-25+; intended DV measurement involved combining variables and summing scores for each scenario question (total of 4). Statistical analysis originally intended included OLS regression in addition to ANOVA with hierarchical entry of IVs.

Table 24

Research question 13: Do LCP physiatrist and non-LCP physiatrists differ in their summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, after controlling for relevant demographic variables?

IV item	*IV variable*	*IV measurement*	*DV item(s)*	*#DVs*	*DV measurement*
P3	Board Certified or Non-Certified	Variables combined; Recoded - dichotomous	P20A-P21M	1	Variables combined; scores summed; Continuous
P17	Knowledge of SCs Related to SCI	Variables combined; Ordinal	P21A-21M	1	Variables combined; scores summed; Continuous
P5	Employment Status (PT or FT)	Dichotomous	P22A-22M	1	Variables combined; scores summed; Continuous
P4	Employed SCI model system	Recoded dichotomous	P23A-23M	1	Variables combined; scores summed; Continuous
P7	# of LCPs developed for SCI	Variables combined; Ordinal			
P6	# of SCI Patients seen per year	Variables combined; Ordinal			
P14	Percentage of LCPs that are Plaintiff Cases	Variables combined; Ordinal			
MAIN IV:	Group: LCP physiatrist vs. non-LCP-physiatrist	Recoded dichotomous			

Note. Method: OLS regression and ANOVA. Hierarchical entry of IVs (step1: demographics, step2: group); each DV analyzed separately. Total DVs = 4.

Research question fourteen was intended to assess whether a difference exists between LCPs and non-LCP physiatrists in their summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, after controlling for relevant demographic variables. The intended IVs prior to testing for assumptions/preliminary analysis were as follows: Board certified versus non-board certified (dichotomous variable); knowledge of SCs related to SCI (ordinal variable); experience working at a model system (dichotomous variable); and LCP versus non-LCP physiatrist (dichotomous variable) number of life care plans developed for persons with SCI; number of patients seen with SCI per year; and percentage of life care plans that are plaintiff cases. Two survey items included answer choices ranging from 0%; 1-25%; 26-50%; 51-75%; and 76-100% for along an additional two survey items with scores ranging from 1-25+; intended DV measurement involved combining variables and summing scores for each scenario question (total of 4). Statistical analysis originally intended included OLS regression in addition to ANOVA with hierarchical entry of IVs.

Table 25

Research question 14: Do LCPs and non-LCP physiatrists differ in their summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, after controlling for relevant demographic variables?

IV item	*IV variable*	*IV measurement*	*DV item(s)*	*#DVs*	*DV measurement*
L3/P3	Certified or Non-Certified	Variables combined; Recoded - dichotomous	L16A-16M / P20A-P21M	1	Variables combined; scores summed; Continuous
L7/P17	Knowledge of SCs Related to SCI	Variables combined; Ordinal	L17A-17M / P21A-21M	1	Variables combined; scores summed; Continuous
L4	Employment Status (PT or FT)	Dichotomous	L18A-18M / P22A-22M	1	Variables combined; scores summed; Continuous
P4	Employed SCI model system	Recoded dichotomous	L19A-19M / P23A-23M	1	Variables combined; scores summed; Continuous
L5	# of LCPs developed for SCI	Variables combined; Ordinal			
L6/P6	# of SCI Patients seen per year	Variables combined; Ordinal			
L20	Percentage of LCPs that are Plaintiff Cases	Variables combined; Ordinal			
MAIN IV:	Group: LCP vs. non-LCP-physiatrist	Recoded dichotomous			

Note. Method: OLS regression and ANOVA. Hierarchical entry of IVs (step1: demographics, step2: group); each DV analyzed separately. Total DVs = 4.

Research question fifteen was intended to assess whether a difference exists between LCPs and LCP physiatrists in their summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, after controlling for relevant demographic variables. The intended IVs prior to testing for assumptions/preliminary analysis were as follows: Knowledge of SCs related to SCI (ordinal variable); number of life care plans developed for persons with SCI; number of patients seen with SCI per year; and percentage of life care plans that are plaintiff cases with main IV being Group (LCP versus LCP-physiatrist). Two survey items included answer choices ranging from 0%; 1-25%; 26-50%; 51-75%; and 76-100% for along an additional two survey items with scores ranging from 1-25+; intended DV measurement involved combining variables and summing scores for each scenario question (total of 4). Statistical analysis originally intended included OLS regression in addition to ANOVA with hierarchical entry of IVs.

Table 26

Research question 15: Do LCPs and LCP physiatrists differ in their summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, after controlling for relevant demographic variables?

IV item	*IV variable*	*IV measurement*	*DV item(s)*	*#DVs*	*DV measurement*
L7/P17	Knowledge of SCs Related to SCI	Variables combined; Ordinal	L16A-16M / P20A-P21M	1	Variables combined; scores summed; Continuous
L5/P7	# of LCPs developed for SCI	Variables combined; Ordinal	L17A-17M / P21A-21M	1	Variables combined; scores summed; Continuous
L6/P6	# of SCI Patients seen per year	Variables combined; Ordinal	L18A-18M / P22A-22M	1	Variables combined; scores summed; Continuous
L20/P14	Percentage of LCPs that are Plaintiff Cases	Variables combined; Ordinal	L19A-19M / P23A-23M	1	Variables combined; scores summed; Continuous
MAIN IV:	Group: LCP vs. LCP-physiatrist	Recoded dichotomous			

Note. Method: OLS regression and ANOVA. Hierarchical entry of IVs (step1: demographics, step2: group); each DV analyzed separately. Total DVs = 4.

Research question sixteen was intended to assess if a difference exists between summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, LCPs versus LCP-physiatrists, and whether the bulk of life care plans are identified as plaintiff or defense cases. The two intended IVs prior to testing for assumptions/preliminary analysis were Group: LCP versus LCP-physiatrist and percentage of life care plans that are plaintiff cases. Two survey items included answer choices ranging from 0%; 1-25%; 26-50%; 51-75%; and 76-100% for along an additional two survey items with scores ranging from 1-25+; intended DV measurement involved combining variables and summing scores for each scenario question (total of 4). Statistical analysis originally intended included t-tests with each DV analyzed separately.

Table 27

Research question 16: Is there are difference between summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, LCPs versus LCP-physiatrists, and whether the bulk of life care plans are identified as plaintiff or defense cases?

IV item	*IV variable*	*IV measurement*	*DV item(s)*	*#DVs*	*DV measurement*
L21/P15	Group: LCP or LCP-physiatrist	Recoded dichotomous	L16A-16M / P20A-P21M	1	Variables combined; scores summed; Continuous
	Plaintiff or defense	Variables combined; dichotomous	L17A-17M / P21A-21M	1	Variables combined; scores summed; Continuous
			L18A-18M / P22A-22M	1	Variables combined; scores summed; Continuous
			L19A-19M / P23A-23M	1	Variables combined; scores summed; Continuous

Note. Method: T-tests. Each DV analyzed separately. Total DVs = 4.

Overview of Ordinal Logistic Regression

The purpose of logistic regression is similar to multiple regression although the difference lies with making predictions and the scale of measurement utilized for the dependent variable. With bivariate and multiple regression the focus is on prediction; logistic regression aims at assessing the probability of whether any of the independent variables (categorical and/or continuous) will fall within one of the categories of the dependent variable (i.e., gender: male or female). In addition to logistic regression, a cumulative odds ordinal logistic regression with proportional and partial proportional odds will be utilized. When the dependent variables have ordinal data (i.e., Likert scale questions: Strongly disagree, disagree, agree, and strongly agree) as in the survey for both life care planners and physiatrists to determine their likelihood of including secondary complications within a LCP, the conventional ordinal least squares (OLS) regression is not suitable (Williams, 2006). Because the assumptions for proportional odds model is often violated, such as insufficient sample size and the odds for each independent variable should have equal variance among the dependent variable responses (i.e., proportional odds), the generalized ordered logit (partial proportional odds) model is often a preferred statistical method, allowing for disproportional responses towards the dependent variable (Cornwell, Laumann & Schumm, 2008). As such, these statistical analyses to be implemented are considered part of the non-parametric family of tests will and were implemented based on the nominal and ordinal nature of the dependent variables.

Prior to running any statistical analysis (i.e., t-test, ANOVA, logistic regression), ensuring the assumptions of each test has not been violated was implemented. For t-test and ANOVA, there should be no significant outliers (extreme scores) that can push or pull the data giving the indication that the results are higher or lower than what they actually are. Inspection of a boxplot can typically be utilized to assess for outliers. In addition, the data should be normally distributed and can be tested for by using a superimposed histogram with normal probability plots. Finally, the groups should have equal variances and can be tested for by Tukey's post hoc. Because running a statistical test of ANOVA can provide results indicating that at least two or more groups differ from one another, it will not indicate which group. Therefore, running a post hoc is required to receive and provide meaningful data.

The alpha level (α) for the proposed study was set equal to .05. The .05 alpha level is typically utilized in research as a healthy medium so that the level is not too stringent therefore increasing our risk of committing a Type II error (Huck, 2012). The more stringent the alpha level tends to be (i.e., .001) the greater the risk of committing a Type II error. If results indicate a *p*-value less than or equal to .05, then the null hypothesis can be rejected (there is no difference between x and y groups) and accept the alternative hypothesis (there is a difference between x and y groups) with only a 5% chance of committing a Type I error. Results are considered statistically significant at this level. If the alpha level (α) is set at .01, then the risk of committing a Type I error becomes reduced to a 1% chance, or one time out of a 100 our results are due to chance or probability.

Because the study involved a nine-step version of hypothesis testing, an a priori power analysis was conducted to determine the number of participants needed to obtain a power of .80 with a medium effect size of .5 respectively for t-tests (Huck, 2012). The purpose of implementing the a priori power analysis was to determine the practical significance in addition to the level of significance (i.e., *p*-value). Rather than indicating whether the results are statistically significant at the .05 level, the practical significance determined by the effect size, (i.e., small, medium, or large), was determined to be included as necessary and depending on the tests implemented. Although a study can provide results that are statistically significant, the strength of the differences within the findings may be small (Cohen, 1988; Huck, 2012).

To determine a sufficient sample size, the a priori power analysis conducted utilizing the 16 independent variables for life care planners and 13 independent variables for physiatrists, with an alpha of .05, beta set at .80, and a medium effect size of .05, the total number of participants required are 193 and 186 respectively. The research conducted involved three groups (life care planners, physiatrists, and comparing life care planners to physiatrists). Therefore, a total sample size for the study required 379 participants.

CHAPTER IV

RESULTS

The goal of this study was to survey life care planners (LCP) and physiatrists to obtain their opinions on the inclusion of financial costs associated with potential secondary complications when developing life care plans ('plans') for persons with spinal cord injuries (SCI). A primary focus was to assess for relationships and differences regarding the likelihood and frequency of secondary complications (SC) within a lifetime among persons with SCI. The study was designed to investigate three sets of research questions pertaining to: (1) LCPs, (2) physiatrists, and (3) the comparison of LCPs and physiatrists[1].

The following research questions were used to guide the researcher in the proposed study:

Research Questions for Life-Care Planners

RQ A: Are there relationships between life care planner demographics and ratings concerning the possibility versus probability of secondary complication costs imbedded within the life care plan?

RQ B: Are ratings of the likelihood of 13 secondary complications a function of life care planner demographics?

RQ C: Are ratings of the frequency of 13 SCs requiring hospitalization and/or treatment a function of life care planner demographics?

[1] Within the analyses and results, the acronym LCP was used to refer to life care *planners* whereas the word 'plan' was used as short hand for life care *plans*, to avoid confusion between the practitioner and the product.

Research Questions for Physiatrists

RQ D: Are there relationships between LCP-physiatrist demographics and ratings concerning the possibility versus probability of secondary complication costs imbedded within the life care plan?

RQ E: Are ratings of the likelihood of 13 secondary complications a function of physiatrist demographics?

RQ F: Are ratings of the frequency of 13 SCs requiring hospitalization and/or treatment a function of physiatrist demographics?

RQ G: Are ratings pertaining to the likelihood of SCs if preventative measures are taken/not taken a function of physiatrist demographics?

Research Questions for the Comparison of LCPs and Physiatrists (Including LCP-Physiatrists and Non-LCP-Physiatrists)

RQ H: Do LCP physiatrists and non-LCP physiatrists differ in their summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, after controlling for relevant demographic variables?

RQ I: Do LCPs and non-LCP physiatrists differ in their summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, after controlling for relevant demographic variables?

RQ J: Do LCPs and LCP physiatrists differ in their summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs *incurred by persons with SCI, after controlling for relevant demographic variables?*

RQ K: Is there a relationship between summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, life care planners versus LCP-physiatrists, and whether the bulk of life care plans are identified as plaintiff or defense cases?

RQ L: Do certified and non-certified LCPs and LCP-physiatrists differ on whether they have felt pressure to increase costs when developing plans for plaintiff cases?

Preliminary Analyses of RQs

This section details the results of preliminary data analyses. First, data was screened to ensure adequacy of the data and to remove missing cases. This is followed by a description of the explanatory demographic variables used in this study. Preliminary screening and data analyses were then conducted to evaluate the research questions against the statistical analysis as proposed in chapter three based on the characteristics of the data, feasibility of the methods, and evaluation of the assumptions. Based on the results of the analyses, modification of some research questions was required in order to enhance/improve the analyses. These preliminary analyses are discussed in the sections that follow. For ease of explanation, the results pertaining to the research questions are presented by *outcome variable* (not by group).

Initial Data Screening

Initial data screening was conducted to ensure data were imported correctly and to remove any unsuitable cases. In total, 260 potential respondents accessed the surveys of which 80.8% (n = 210) finished the survey and 19.2% (n = 50) did not. One respondent did not agree to participate on the informed consent form and was, therefore, excluded. Another 15 cases did not respond to the initial group classification item (LCP or physiatrist) nor to any other survey items and were similarly excluded. Two cases reported that they were both a LCP and physiatrist. One of these cases did not respond to any further items on the survey and as such, removed from the analysis. The other case responded to some of the LCP survey items, and was therefore classified as an LCP.

After the initial screening and removal of cases, there remained 243 cases in the data set. Of these, 49.4% (n = 120) were LCP and 50.6% (n = 123) were physiatrists. Physiatrists were further classified into whether they were a LCP physiatrist or a non-LCP physiatrist based on their responses to the employment item (P5)[2]. Of the 117 cases that responded to the item, 39.3% (n = 46) were classified as LCP-physiatrists and 60.7% (n = 71) as non-LCP physiatrists. Non-LCP physiatrists were asked to skip the survey items pertaining to the inclusion of possible and probable secondary costs within the plan. To optimize sample sizes for the analyses, cases with missing data were excluded on an *analysis-by-analysis* basis. Thus, the number of cases differed according to each analysis.

[2] Survey items are preceded by the prefix “P” or” L” to denote an item on the physiatrist or LCP survey, respectively.

Table 28

LCP Participant Demographics

Identified Demographic	*n*	*%*
Race/Ethnicity		
Caucasian (non-Hispanic)	117	97.5
African-American	2	1.7
Hispanic	1	.8
Gender		
Male	25	20.8
Female	95	79.2
Certified vs. Non-Certified LCP		
Certified LCP	91	75.8
Non-Certified Life Care Planner	29	24.2
Training Disciplines		
Physician	4	3.3
Registered Nurse	48	40.0
Certified Rehabilitation Counselor	39	32.5
Licensed Professional Counselor	15	12.5
Other	36	30.0
Employment status		
Employed FT as a LCP (> 40 hours weekly)	71	61
Employed PT as a LCP (< 40 hours weekly)	46	39
LCPs developed (total to date) for individuals with SCI		
0	4	3
1-25	39	33
26-50	23	20
51-75	11	9
76-100	6	5
101+	34	29
Percentage of your current/past LCPs as plaintiff cases		
0	7	18
1-25	9	24
26-50	7	18
51-75	8	21
76-100	7	18
Bulk of your LCPs		
Plaintiff cases (more than 51%+ of the time)	79	75
Defense cases (more than 51%+ of the time)	27	25
Total	120	49.4

Note. For training disciplines, participants included within the "Other" category included: Occupational Therapist, Physiotherapist, Public Health Nurse, Registered Occupational Therapist, etc. FT = full time, PT = part time.

Table 29

Physiatrist Participant Demographics

Identified Demographic	*n*	%
Race/Ethnicity		
Caucasian (non-Hispanic)	84	67
African-American	8	5
Hispanic	10	7
Asian	27	21
Gender		
Male	59	42
Female	71	58
Certified vs. Non-Certified		
Board Certified Physiatrist	92	74
Non-Board Certified Physiatrist	31	26
Area of Employment (Multiple Answer Choices Were Allowed)		
I have worked at a SCI model system.	59	48
I am currently working at a SCI model system.	28	23
I have worked at a university hospital.	65	53
I am currently working at a university hospital.	71	58
I have never worked at any of the SCI medical systems above.	10	8
Spinal cord injury patients seen per year		
Less than 25	7	18
26-50	3	8
51-75	5	13
76-100	8	21
101+	15	39
Employment Status		
Employed FT as a Physiatrist and develop LCPs part time	12	10
Employed PT as a Physiatrist and full time develop LCPs	2	2
Employed FT as a Physiatrist but only consult on LCPs	36	29
A full or PT Physiatrist who is not involved in LCP	74	60
Total	123	50.6

Note. LCP = life care planner, LCPs – life care plans, FT = full time, PT = part time.

Table 30

Physiatrist-LCP Participant Demographics

Identified Demographic	*n*	*%*
LCPs developed (total to date) for individuals with SCI		
1-25	26	68
26-50	6	16
51-75	3	8
76-100	0	0
101+	3	8
Percentage of your current/past LCPs as plaintiff cases		
0	7	18
1-25	9	24
26-50	7	18
51-75	8	21
76-100	7	18
Bulk of your LCPs		
Plaintiff cases (more than 51%+ of the time)	24	71
Defense cases (more than 51%+ of the time)	10	29
Total	46	39.3

Note. LCP = life care planner, LCPs – life care plans.

Demographic variables

This study sought to investigate the relationship between a number of demographic variables and the responses to the survey regarding costs and secondary complications. Some items were common to both surveys and could be combined, whereas others were specific to LCPs or physiatrists. The table below presents the predictor variables used in this study, their coding/measurement levels, and the groups they pertain to.

Table 31

Explanatory demographic variables used in the analyses

Survey Item	Item Description	Coding / Measurement	Group
L3/P3	Certified or non-certified	Dichotomous; (0 = non-certified, 1 = certified)	LCP Phy-LCP Phy-Non-LCP
L7 / P17	Knowledge of SCs related to SCI	Ordinal 1-5; (1 = Poor, 5 = Excellent)	LCP Phy-LCP Phy-Non-LCP
L5 / P7	# of life care plans developed for SCI	Ordinal 1-6 (1 = 0, 6 = 101+)	LCP Phy-LCP
L20 / P14	Percentage of LCPs that are Plaintiff Cases	Ordinal 1-5 (1 = 0%, 5 = 76-100%)	LCP Phy-LCP
L4	Employment status	Dichotomous; (1 = FT, 2 = PT)	LCP
P4	Ever worked at SCI model system	Dichotomous; (1 = No, 2 = Yes)	Phy-LCP Phy-Non-LCP
L6	# of SCI patients seen per year	Ordinal 1-6; (1 = 0, 6 = 50+)	LCP
P6	# of SCI Patients seen per year	Ordinal 1-5 (1 = <25, 5 = 101+)	Phy-LCP

Note. LCP = life care planner, Phy-LCP = physiatrist life care planner, Phy-Non-LCP = physiatrist non-life care planner.

Spearman's rho correlation coefficients were computed between the explanatory variables in the full sample and in each sub-sample. Spearman correlations were used rather than Pearson correlations due to the discrete/ordinal measurement level of the variables. The correlations between predictor variables were of a sufficiently low magnitude to not pose problems with multicollinearity in the analyses. The highest correlation was observed between the number of SCI patients seen per year and the number of plans developed for SCI in total (ρ = .47-57 depending on the group). Higher levels of reported knowledge of SCs also tended to be correlated to number of patients and/or plans. It should also be noted that the number of Phy-LCPs was about 36 cases, indicating potential difficulties in conducting analyses with many predictor variables within this subgroup.

Table 32

Spearman's rho correlation coefficients between explanatory variables in full and sub-samples

	Variable	Certified 1	Knowledge 2	# plans 3	% plaintiff 4	Emp. LCP 5	Emp. Phy 6	# pts LCP 7	# pts Phy 8
	Full sample (below diagonal); LCP sample (above diagonal)								
1	Certified	--	.008 (n = 116)	.063 (n = 117)	.074 (n = 107)	.019 (n = 117)	NA	.023 (n = 115)	NA
2	Knowledge	.112 (n=223)	--	.334*** (n = 116)	-.063 (n = 107)	-.204* (n = 115)	NA	.353*** (n = 115)	NA
3	# of plans	-.029 (n=154)	.208* (n = 152)	--	.001 (n = 107)	-.387*** (n = 116)	NA	.568*** (n = 115)	NA
4	% plaintiff cases	.136 (n = 144)	-.010 (n = 143)	.058 (n = 144)	--	-.161 (n = 107)	NA	.097 (n = 106)	NA
5	Employment FT or PT (LCP)	.019 (n = .840)	-.204* (n = 115)	-.387*** (n = 116)	-.161 (n = 107)	--	--	-.281** (n = 114)	NA
6	Employed at SCI model system (Phy)	.223* (n = 118)	.063 (n = 107)	.100 (n = 37)	.142 (n = 37)	NA	--	NA	NA
7	# of SCI patients/yr (LCP)	.023 (n = 115)	.353*** (n = 115)	.568*** (n = 115)	.097 (n = 106)	-.281** (n = 114)	NA	--	NA
8	# of SCI patients/year (Phy)	.111 (n = 37)	.297 (n = 36)	.476** (n = 37)	.313 (n = 37)	NA	-.022 (n = 37)	NA	--
	Phy-Non-LCP (below diagonal); Phy-LCP (above diagonal)								
1	Certified	--	.090 (n = 35)	-.373* (n = 36)	.385* (n = 36)	NA	.447** (n = 45)	NA	.135 (n = 36)
2	Knowledge	.265* (n=71)	--	.246 (n = 35)	-.448** (n = 35)	NA	-.010 (n = 35)	NA	.346* (n = 35)
3	# of plans	NA	NA	--	-.003 (n = 36)	NA	.117 (n = 36)	NA	.465** (n = 36)
4	% plaintiff cases	NA	NA	NA	--	NA	.133 (n = 36)	NA	.353* (n = 36)
6	Worked at SCI model system (Phy)	.082 (n = 71)	.110 (n = 71)	NA	NA	NA	--	NA	.014 (n = 36)

Note. NA = not applicable. *p<.05, **p<.01, ***p<.001.

Possibility versus Probability of Secondary Complication Costs

Two research questions pertained to the possibility versus probably of SC costs included in the life care plan.

RQ A: Are there relationships between ***life care planner*** *demographics and ratings concerning the possibility versus probability of secondary complication costs imbedded within the life care plan?*

RQ D: Are there relationships between ***LCP-physiatrist*** *demographics and ratings concerning the possibility versus probability of secondary complication costs imbedded within the life care plan?*

Exploratory Analyses and Considerations

The proposed method to analyze these RQs was via separate cumulative odds ordinal logit models with proportional and/or partial proportional odds. When the dependent variables have ordinal data (e.g., Likert type items: Strongly disagree, disagree, agree, and strongly agree) as in the surveys for both life care planners and physiatrists to determine their likelihood of including secondary complications within a life care plan, the conventional ordinal least squares (OLS) regression is not suitable. The assumption of parallel lines (PL) or that predictor variable coefficients are equivalent across all levels of the outcome variable, is required for the proportional odds model. However, this assumption is often violated, and it is common for one or more coefficients to differ across levels of the outcome (Williams, 2006). The partial proportional odds model offers an alternative, whereby the PL constraint is relaxed for only those variables not meeting the assumption.

With only 35 cases in the Phy-LCP group and six proposed explanatory variables there were a large proportion of cells with zero frequencies. As such, problems can occur when there are too few cases relative to the number of predictor variables, included large parameter estimates and standard errors and possibly failure of convergence when there are too many empty cells (Tabachnick & Fidell, 2007). Furthermore, the rule of thumb for logistic and polychotomous regression (where you have multiple dependent variables that are predicted) generally specifies at least 10 cases per variable (e.g., Peduzzi, Concato, Kemper, Holford, & Feinstein, 1996), the sample size for the Phy-LCP group was clearly too small to obtain reliable estimates. Indeed, preliminary analyses showed that a number of models did not converge. Although there was a larger sample size for LCPs (approx. 100), the ratio of variables to cases was still not ideal.

Therefore, it was decided to combine these two research questions into one, for the purposes of statistical analyses, and to limit the predictor variables to those that were common to the two groups (i.e., certified, knowledge of SC, number of plans, percentage plaintiff). A grouping variable was included to determine whether LCPs and Phy-LCPs differed in their responses. The revised research question was as follows:

RQ 1: Are there relationships between LCP and Phy-LCP demographics and ratings concerning the possibility versus probability of secondary complication costs imbedded within the life care plan?

<u>Statistical Methods</u>

Generalized ordered logit analysis was performed using the STATA software application and the `gologit2` user defined program (Williams, 2006). The parallel lines assumption or equivalently, the proportional hazards assumption, was tested using the `autofit` procedure available within the `gologit2` program. When `autofit` is specified, the algorithm starts with the least parsimonious (unconstrained) model and then does a series of Wald tests on each variable to determine whether the β coefficients differ across equations (i.e., violate the PL assumption). This procedure is repeated iteratively by gradually imposing constraints on non-significant variables until there are no more variables that meet the PL assumption. A global Wald test was then conducted on the final model with constraints and compared to the original unconstrained model. A non-significant global Wald test indicates that the final model meets the PL assumption. Thus, the `gogolit2` program allows one to fit a partial proportional odds model (PPOM) that is less restrictive than the proportional odds model (POM) but is more parsimonious and easier to interpret than a fully unconstrained model such as in multinomial logistic regression. Parameter estimates for constrained variables are the same across levels of the outcome, and unique β coefficients are only produced for those that did not meet the PL assumption. Note that if constraints for parallel lines are met for all variables, then the results equal those of the POM (Williams, 2006).

Interpretation of the β coefficients for unconstrained variables is similar to a series of logistic regressions. The first equation contrasts the first category of the outcome variable with all higher levels. The second contrasts categories 1 and 2, versus 3 and higher. Equations are estimated for all categories except the last. In other words, interpretation of results at each category of the outcome contrasts the current category and all lower-coded categories against any higher categories. A positive coefficient indicates that higher values on the explanatory variable are associated with greater likelihood of being in a higher category of the outcome variable than the current one, whereas a negative coefficient represents an increased likelihood of being in the current or a lower category (Williams, 2006).

Likelihood of Secondary Complications in SCI

Two research questions pertained to the ratings of the likelihood of secondary complications.

RQ B: Are ratings of the likelihood of 13 secondary complications a function of ***life care planner*** *demographics?*

RQ E: Are ratings of the likelihood of 13 secondary complications a function of ***physiatrist*** *demographics?*

Exploratory Analyses and Considerations

Two scenarios were presented to respondents and they were asked to report the likelihood of 13 separate complications on an ordinal scale from 1 to 5 (1 = 0%, 5 = 76-100%). Thus, the proposed method to analyze these RQs was via separate cumulative odds ordinal logit models with proportional and/or partial proportional odds. However, as reported in the previous section, too high of a variable-to-case ratio and many empty cells can lead to difficulties in the analysis. For life care planners separately, 13 of the 26 analyses did not converge. Furthermore, only two of the remaining 13 analyses had statistically significant model effects (at $p < .004$, using the Bonferroni correction to the alpha level). Exploration of responses in the group of physiatrists separately yielded nine analyses that did not converge, and only three that obtained statistically significant model results (at $p < .004$). Furthermore, inspection of item coefficients in the models with significant effects indicated that variables common to both groups (e.g., certification or knowledge) were responsible for the majority of the significant findings.

To improve the sample size and fit of the analyses, the two groups were combined. The set of independent variables were limited to those common to both groups; namely, certification and knowledge of secondary complications. A grouping variable was also included to examine whether responses differed between LCPs, Physiatrist-LCPs, and Physiatrist-Non-LCPs. The combined research question was reworded as follows:

RQ 2: Are ratings of the likelihood of 13 secondary complications a function of demographics or type of practitioner?

Statistical Methods

All analyses for this research question were conducted with the STATA `gologit2` program and `autofit` option, described in the previous section.

Frequency of Secondary Complications Requiring Hospitalization and/or Treatment

Two research questions were proposed to examine the frequency ratings of SCs according to demographic variables.

RQ C: Are ratings of the frequency of 13 SCs requiring hospitalization and/or treatment a function of ***life care planner*** *demographics?*

RQ F: Are ratings of the frequency of 13 SCs requiring hospitalization and/or treatment a function of ***physiatrist*** *demographics?*

Exploratory Analyses and Considerations

For each of the two scenarios, respondents were asked to report the frequency of which each of the secondary complications would require hospitalization and/or treatment in one's lifetime. Response options could be any integer between 0 and 25+. The proposed method to analyze these data was via multiple linear regression.

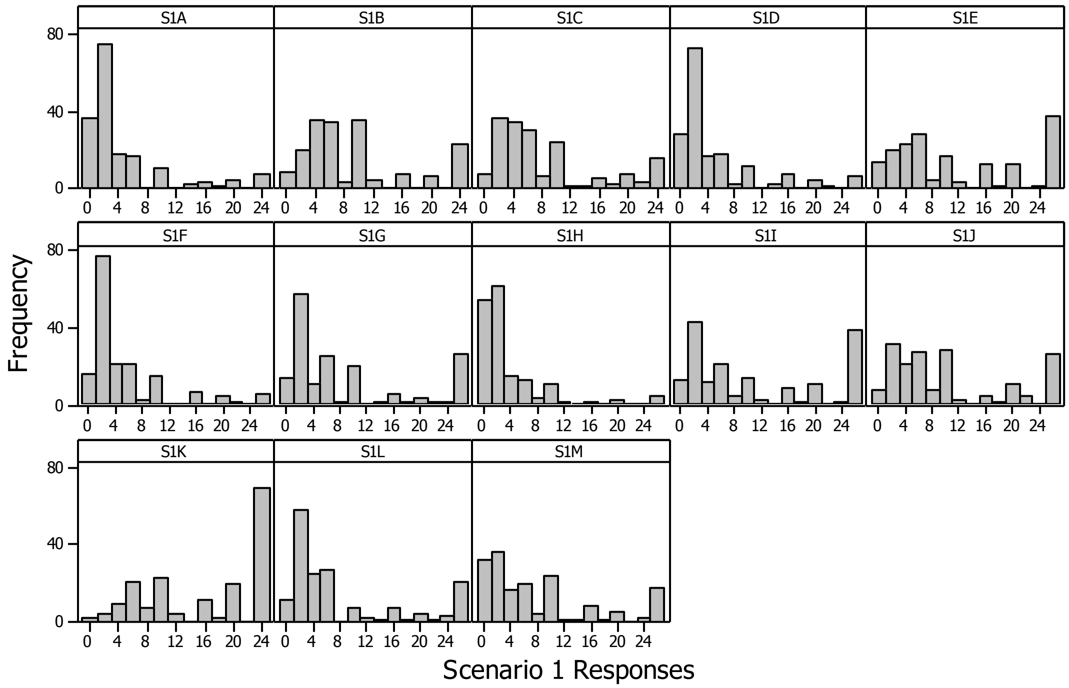
However, the distributions of responses to these items were decidedly non-normal (see figures 1 and 2). Many were significantly skewed to the right with a buildup of zero and low values. Some distributions were bimodal (typically with a number of both low and high values), and other items showed responses resembling a uniform distribution. In addition, none of the items obtained a full range of possible values between 0-25; there were numerous gaps within the distributions and these often occurred for the middle values, further deviating from what would be expected in a Gaussian distribution (highest frequencies of middle values).

Preliminary analyses using linear regression yielded unsatisfactory results. Inspection of residual and casewise diagnostics indicated frequent violation of assumptions and many cases with large residuals. Thus, an alternative statistical method (CATREG) was selected whereby the outcomes were categorized and quantified to optimize their relationships with the predictor variables.

The research questions were combined in order to increase the sample size and examine the responses simultaneously. The explanatory variables included were those common to all LCPs and physiatrists (i.e., certification and knowledge). A grouping variable was also specified (LCP, Phy-LCP, or Phy-Non-LCP) to evaluate whether results varied according to practitioner type. The revised research question was as follows:

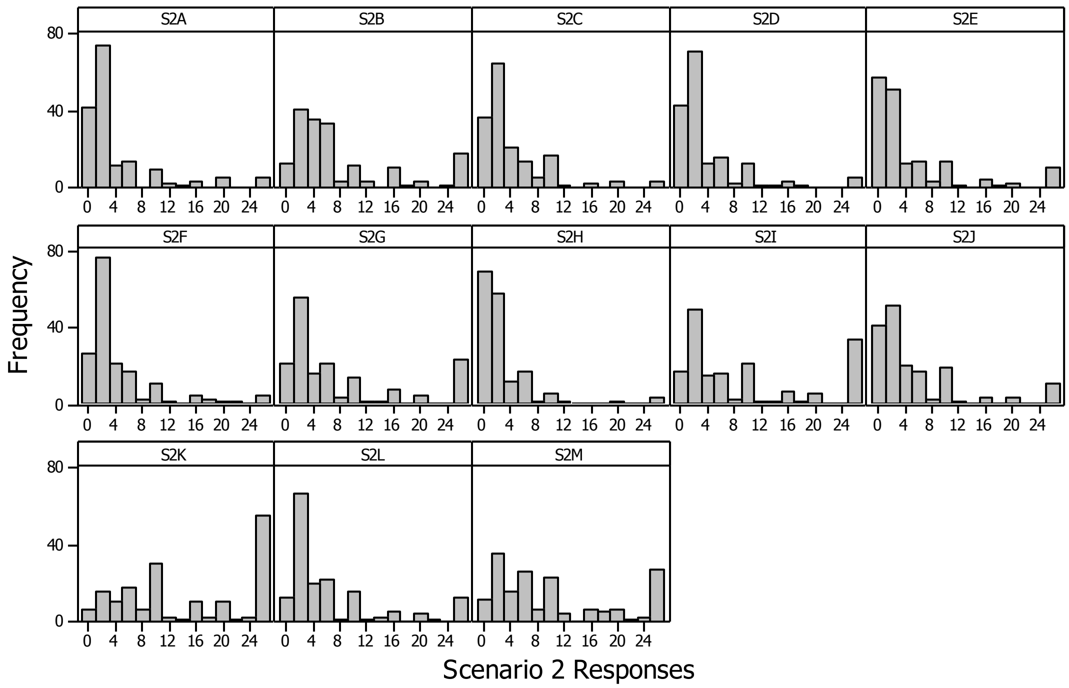
RQ 3: Are ratings of the frequency of 13 secondary complications requiring hospitalization/treatment a function of demographics or type of practitioner?

Figure 1. Histograms of scenario 1 responses regarding frequency of SC requiring hospitalization and/or treatment. The item responses did not follow normal distributions.



Note. S1A = skin breakdown requiring surgery, S1B = skin breakdown requiring home wound care, S1C = pneumonia (atelectasis, and/or aspiration), S1D = heterotopic ossification, S1E = autonomic dysreflexia, S1F = deep vein thrombosis, S1G = cardiovascular disease, S1H = syringomyelia, S1I = neuropathic pain, S1J = respiratory dysfunction, S1K = urinary tract infections, S1L = osteoporosis/bone fractures, S1M = repetitive motion injury/overuse syndrome.

Figure 2. Histograms of scenario 2 responses regarding frequency of SC requiring hospitalization and/or treatment. The item responses did not follow normal distributions.



Note. S1A = skin breakdown requiring surgery, S1B = skin breakdown requiring home wound care, S1C = pneumonia (atelectasis, and/or aspiration), S1D = heterotopic ossification, S1E = autonomic dysreflexia, S1F = deep vein thrombosis, S1G = cardiovascular disease, S1H = syringomyelia, S1I = neuropathic pain, S1J = respiratory dysfunction, S1K = urinary tract infections, S1L = osteoporosis/bone fractures, S1M = repetitive motion injury/overuse syndrome.

Statistical Methods

Based on the preliminary findings, the alternative method of categorical regression with optimal scaling was selected to analyze these data. The categorical regression procedure quantifies categorical data by assigning numeric values to produce an optimal linear regression equation for the transformed variables. The procedure simultaneously scales variables with various measurement levels (nominal, ordinal, and numeric) yet quantifies the variables that reflect the characteristics of the original categories as specified by the optimal scaling level.

Examination of the optimal scaling for the outcomes indicated that an ordinal scaling level was more suitable than a numeric one (e.g., many values obtained the same quantifications). The initial configuration was set at all multiple systemic starts in order to find the optimal solution (IBM Corp., 2011).

Summary Measures of Likelihood and Frequency of SC

Four research questions were developed to examine whether summary ratings of likelihood of SC and the frequency of SC requiring hospitalization/treatment differed according to practitioner type. The first three RQs were similar with the exception of the groups being compared.

(a) Comparison of Groups

RQ H: Do LCP physiatrists and non-LCP physiatrists differ in their summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, after controlling for relevant demographic variables?

RQ I: Do LCPs and non-LCP physiatrists differ in their summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, after controlling for relevant demographic variables?

RQ J: Do LCPs and LCP physiatrists differ in their summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, after controlling for relevant demographic variables?

Preliminary Analyses and Considerations

First, scenario scores were created by averaging across all 13 items within each section. Thus, for each scenario there was a mean score pertaining to likelihood of secondary complications (SC) and another score pertaining to frequency of hospitalizations due to SC. To ensure the variables were not significantly biased due to missing responses, only those cases with 75% or more of the 13 item responses were scored.

Examination of the distribution of the summary scores indicated non-normality, particularly for the frequency of hospitalization scores (see figures below). Screening for outliers identified cases with large Z-scores (i.e. > ± 3). Given that a parametric method such as regression or ANOVA was sought to analyze these data, transformation of the outcome variables was required. The box-cox transformation was employed to reduce skewness. This method is typically performed in an effort to stabilize variance. The resulting transformed scores were also standardized to have a mean of 0 and a standard deviation of 1. The transformations produced scores that indeed improve the distributions in addition to finding no excessively large outliers (see figure 3 and 4).

Using the transformed scores as dependent variables, a hierarchical regression analysis was conducted to evaluate whether demographic variables were necessary to include in the equations as control variables. First, the relevant demographic variables pertaining to the groups under consideration were entered on the first step. The grouping variable was entered on step 2. The significance values of the demographic variables alone and after addition of the grouping variable were examined to determine if they contributed significantly to the model. The regressions were conducted separately using the demographic and grouping variables (i.e., LCP-physiatrists versus non-LCP physiatrists, LCPs versus non-LCP-physiatrists, and LCPs versus

LCP-physiatrists). In only one situation were there any significant demographic variables (Scenario 2 likelihood of SC comparing LCPs versus LCP-physiatrists), and these were no longer significant after adding the grouping variable. Therefore it was determined that the demographic variables contributed little to the variance in the summary scores, and these were not controlled for in the final analyses. Furthermore, the research questions could be combined in order to examine the differences between the three groups simultaneously. Therefore, the revised research question was as follows:

RQ 4: Do LCPs, LCP physiatrists and non-LCP physiatrists differ in their summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI?

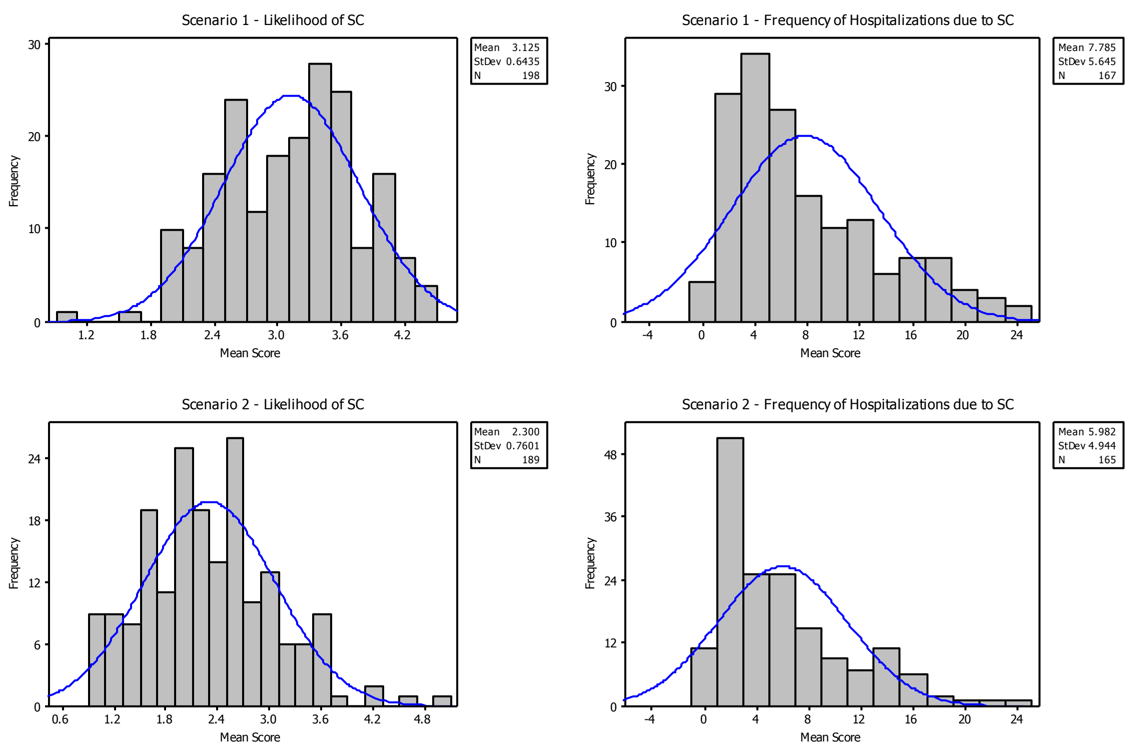


Figure 3. Histograms of mean scenario scores for likelihood of secondary complications (SC) and frequency of hospitalizations.

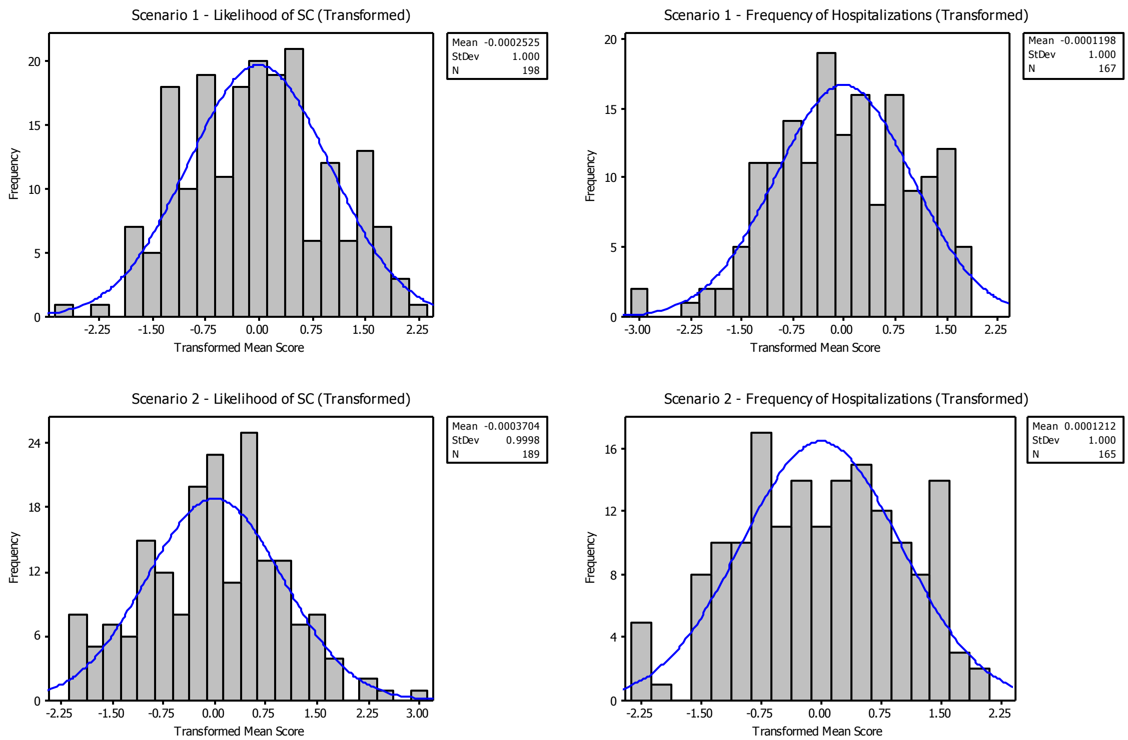


Figure 4. Histograms of transformed scores using the Box-Cox transformation, standardized to a mean of 0 and a standard deviation of 1.

Statistical Methods

The research question was addressed using one-way ANOVAs for each of the four summary scores. The grouping factor consisted of three levels: LCPs, Phy-LCPs, and Phy-Non-LCPs. Where indicated by a significant omnibus test, Bonferroni post-hoc comparisons were conducted between the means to determine where the differences occurred.

In terms of the assumptions of the statistical test, normality of the transformed variables was vastly improved over the original distributions. Furthermore, ANOVA is generally robust to violations of the normality assumptions given sufficient cell sizes. The homogeneity of variances assumption was met for all analyses (as indicated by Levene's test p values > .05). The groups were also independent. Analyses were conducted using SPSS v.20.

(b) Plaintiff vs. Defense Cases

One other research question (RQ K) was specified to examine the relationship between the summary scores, the practitioner type, and whether the respondent tended to work primarily on plaintiff or defense cases. This research question was renamed to RQ5.

RQ K (renamed RQ 5): Is there a relationship between summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, life care planners versus LCP-physiatrists, and whether the bulk of life care plans are identified as plaintiff or defense cases?

<u>Preliminary Analyses and Considerations</u>

As with the previous analysis, preliminary investigations using hierarchical linear regression revealed no significant effects of demographic variables as pertained to the relationships between the explanatory variables and outcome variables. Thus, no demographic control variables were included in the analyses.

<u>Statistical Methods</u>

The RQ was investigated via the use of two-way ANOVAs conducted separately on each of the summary scores. The primary predictor consisted of a dichotomous item where respondents indicated whether the bulk of life care plans were plaintiff cases (coded 1) or defense cases (coded 2). A grouping factor was also included with two levels (LCP, Phy-LCP) to determine the relevance of the type of practitioner to outcome, and whether there were any interactions between group and type of case. Non-LCP physiatrists were excluded from these analyses (they did not complete this item). Where indicated by a significant omnibus test, Bonferroni comparisons were conducted between the means.

Data met the assumptions of the ANOVA analyses, namely approximate normality of residuals, homogeneity of variance as indicated by non-significant Levene's tests ($p > .05$), and independence of observations.

Additional Outcome Measures

There were two additional research questions developed for this study in relation to other items on the surveys.

(a) Likelihood of SCs with and without preventative measures (Physiatrists)

RQ G (Renamed RQ 6): Are ratings pertaining to the likelihood of SCs if preventative measures are taken/not taken a function of physiatrist demographics?

Preliminary Analyses and Considerations

Two items served as outcome measures for this RQ, which asked physiatrists to rate how likely secondary complications are to occur if preventative measures ARE taken, and if preventative measures ARE NOT taken. Responses to both items were on the same ordinal scale from 1 (0%) to 5 (76-100%).

Statistical Methods

Analyses were conducting using generalized ordered logistic regression calculated with the `gologit2` program in STATA with the `autofit` option, as described earlier in this document. Physiatrist demographic variables and a grouping variable comparing the two physiatrist subgroups (Phy-LCP and Phy-Non-LCP) were included as explanatory variables.

(b) Pressure to Increase Costs in Plaintiff Cases

RQ L (Renamed RQ 7): Do certified and non-certified LCPs and LCP-physiatrists differ on whether they have felt pressure to increase costs when developing plans for plaintiff cases?

<u>Preliminary Analyses and Considerations</u>

The outcome variable for this RQ was a dichotomous variable asking respondents whether they had ever felt pressure to include secondary complications to increase costs on plaintiff cases, with response options of 'yes' (coded 1) or 'no' (coded 2). Certification status and group (LCPs or Phy-LCPs) served as explanatory variables.

<u>Statistical Methods</u>

Binomial tests were used to compare the proportion of yes and no responses within each group and overall. Chi-square tests were conducted to determine the relationship between certification and responses overall and within each group. In addition, Mantel-Haenszel statistics were used to compare certification and responses while controlling for practitioner type (LCP or Phy-LCP). This included calculation of risk ratios within each layer of practitioner type, tests of the homogeneity of the odds ratio across categories of the layer, tests of conditional independence, and the significance of the common odds ratio (IBM Corp., 2011).

Summary

The purpose of this chapter was to provide preliminary analyses of the research questions and to make modifications as required in order to ensure validity of the statistical methods used and results obtained. The original research questions were modified and combined to yield seven final research questions addressed in this study:

RQ 1: Are there relationships between LCP and Phy-LCP demographics and ratings concerning the possibility versus probability of secondary complication costs imbedded within the life care plan?

RQ 2: Are ratings of the likelihood of 13 secondary complications a function of demographics or type of practitioner?

RQ 3: Are ratings of the frequency of 13 secondary complications requiring hospitalization/treatment a function of demographics or type of practitioner?

RQ 4: Do LCPs, LCP physiatrists and non-LCP physiatrists differ in their summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI?

RQ 5: Is there a relationship between summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, life care planners versus LCP-physiatrists, and whether the bulk of life care plans are identified as plaintiff or defense cases?

RQ 6: Are ratings pertaining to the likelihood of SCs if preventative measures are taken/not taken a function of physiatrist demographics?

RQ 7: Do certified and non-certified LCPs and LCP-physiatrists differ on whether they have felt pressure to increase costs when developing plans for plaintiff cases?

Statistical analyses were conducted using STATA for the ordered logit models and SPSS v.21.0 for the remainder of the analyses. Graphs were created using Minitab v.16.1.1. An alpha level of .05 was used as a decision point for statistical significance. The alpha level was modified using the Bonferroni correction within each RQ in order to protect against inflated Type I error rates. The following provides the presented results of the statistical analyses for each research question.

Research Question 1 Results

RQ 1: Are there relationships between LCP and Physiatrist-LCP demographics and ratings concerning the possibility versus probability of secondary complication costs imbedded within the life care plan?

Summary of Methods

Table 33

List of variables, coding/measurement levels, and methods for RQ1

Survey #	List of Variables	Coding / Measurement	Statistical Method
Explanatory Variables			
L3/P3	Certified or non-certified	Dichotomous; Non-certified = 0, Certified = 1	
L7/P17	Knowledge of SCs related to SCI	Ordinal 1-5; (1 = Poor, 5 = Excellent)	
L5/P7	Num. of plans developed for SCI	Ordinal 1-6; (1 = 0, 6 = 101+)	
L20/P14	% of plans that are plaintiff cases	Ordinal 1-5; (1 = 0%, 5 = 76-100%)	
(coded)	LCP or Phy-LCP	Dichotomous; LCP = 1, Phy-LCP = 2	
Outcome Variables			
L8/P8	Type of costs often included in plans	Ordinal 1-3; (1 = possible, 2 = Probable, 3 = possible and probable)	PPOM
L9/P9	Belief that plans should include costs even if only possible	Ordinal 1-4; (1 = Strongly Disagree, 4 = Strongly Agree)	PPOM
L10/P10	Include costs in plans if deemed probable by empirical statistics	"	POM
L11/P11	Include costs in plans if deemed probable by physician	"	POM
L12/P12	Include costs in plans if probable by empirical stats and physician	"	POM
L13/P13	Include costs in plans if probable by empirical stats OR physician	"	POM
L14	Always consult physician/expert re SC related to plans *(LCPs only)*	"	POM
L15	Field would benefit from empirical validation on possible v. probable SC *(LCPs only)*	"	POM

Note. Survey # prefix L or P refers to the item on the LCP survey (L) or the physiatrist survey (P). LCP = life care planner, Phy-LCP = Physiatrist life care planner, PPOM = partial proportional odds model, POM = proportional odds model (all explanatory variables met parallel lines assumption). Adjusted alpha for model significance = .05/8 = .006.

This research question sought to investigate the relationship between demographic characteristics of LCPs and Phy-LCPs and ratings regarding the inclusion of possible and probable costs in life care plans. Phy-Non-LCPs were asked to skip these items on the survey and are not included in the analyses. Analyses were conducted using the `gogolit2` program in STATA with the `autofit` option (Williams, 2006).

The first two outcome variables (L8/P8 and L9/P9) did not meet the parallel lines (PL) assumption for all variables and thus, a partial proportional odds model (PPOM) was used. In the PPOM, explanatory variables that met the PL assumption have the same coefficients across all categories of the outcome variable, whereas coefficients that did not meet the PL assumption have different estimated coefficients for each level of the outcome. The explanatory variables for the remaining analyses all met the PL assumption and therefore are presented as in a POM (same coefficients across all levels of the outcome). The final two outcome variables (L14 and L15) were on the LCP survey only and hence those analyses were only conducted on the LCP subsample.

The alpha level for model significance was adjusted based on the number of analyses. Thus, the adjusted alpha level was .006 (.05/8) for these analyses. Descriptive statistics for both LCPs and Phy-LCPs are provided prior to the reporting of results.

Table 34

Physiatrist-LCP *descriptive statistics for cost inclusion within a life care plan*

Types of costs often included in plans	*M* (SD)	Possible n (%)	Probable n (%)	Possible and Probable n (%)	
	2.77 (.758)	6 (16.2)	11 (29.7)	20 (54.1)	
Belief that plans should include costs even if only possible	*M* (SD)	Strong. D. n (%)	Disagree n (%)	Agree n (%)	Strong. A. n (%)
	2.76 (.760)	N/A	16 (43.2)	14 (37.8)	7 (18.9)
Include costs in plans if deemed probable by empirical statistics	*M* (SD)	Strong. D. n (%)	Disagree n (%)	Agree n (%)	Strong. A. n (%)
	2.38 (.828)	4 (10.8)	19 (51.4)	10 (27)	4 (10.8)
Include costs in plans if deemed probable by a physician	*M* (SD)	Strong. D. n (%)	Disagree n (%)	Agree n (%)	Strong. A. n (%)
	2.46 (.803)	5 (13.5)	12 (32.4)	18 (48.6)	2 (5.4)
Include costs in plans if probable by emp. stats. AND physician	*M* (SD)	Strong. D. n (%)	Disagree n (%)	Agree n (%)	Strong. A. n (%)
	2.59 (.798)	2 (5.4)	16 (43.2)	14 (37.8)	5 (13.5)
Include costs in plans if probable by emp. stats. OR physician	*M* (SD)	Strong. D. n (%)	Disagree n (%)	Agree n (%)	Strong. A. n (%)
	2.54 (.691)	2 (5.4)	15 (40.5)	18 (48.6)	2 (5.4)

Note. Strong D. = Strongly disagree, Strong. A = Strongly agree; *M* = mean; SD = standard deviation

Table 35

*Descriptive statistics for **life care planners** and inclusion of cost in a life care plan*

Types of costs often included in plans	*M* (SD)	Possible n (%)	Probable n (%)	Possible and Probable n (%)	
	2.15 (.559)	10 (9.0)	74 (66.7)	27 (24.3)	
Belief that plans should include costs even if only possible	*M* (SD)	Strong. D. n (%)	Disagree n (%)	Agree n (%)	Strong. A. n (%)
	2.31 (.986)	27 (23.5)	41 (35.7)	31 (27.0)	16 (13.9)
Include costs in plans if deemed probable by empirical statistics	*M* (SD)	Strong. D. n (%)	Disagree n (%)	Agree n (%)	Strong. A. n (%)
	2.64 (.898)	13 (11.2)	36 (31.0)	47 (40.5)	20 (17.2)
Include costs in plans if deemed probable by a physician	*M* (SD)	Strong. D. n (%)	Disagree n (%)	Agree n (%)	Strong. A. n (%)
	2.77 (.898)	11 (9.5)	30 (25.9)	50 (43.1)	25 (21.6)
Include costs in plans if probable by emp. stats. AND physician	*M* (SD)	Strong. D. n (%)	Disagree n (%)	Agree n (%)	Strong. A. n (%)
	2.43 (.877)	15 (13.4)	48 (42.9)	35 (31.3)	14 (12.5)
Include costs in plans if probable by emp. stats. OR physician	*M* (SD)	Strong. D. n (%)	Disagree n (%)	Agree n (%)	Strong. A. n (%)
	2.75 (.861)	9 (8.0)	22 (28.3)	50 (44.2)	22 (19.5)
Always consult physician/expert re SC related to plans	*M* (SD)	Strong. D. n (%)	Disagree n (%)	Agree n (%)	Strong. A. n (%)
	2.99 (.822)	5 (4.3)	24 (20.9)	53 (46.1)	33 (28.7)
Field would benefit from empirical validation on possible v. probable SC	*M* (SD)	Strong. D. n (%)	Disagree n (%)	Agree n (%)	Strong. A. n (%)
	3.22 (.832)	7 (6.0)	9 (7.8)	52 (44.8)	48 (41.4)

Note. Strong D. = Strongly disagree, Strong. A = Strongly agree; *M* = mean; SD = standard deviation

Results

A significant association was found between the demographic variables and the likelihood of including possible or probable costs in the life care plan on item L8/P8 ($p < .001$). Certification, number of plans developed for SCI and group were each significant predictors, although their coefficients differed according to the level of the outcome variable. For certification, the positive significant coefficient for possible SC indicated that certified respondents were more likely than non-certified respondents to report the inclusion of probable and possible/probable SC. Alternatively, non-certified respondents were more likely to report the inclusion of possible complications only.

The number of life care plans had a negative significant coefficient for possible SC, indicating that higher values for the number of plans were associated with lower values of the outcome variable. Thus, more completed life care plans for SCI increased the likelihood of reporting possible SC (in comparison to probable or possible/probable SC).

Finally, Phy-LCPs had a greater likelihood than LCPs to report possible SC as compared to the higher categories, as noted by the negative coefficient. However, Phy-LCPs also showed greater likelihood than LCPs of reporting possible/probable SC than the lower categories of the outcome variable. Taken together, these results indicate that LCPs were more likely to report the middle category (probable SC) than were Phy-LCPs. The percent of LCPs and Phy-LCPs reporting each level of the outcome are shown in the figure that follows, with values divided across certification status. The chart illustrates the greater likelihood of LCPs to report probable complications. It also indicates the greater likelihood of non-certified respondents to select possible complications, which was particularly notable for non-certified Phy-LCPs.

Table 36

PPOM for the association between demographic variables and item L8/P8: Including possible or probable costs when developing a life care plan

Model Statistics	Possible SC (1)	Probable SC (2)
Model coefficients b (se(b))		
Certified (1) or non-certified (0)	1.774 (.625)**	-.415 (.520)
Knowledge	.408 (.228)	
Num plans for SCI	-.537 (.208)*	-.028 (.135)
%Plaintiff	.005 (.170)	
Group: LCP (1) or Phy-LCP (2)	-1.999 (.816)*	1.311 (.490)**
Model Summary		
LR $\chi 2$ (df = 8)	36.17	
p	< .001***	
Pseudo R^2	.141	
Wald test of PL p	.167	
N	137	

*Note.*SC = secondary complications. PL assumption not met for Certified, Num plans for SCI, or Group. Adjusted alpha for model significance = .05/8 = .006. **p*<.05, ***p*<.01, ****p*<.001.

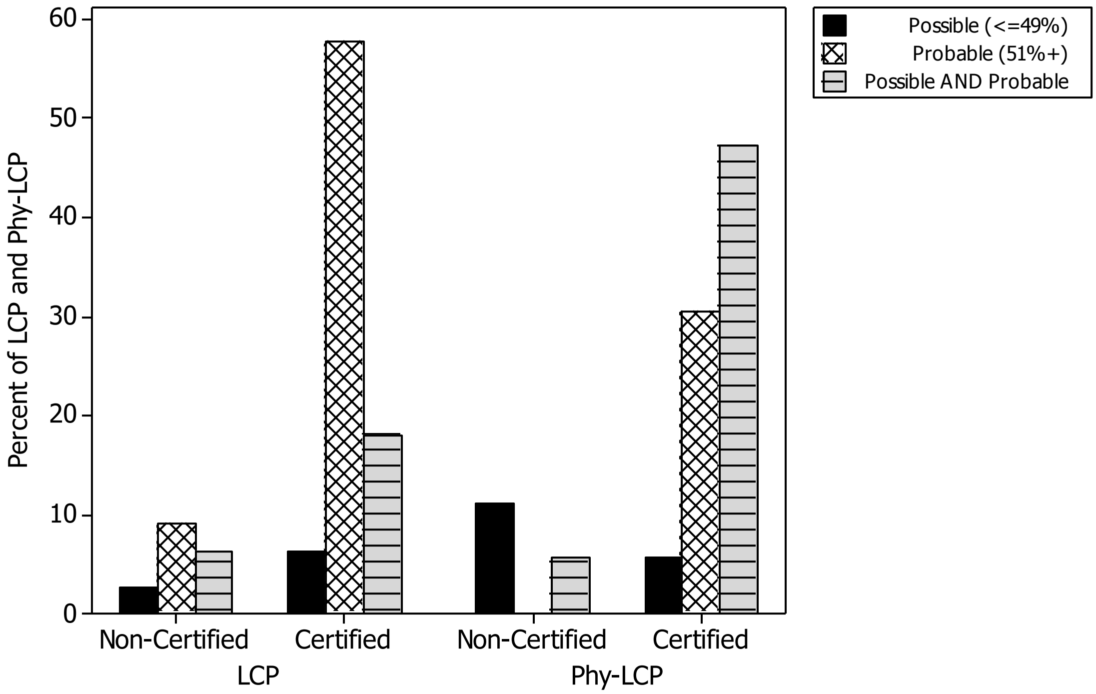


Figure 5. *Percent of LCP and Phy-LCP reporting the inclusion of possible, probable, or possible AND probable costs, according to certification status.*

A PPOM model was fit to the outcome item rating belief that life care plans should include costs even if they are only possible. Number of plans developed for SCI did not meet the parallel lines assumption. The model was not statistically significant at the adjusted alpha level. Phy-LCPs were more likely to report higher levels of agreement with this statement than were LCPs.

Table 37

PPOM for belief that life care plans should include costs for SC even if they are only ***possible***

Variable	Strongly Disagree	Disagree	Agree
Model coefficients b (se(b))			
Certified (1) or non-certified (0)		-.095 (.417)	
Knowledge		-.187 (.193)	
Numb plans for SCI	.028 (.131)	.050 (.114)	.388* (.155)
%Plaintiff		.233 (.143)	
Group: LCP (1) or Phy-LCP (2)		1.331** (.422)	
Model Summary			
LR χ2 (df = 7)	17.48		
p	.015*		
Pseudo R^2	.047		
Wald test of PL p	.199		
N	141		

*Note.*SC = secondary complications. PL assumption not met for Num plans for SCI. Adjusted alpha for model significance = .05/8 = .006. $^{*}p<.05$, $^{**}p<.01$, $^{***}p<.001$.

Multiple POM models were run to investigate the relationship between the demographic variables and the ratings regarding inclusion of possible vs. probable costs. The only model that reached statistical significance was for item L15, asking LCPs to rate agreement with the statement "I believe the field of life care planning would benefit from empirical validation regarding whether to include possible complications versus probable complications to allow for consistency among the field" (p = .005). Certified respondents were more likely to show higher agreement with the statement than non-certified respondents. Furthermore, knowledge of SC had a significant negative coefficient (-.664), indicating that those with higher knowledge were more likely to report *less* agreement.

Table 38

Results of multiple POM investigating the association between demographic variables and ratings of costs included in life care plans (all explanatory variables met the PL assumption)

	LCP and Phy-LCP Include costs only if deemed probable (51%) by:				LCP Only	
Model Statistics	Empirical Statistics	Physician	Empirical Stats **AND** Physician	Empirical Stats **OR** Physician	Always consult physician	Empirical validation possible v. probable
Model coefficients b (se(b))						
Certified (1) or non-certified (0)	.001 (.406)	.056 (.411)	.342 (.419)	.896* (.443)	-.337 (.478)	1.160* (.505)
Knowledge	.035 (.192)	-.201 (.194)	-.048 (.197)	-.224 (.202)	-.343 (.217)	-.664** (.230)
Num plans for SCI	.139 (.102)	.102 (.105)	.335 (.112)	.026 (.108)	.132 (.117)	.156 (.122)
%Plaintiff	-.091 (.144)	.160 (.144)	-.086 (.144)	-.041 (.148)	-.062 (.184)	-.324 (.195)
Group: LCP (1) or Phy-LCP (2)	-.587 (.411)	-.352 (.410)	.450 (.416)	-.519 (.417)	---	---
Model Summary						
LR $\chi 2$	5.84	6.26	10.75	8.78	3.39	14.88
df	5	5	5	5	4	4
p	.322	.282	.057	.118	.495	**.005****
Pseudo R^2	.016	.018	.031	.026	.014	.067
p for Wald test of PL	.623	.498	.729	.521	.256	.335
N	142	142	138	139	106	106

Note. Adjusted alpha for model significance = .05/8 = .006.; Num = Number

**p*<.05, ***p*<.01, ****p*<.001.

Research Question 2 Results

RQ 2: Are ratings of the likelihood of 13 secondary complications a function of demographics or type of practitioner?

<u>Summary of Methods</u>

Table 39

List of variables, coding/measurement levels, and methods for RQ2

Survey #	List of Variables	Coding / Measurement	Statistical Method
Explanatory Variables			
L3/P3	Certified or non-certified	Dichotomous; Non-certified = 0, Certified = 1	
L7/P17	Knowledge of SCs related to SCI	Ordinal 1-5; (1 = Poor, 5 = Excellent)	
(coded)	Group LCP, Phy-LCP, or Phy-Non-LCP	Categorical; LCP = 1, Phy-LCP = 2, Phy-Non-LCP = 3	
Outcome Variables			
L16/P20A–L16/P20M	Likelihood of secondary complications for scenario 1 (total = 13)	Ordinal 1-5; (1 = 0%, 5 = 76-100%)	POM/PPOM
L18/P22A-L18/P22M	Likelihood of secondary complications for scenario 2 (total = 13)	Ordinal 1-5; (1 = 0%, 5 = 76-100%)	POM/PPOM

Note. Survey # prefix L or P refers to the item on the LCP survey (L) or the physiatrist survey (P). LCP = life care planner, Phy-LCP = Physiatrist life care planner, Phy-Non-LCP = Physiatrist non-life care planner, PPOM = partial proportional odds model, POM = proportional odds model (i.e., all explanatory variables met parallel lines assumption). Adjusted alpha for model significance for each scenario = .05/13 = .004.

These analyses were conducted using the `gogolit2` program in STATA with the `autofit` option. The responses to the dependent variables were all ordinal and was coded as follows: 1 = 0%, 2 = 1-25%, 3 = 26-50%, 4 = 51-75%, and 5 = 76-100%. Certification was coded as 0 = non-certified and 1 = certified. Knowledge of secondary complications was an ordinal variable with 5 levels (1 = poor, 5 = excellent). Finally, group was coded 1 = LCP, 2 = Phy-LCP, and 3 = Phy-Non-LCP. Statistically significant results of group were followed up with factor specifications (Phy-Non-LCP as reference) to determine if any differences existed. A Bonferroni corrected alpha level of .004 (.05/13) was used to determine model significance for each scenario.

The majority of the analyses for scenario 1 (S1) met the parallel lines assumption (PL) for all explanatory variables. Only S1K (urinary tract infection) failed to meet the assumption (for group) and thus, the results for this item are presented in a separate table by levels of the outcome variable. Two models had statistically significant results using the adjusted alpha level of .004; S1A (skin breakdown requiring surgery; p = .004) and S1D (heterotopic ossification; p < .001). S1F (deep vein thrombosis) also approached significance with a p value of .006. In all cases, group was the statistically significant explanatory variable driving the model. Group coefficients indicated that LCPs had significantly greater likelihood of higher ratings than either Phy-LCP or Phy-non-LCPs. The two physiatrist subgroups did not differ significantly from one another in any of the comparisons.

The results are shown separately by response category for S1K: UTI due to violation of the parallel lines assumption for group ($p = .004$). Overall, the model was statistically significant ($p < .001$). Knowledge of secondary complications was a statistically significant and positive predictor. Thus, higher knowledge levels were associated with higher ratings of UTI frequency.

Group was a significant (negative) predictor only within the response category of 26-50%. Non-LCP physiatrists were more likely to report frequencies of 26-50% or less than the other two groups.

Table 40

*Descriptive statistics for **LCP Scenario 1**: Likelihood of secondary complications*

	M (SD)	Mode	0% n (%)	1-25% n (%)	26-50% n (%)	51-75% n (%)	76-100% n (%)	0-50% n (%)	51-100% n (%)	Total
SB-Sx	2.83 (.999)	1-25%	5 (4.5)	46 (41.4)	28 (25.2)	27 (24.3)	5 (4.5)	79 (71.2)	32 (28.8)	111
SBHWC	3.52 (1.14)	51-75%	3 (2.7)	24 (21.6)	21 (18.9)	38 (34.2)	25 (22.5)	48 (43.2)	63 (56.8)	111
PNA	3.18 (1.05)	51-75%	3 (2.7)	33 (30.0)	25 (22.7)	39 (35.5)	10 (9.1)	61 (55.5)	49 (44.5)	110
HO	2.83 (.961)	1-25%	3 (2.8)	48 (44.0)	27 (24.8)	27 (24.8)	4 (3.7)	78 (71.6)	31 (28.4)	109
AD	3.41 (1.11)	51-75%	5 (4.5)	21 (19.1)	26 (23.6)	40 (36.4)	18 (16.4)	52 (47.3)	58 (52.7)	110
DVT	2.75 (.898)	1-25%	4 (3.7)	45 (41.7)	36 (33.3)	20 (18.5)	3 (2.8)	85 (78.7)	23 (21.3)	108
CVD	3.12 (.926)	26-50%	3 (2.7)	22 (20.0)	54 (49.1)	21 (19.1)	1 (9.1)	79 (71.8)	31 (28.2)	110
SMI	2.25 (.685)	1-25%	8 (7.4)	72 (66.7)	21 (19.4)	7 (6.5)	N/A	101 (93.5)	7 (6.5)	108
NP	3.40 (1.04)	51-75%	3 (2.7)	20 (18.2)	34 (30.9)	36 (32.7)	17 (15.5)	57 (51.8)	53 (48.2)	110
RD	3.42 (1.05)	51-75%	1 (.9)	25 (23.1)	28 (25.9)	36 (33.3)	18 (16.7)	54 (50.0)	54 (50.0)	108
UTI	4.13 (1.00)	76-100%	1 (.8)	10 (9.2)	12 (11.0)	37 (33.9)	49 (45.0)	23 (21.1)	86 (78.9)	109
OP/Fx	3.49 (1.07)	51-75%	2 (1.8)	23 (20.9)	24 (21.8)	41 (37.3)	20 (18.2)	49 (44.5)	61 (55.5)	110
RMI	3.07 (1.19)	1-25%	8 (7.3)	35 (31.8)	23 (20.9)	29 (26.4)	15 (13.6)	66 (60.0)	44 (40.0)	110

Note. Note. SB-Sx = skin breakdown requiring surgery, SBHWC = skin breakdown requiring home wound care, PNA = pneumonia (atelectasis, and/or aspiration), HO = heterotopic ossification, AD = autonomic dysreflexia, DVT = deep vein thrombosis, CVD = cardiovascular disease, SMI = syringomyelia, NP = neuropathic pain, RD = respiratory dysfunction, UTI = urinary tract infections, OP/Fx = osteoporosis/bone fractures, RMI = repetitive motion injury/overuse syndrome.

Table 41

*Descriptive statistics for **Phy-LCP Scenario 1**: Likelihood of secondary complications*

			0%	1-25%	26-50%	51-75%	76-100%	0-50%	51-100%	
	M (SD)	Mode	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	Total
SB-Sx	2.15 (.744)	1-25%	5 (14.7)	21 (61.8)	6 (17.6)	2 (5.9)	N/A	32 (94.1)	2 (5.9)	34
SBHWC	3.24 (1.10)	51-75%	3 (8.8)	5 (14.7)	10 (29.4)	13 (38.2)	3 (8.8)	18 (52.9)	16 (47.1)	34
PNA	2.97 (1.05)	1-25%	1 (2.9)	13 (38.2)	9 (26.5)	8 (23.5)	3 (8.8)	23 (67.6)	11 (32.4)	34
HO	2.21 (.729)	1-25%	3 (8.8)	24 (70.6)	4 (11.8)	3 (8.8)	N/A	31 (91.2)	3 (8.8)	34
AD	3.38 (1.05)	26-50%	N/A	8 (23.5)	11 (32.4)	9 (26.5)	6 (17.6)	19 (55.9)	15 (44.1)	34
DVT	2.47 (.706)	1-25%	1 (2.9)	19 (55.9)	11 (32.4)	3 (8.8)	N/A	31 (91.2)	3 (8.8)	34
CVD	3.50 (.929)	26-75%	N/A	5 (14.7)	12 (35.3)	12 (35.3)	5 (14.7)	17 (50)	17 (50)	34
SMI	2.15 (.500)	1-25%	1 (2.9)	28 (82.4)	4 (11.8)	1 (2.9)	N/A	33 (97.1)	1 (2.9)	34
NP	3.59 (.857)	26-75%	N/A	3 (8.8)	13 (38.2)	13 (38.2)	5 (14.7)	16 (47.1)	18 (52.9)	34
RD	3.65 (1.13)	76-100%	N/A	7 (20.6)	8 (23.5)	9 (26.5)	10 (29.4)	15 (44.1)	19 (55.9)	34
UTI	4.29 (.836)	76-100%	N/A	1 (2.9)	5 (14.7)	11 (32.4)	17 (50.0)	6 (17.6)	28 (82.4)	34
OP/Fx	3.24 (.890)	51-75%	N/A	9 (26.5)	9 (26.5)	15 (44.1)	1 (2.9)	18 (52.9)	16 (47.1)	34
RMI	3.79 (.880)	51-75%	N/A	2 (5.9)	11 (32.4)	13 (38.2)	8 (23.5)	13 (38.2)	21 (61.8)	34

Note. SB-Sx = skin breakdown requiring surgery, SBHWC = skin breakdown requiring home wound care, PNA = pneumonia (atelectasis, and/or aspiration), HO = heterotopic ossification, AD = autonomic dysreflexia, DVT = deep vein thrombosis, CVD = cardiovascular disease, SMI = syringomyelia, NP = neuropathic pain, RD = respiratory dysfunction, UTI = urinary tract infections, OP/Fx = osteoporosis/bone fractures, RMI = repetitive motion injury/overuse syndrome, N/A = not applicable/not reported

Table 42

*Descriptive statistics for **Phy-Non-LCP Scenario 1**: Likelihood of secondary complications*

	M (SD)	Mode	0% n (%)	1-25% n (%)	26-50% n (%)	51-75% n (%)	76-100% n (%)	0-50% n (%)	51-100% n (%)	Total
SB-Sx	2.37 (.760)	1-25%	2 (3.7)	36 (66.7)	11 (20.4)	4 (7.4)	1 (1.9)	49 (90.7)	5 (9.3)	54
SBHWC	3.15 (1.10)	51-75%	N/A	18 (34.0)	17 (32.1)	10 (18.9)	8 (15.1)	35 (66.0)	18 (34.0)	53
PNA	2.96 (1.05)	1-25%	N/A	23 (44.2)	14 (26.9)	9 (17.3)	6 (11.5)	37 (71.2)	15 (28.8)	52
HO	2.22 (.502)	1-25%	1 (1.9)	41 (75.9)	11 (20.4)	1 (1.9)	N/A	53 (98.1)	1 (1.9)	54
AD	3.32 (1.05)	26-50%	N/A	14 (26.4)	17 (32.1)	13 (24.5)	9 (17.0)	31 (58.5)	22 (41.5)	53
DVT	2.34 (.618)	1-25%	1 (1.9)	36 (67.9)	13 (24.5)	3 (5.7)	N/A	50 (94.3)	3 (5.7)	53
CVD	3.06 (1.03)	26-75%	N/A	20 (37.7)	16 (30.2)	11 (20.8)	6 (11.3)	36 (67.9)	17 (32.1)	53
SMI	2.13 (.520)	1-25%	2 (3.8)	44 (83.0)	5 (9.4)	2 (3.8)	N/A	51 (96.2)	2 (3.8)	53
NP	3.47 (1.05)	51-75%	N/A	12 (22.6)	14 (26.4)	17 (32.1)	10 (18.9)	26 (49.1)	27 (50.9)	53
RD	3.23 (1.15)	1-25%	1 (1.9)	17 (32.1)	14 (26.4)	11 (20.8)	10 (18.9)	32 (60.4)	21 (39.6)	53
UTI	3.96 (1.14)	76-100%	N/A	7 (13.2)	14 (26.4)	6 (11.3)	26 (49.1)	21 (39.6)	32 (60.4)	53
OP/Fx	3.58 (1.08)	26-50%	N/A	10 (18.9)	16 (30.2)	13 (24.5)	14 (26.4)	26 (49.1)	27 (50.9)	53
RMI	3.26 (1.16)	26-50%	2 (3.8)	13 (24.5)	18 (34.0)	9 (17.0)	11 (20.8)	33 (62.3)	20 (37.7)	53

Note. SB-Sx = skin breakdown requiring surgery, SBHWC = skin breakdown requiring home wound care, PNA = pneumonia (atelectasis, and/or aspiration), HO = heterotopic ossification, AD = autonomic dysreflexia, DVT = deep vein thrombosis, CVD = cardiovascular disease, SMI = syringomyelia, NP = neuropathic pain, RD = respiratory dysfunction, UTI = urinary tract infections, OP/Fx = osteoporosis/bone fractures, RMI = repetitive motion injury/overuse syndrome, N/A = not applicable/not reported

Table 43

***Results of multiple POM** investigating the association between demographic variables and frequency ratings of secondary complications for **Scenario 1** (All explanatory variables meet the PL assumption)*

Model Statistics	S1A SB-Sx	S1B SB-HWC	S1C PNA	S1D HO	S1E AD	S1F DVT	S1G CVD	S1H SMI	S1I NP	S1J RD	S1K UTI[a]	S1L OP/Fx	S1M RMI
Model coefficients b (se(b))													
Certified	.415	.377	.487	.335	.602	.283	.215	.442	-.663	-.274	--	-.129	.031
	(.346)	(.331)	(.337)	(.358)	(.332)	(.358)	(.335)	(.424)	(.344)	(.333)		(.330)	(.332)
Knowledge	.028	-.025	.154	-.177	.107	-.240	.273	-.096	-.026	.302*	--	.158	.059
	(.149)	(.139)	(.144)	(.157)	(.146)	(.153)	(.144)	(.183)	(.145)	(.144)		(.142)	(.138)
Group	-.537**	-.337*	-.267	-.707***	-.135	-.482**	-.092	-.240	.070	-.172	--	-.004	.186
	(.163)	(.150)	(.153)	(.175)	(.150)	(.165)	(.155)	(.194)	(.152)	(.152)		(.151)	(.150)
Specific group coefficients [Phy-Non-LCP as reference]													
LCP	.961**	.658*		1.315***		.954**							
	(.328)	(.303)		(.354)		(.338)							
Phy-LCP	-.759	.186		-.219		.399							
	(.463)	(.403)		(.495)		(.374)							
Model Summary													
LR χ2 (df=3)	13.23	6.17	6.05	20.62	4.66	12.50	4.42	3.08	0.27	5.68	PPOM	1.36	1.83
p	**.004****	.104	.109	< **.001*****	.198	.006**	.219	.380	.965	.129	--	.716	.609
Pseudo R^2	.027	.011	.011	.047	.008	.028	.009	.010	.001	.010	--	.003	.003
p for Wald test of PL	.635	.717	.354	.092	.887	.841	.320	.109	.591	.477	--	.895	.081
N	197	196	194	195	195	193	195	193	195	193	--	195	195

Note. SB-Sx = skin breakdown requiring surgery, SB-HWC = skin breakdown requiring home wound care, PNA = pneumonia (atelectasis, and/or aspiration), HO = heterotopic ossification, AD = autonomic dysreflexia, DVT = deep vein thrombosis, CVD = cardiovascular disease, SMI = syringomyelia, NP = neuropathic pain, RD = respiratory dysfunction, UTI = urinary tract infections, OP/Fx = osteoporosis/bone fractures, RMI = repetitive motion injury/overuse syndrome. Certified coded 0 = non-certified and 1 = certified. Knowledge coded 1-5 (1 = poor, 5 = excellent). Group coded 1 = LCP, 2 = Phy-LCP, 3 = Phy-Non-LCP. Adjusted alpha for model significance = .05/13 = .004.

[a]PL assumption not met for group, thus a PPOM was used.

$^{*}p$<.05, $^{**}p$<.01, $^{***}p$<.001.

Table 44

PPOM for items not meeting the parallel limes assumption, ***Scenario 1***

Item	Variable	0%	1-25%	26-50%	51-75%
S1K: UTI		*Model coefficients b (se(b))*			
	Certified	.377 (.341)			
	Knowledge	.418** (.150)			
	Group	11.799	-.207	-.551**	.015
		(1302.416)	(.275)	(.193)	(.173)
	Model Summary				
	LR χ2	23.46 (df = 6)			
	p	**< .001******			
	Pseudo R^2	.049			
	Wald test of PL p	.691			
	N	194			

Note. UTI = urinary tract infections, Certified coded 0 = non-certified and 1 = certified. Knowledge coded 1-5 (1 = poor, 5 = excellent). Group coded 1 = LCP, 2 = Phy-LCP, 3 = Phy-Non-LCP. Adjusted alpha for model significance = .05/13 = .004. **p*<.05, ***p*<.01, ****p*<.001.

For scenario 2, analysis of seven of the 13 items did not converge. Two items did not meet the PL assumption for all explanatory variables and are presented separately according to outcome variable level using PPOM analyses.

The POM analyses for the remaining four items in scenario 2 were all statistically significant ($p < .001$ for each analysis). These included ratings of skin breakdown requiring home wound care (S2B), cardiovascular disease (S2G), respiratory dysfunction (S2J), and urinary tract infections (S2K). In each analysis, group was a statistically significant and negative predictor meaning that higher levels of group were associated with an increased likelihood of being in the lower outcome categories. In other words, LCPs (coded 1) were more likely to provide higher frequency ratings than either Phy-LCPs or Phy-Non-LCPs, who did not differ from one another.

The two items that did not meet the PL assumption were S2I (neuropathic pain) and S2L (osteoporosis/fractures). Both models were statistically significant ($p < .001$). Group was a statistically significant and negative predictor for the outcome categorizations of 0% through 26-50%. Thus, as seen with the results from the POM analyses, LCPs had greater likelihood of reporting the higher frequency categories than the physiatrist groups. The coefficients for 51-75% were unstable since there were no Phy-LCPs or Phy-Non-LCPs reporting frequencies of 76-100% on these items (the coefficient for 51-75% compares the cumulative percentage of the current and lower categories to the highest category).

Table 45

Descriptive statistics for ***LCP Scenario 2****: Likelihood of secondary complications*

			0%	1-25%	26-50%	51-75%	76-100%	0-50%	51-100%	
	M (SD)	Mode	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	Total
SB-Sx	2.34 (1.01)	1-25%	18 (17.5)	52 (50.5)	16 (15.5)	14 (13.6)	3 (2.9)	86 (83.5)	17 (16.5)	103
SBHWC	2.92 (1.09)	1-25%	6 (5.8)	37 (35.9)	29 (28.2)	21 (20.4)	10 (9.7)	72 (60.0)	31 (25.8)	103
PNA	2.32 (.992)	1-25%	18 (17.5)	51 (49.5)	21 (20.4)	9 (8.7)	4 (3.9)	90 (87.4)	13 (12.6)	103
HO	2.33 (.856)	1-25%	10 (9.7)	62 (60.2)	21 (20.4)	7 (6.8)	3 (2.9)	93 (90.3)	10 (9.7)	103
AD	2.23 (1.00)	1-25%	23 (22.3)	49 (47.6)	18 (17.5)	10 (9.7)	3 (2.9)	90 (87.4)	13 (12.6)	103
DVT	2.35 (.830)	1-25%	11 (10.9)	55 (54.5)	25 (24.8)	9 (8.9)	1 (1.0)	91 (90.1)	10 (9.9)	101
CVD	2.77 (1.06)	1-25%	8 (7.9)	38 (37.6)	32 (31.7)	15 (14.9)	8 (7.9)	78 (77.2)	23 (22.8)	101
SMI	1.97 (.780)	1-25%	22 (21.8)	67 (66.3)	8 (7.9)	1 (1.0)	3 (3.0)	97 (96.0)	4 (4.0)	101
NP	3.17 (1.10)	1-25%	3 (2.9)	32 (31.1)	25 (24.3)	30 (29.1)	13 (12.6)	60 (58.3)	43 (41.7)	103
RD	2.45 (1.04)	1-25%	15 (14.6)	50 (48.5)	19 (18.4)	15 (14.6)	4 (3.9)	84 (81.6)	19 (18.4)	103
UTI	3.57 (1.17)	51-75%	4 (3.9)	20 (19.4)	17 (16.5)	37 (35.9)	25 (24.3)	41 (39.8)	62 (60.2)	103
OP/Fx	2.97 (1.08)	1-25%	3 (2.9)	44 (42.7)	17 (16.5)	31 (30.1)	8 (7.8)	64 (62.1)	39 (37.9)	103
RMI	3.64 (1.18)	51-75%	5 (4.9)	15 (14.7)	20 (19.6)	34 (33.3)	28 (27.5)	40 (39.2)	62 (60.8)	102

Note. Note. SB-Sx = skin breakdown requiring surgery, SBHWC = skin breakdown requiring home wound care, PNA = pneumonia (atelectasis, and/or aspiration), HO = heterotopic ossification, AD = autonomic dysreflexia, DVT = deep vein thrombosis, CVD = cardiovascular disease, SMI = syringomyelia, NP = neuropathic pain, RD = respiratory dysfunction, UTI = urinary tract infections, OP/Fx = osteoporosis/bone fractures, RMI = repetitive motion injury/overuse syndrome.

Table 46

*Descriptive statistics for **Physiatrist-Non-LCP Scenario 2**: Likelihood of secondary complications*

	M (SD)	Mode	0% n (%)	1-25% n (%)	26-50% n (%)	51-75% n (%)	76-100% n (%)	0-50% n (%)	51-100% n (%)	Total
SB-Sx	1.41 (.599)	0%	35 (64.8)	16 (29.6)	3 (5.6)	N/A	N/A	54 (100)	N/A	54
SBHWC	1.81 (.878)	0%	24 (45.3)	17 (32.1)	10 (18.9)	2 (3.8)	N/A	51 (96.2)	2 (3.8)	53
PNA	1.33 (.583)	0%	39 (72.2)	12 (22.2)	3 (5.6)	N/A	N/A	54 (100)	N/A	54
HO	1.31 (.469)	0%	37 (68.5)	17 (31.5)	N/A	N/A	N/A	54 (100)	N/A	54
AD	1.31 (.543)	0%	39 (72.2)	13 (24.1)	2 (3.7)	N/A	N/A	54 (100)	N/A	54
DVT	1.48 (.637)	0%	32 (59.3)	18 (33.3)	4 (7.4)	N/A	N/A	54 (100)	N/A	54
CVD	2.06 (1.04)	0%	21 (38.9)	15 (27.8)	12 (22.2)	6 (11.1)	N/A	48 (88.9)	6 (11.1)	54
SMI	1.15 (.411)	0%	46 (86.8)	6 (11.3)	1 (1.9)	N/A	N/A	53 (100)	N/A	53
NP	2.32 (1.02)	26-50%	14 (26.4)	15 (28.3)	17 (32.1)	7 (13.2)	N/A	46 (86.8)	7(13.2)	53
RD	1.34 (.586)	0%	38 (71.7)	12 (22.6)	3 (5.7)	N/A	N/A	53 (100)	N/A	53
UTI	2.71 (1.09)	51-75%	9 (17.3)	13 (25.0)	14 (26.9)	16 (30.8)	N/A	36 (69.2)	16 (30.8)	52
OP/Fx	2.13 (.971)	1-25%	15 (28.8)	21 (40.4)	10 (19.2)	6 (11.5)	N/A	46 (88.5)	6 (11.5)	52
RMI	2.81 (.982)	1-75%	5 (9.4)	16 (30.2)	16 (30.2)	16 (30.2)	N/A	37 (69.8)	16 (30.2)	53

Note. SB-Sx = skin breakdown requiring surgery, SBHWC = skin breakdown requiring home wound care, PNA = pneumonia (atelectasis, and/or aspiration), HO = heterotopic ossification, AD = autonomic dysreflexia, DVT = deep vein thrombosis, CVD = cardiovascular disease, SMI = syringomyelia, NP = neuropathic pain, RD = respiratory dysfunction, UTI = urinary tract infections, OP/Fx = osteoporosis/bone fractures, RMI = repetitive motion injury/overuse syndrome, N/A = not applicable/not reported

Table 47

*Descriptive statistics for **Phy-LCP Scenario 2**: Likelihood of secondary complications*

	M (SD)	Mode	0% n (%)	1-25% n (%)	26-50% n (%)	51-75% n (%)	76-100% n (%)	0-50% n (%)	51-100% n (%)	Total
SB-Sx	1.47 (.718)	0%	21 (65.6)	7 (21.9)	4 (12.5)	N/A	N/A	32 (100)	N/A	32
SBHWC	2.06 (1.08)	0%	13 (40.6)	8 (25.0)	7 (21.9)	4 (12.5)	N/A	28 (87.5)	4 (12.5)	32
PNA	1.38 (.660)	0%	23 (71.9)	6 (18.8)	3 (9.4)	N/A	N/A	32 (100)	N/A	32
HO	1.44 (.619)	0%	20 (62.5)	10 (31.3)	2 (6.3)	N/A	N/A	32 (100)	N/A	32
AD	1.38 (.554)	0%	21 (65.6)	10 (31.3)	1 (3.1)	N/A	N/A	32 (100)	N/A	32
DVT	1.44 (.564)	0%	19 (59.4)	12 (37.5)	1 (3.1)	N/A	N/A	32 (100)	N/A	32
CVD	2.34 (1.0)	26-50%	8 (25.0)	9 (28.1)	11 (34.4)	4 (12.5)	N/A	28 (87.5)	4 (12.5)	32
SMI	1.22 (.491)	0%	26 (81.3)	5 (15.6)	1 (3.1)	N/A	N/A	32 (100)	N/A	32
NP	2.22 (.906)	1-25%	6 (18.8)	17 (53.1)	5 (15.6)	4 (12.5)	N/A	28 (87.5)	4 (12.5)	32
RD	1.56 (.878)	0%	20 (62.5)	8 (25.0)	2 (6.3)	2 (6.3)	N/A	30 (93.8)	2 (6.3)	32
UTI	3.06 (1.01)	51-75%	2 (6.3)	8 (25.0)	9 (28.1)	12 (37.5)	1 (3.1)	19 (59.4)	13 (40.6)	32
OP/Fx	2.19 (.859)	1-25%	7 (21.9)	14 (43.8)	9 (28.1)	2 (6.3)	N/A	30 (93.8)	2 (6.3)	32
RMI	2.91 (1.06)	26-50%	5 (15.6)	4 (12.5)	12 (37.5)	11 (34.4)	N/A	21 (65.6)	11 (34.4)	32

Note. SB-Sx = skin breakdown requiring surgery, SBHWC = skin breakdown requiring home wound care, PNA = pneumonia (atelectasis, and/or aspiration), HO = heterotopic ossification, AD = autonomic dysreflexia, DVT = deep vein thrombosis, CVD = cardiovascular disease, SMI = syringomyelia, NP = neuropathic pain, RD = respiratory dysfunction, UTI = urinary tract infections, OP/Fx = osteoporosis/bone fractures, RMI = repetitive motion injury/overuse syndrome, N/A = not applicable/not reported

Table 48

Results of multiple POM *investigating the association between demographic variables and frequency ratings of secondary complications for* ***Scenario 2*** *(All explanatory variables meet the PL assumption)*

Model Statistics	S2A SB-Sx	S2B SB-HWC	S2C PNA	S2D HO	S2E AD	S2F DVT	S2G CVD	S2H SMI	S2I NP	S2J RD	S2K UTI	S2L OP/Fx	S2M RMI
Model coefficients b (se(b))													
Certified		.247					.175			.065	.545		
		(.342)					(.324)			(.361)	(.353)		
Knowledge		.215					.230			.116	.341*		
		(.147)					(.146)			(.157)	(.149)		
Group		-1.011***					-.666***			-1.349***	-.735***		
		(.168)					(.162)			(.196)	(.159)		
Specific group coefficients [Phy-Non-LCP as reference]													
LCP		1.964***					1.311***			2.600***	1.439***		
		(.340)					(.320)			(.388)	(.322)		
Phy-LCP		.228					.460			.447	.233		
		(.426)					(.418)			(.476)	(.417)		
Model Summary													
LR χ2 (df=3)	DNC	41.06	DNC	DNC	DNC	DNC	19.01	DNC	PPOM	58.88	27.65	PPOM	DNC
p		< .001***					< .001***			< .001***	< .001***		
Pseudo R^2		.074					.035			.121	.049		
p for Wald test of PL		.316					.136			.828	.326		
N		187					186			187	186		

Note. SB-Sx = skin breakdown requiring surgery, SB-HWC = skin breakdown requiring home wound care, PNA = pneumonia (atelectasis, and/or aspiration), HO = heterotopic ossification, AD = autonomic dysreflexia, DVT = deep vein thrombosis, CVD = cardiovascular disease, SMI = syringomyelia, NP = neuropathic pain, RD = respiratory dysfunction, UTI = urinary tract infections, OP/Fx = osteoporosis/bone fractures, RMI = repetitive motion injury/overuse syndrome. Certified coded 0 = non-certified and 1 = certified. Knowledge coded 1-5 (1 = poor, 5 = excellent). Group coded 1 = LCP, 2 = Phy-LCP, 3 = Phy-Non-LCP. Adjusted alpha for model significance = .05/13 = .004.

[a]PL assumption not met for group.

$^{*}p$<.05, $^{**}p$<.01, $^{***}p$<.001.

Table 49

PPOM for items not meeting the parallel lines assumption, ***Scenario 2***

		76-100% compared to:			
Item	Variable	0%	1-25%	26-50%	51-75%
S2I: NP		*Model coefficients b (se(b))*			
	Certified	.201 (.332)			
	Knowledge	-.025 (.150)			
	Group	-1.207*** (.297)	-.478** (.172)	-.808*** (.221)	-13.501 (551.592)
		Model Summary			
	LR χ2	37.40			
	p	< .001***			
	Pseudo R^2	.067			
	Wald test of PL p	.150			
	N	187			
S2L: Os/Fx		*Model coefficients b (se(b))*			
	Certified	.742 (.351)*			
	Knowledge	1.000 (.151)			
	Group	-1.201*** (.279)	-.554** (.183)	-1.013*** (.266)	-12.535 (769.591)
		Model Summary			
	LR χ2	41.19 (6)			
	p	< .001***			
	Pseudo R^2	.079			
	Wald test of PL p	.398			
	N	186			

Note. NP = neuropathic pain, Os/Fx = Osteoporosis, fractures. Certified coded 0 = non-certified and 1 = certified. Knowledge coded 1-5 (1 = poor, 5 = excellent). Group coded 1 = LCP, 2 = Phy-LCP, 3 = Phy-Non-LCP. Adjusted alpha for model significance = .05/13 = .004. $^{*}p$<.05, $^{**}p$<.01, $^{***}p$<.001.

Research Question 3 Results

RQ 3: Are ratings of the frequency of 13 secondary complications requiring hospitalization/treatment a function of demographics or type of practitioner?

<u>Summary of Methods</u>

Table 50

List of variables, coding/measurement levels, and methods for RQ3

Survey #	List of Variables	Coding / Measurement	Statistical Method	Optimal Scaling Level
Explanatory Variables				
L3/P3	Certified or non-certified	Dichotomous; Non-certified = 0, Certified = 1		Nominal
L7/P17	Knowledge of SCs related to SCI	Ordinal 1-5; (1 = Poor, 5 = Excellent)		Ordinal
(coded)	Group LCP, Phy-LCP, or Phy-Non-LCP	Categorical; LCP = 1, Phy-LCP = 2, Phy-Non-LCP = 3		Nominal
Outcome Variables				
L17/P21A–L17/P21M	Frequency of secondary complication for scenario 1 (total = 13)	Count (integer) 0-25	CATREG	Ordinal
L19/P23A-L19/P23M	Likelihood of secondary complications for scenario 2 (total = 13)	Count (integer) 0-25	CATREG	Ordinal

Note. Survey # prefix L or P refers to the item on the LCP survey (L) or the physiatrist survey (P). LCP = life care planner, Phy-LCP = Physiatrist life care planner, Phy-Non-LCP = Physiatrist non-life care planner, Catreg = categorical regression with optimal scaling. Adjusted alpha for model significance for each scenario = .05/13 = .004.

For each of the two scenarios, respondents were asked to report the frequency of which each of the secondary complications would require hospitalization and/or treatment in one's lifetime. Response options could be any integer between 0 and 25+. As mentioned in the section on preliminary analyses, the distributions of responses to these items were decidedly non-normal. Preliminary analyses using linear regression provided unsatisfactory results. Inspection of residual and casewise diagnostics indicated frequent violation of assumptions and many cases with large residuals. Therefore, the alternative method of categorical regression (CATREG) with optimal scaling was selected to analyze these data. This procedure quantifies categorical data by assigning numeric values to produce an optimal linear regression equation for the transformed variables. Bonferroni correction of the alpha level was conducted for each scenario, resulting in an adjusted alpha level of .004 (.05/13) for model significance.

Results

Analyses were conducted on each item separately. The standardized regression coefficients for each explanatory variable, the overall model summary, the number of quantifications for each variable, and the specific values of quantifications obtained for any significant predictors are reported in the tables.

Initially, it can be observed that the number of quantifications for the outcome variables ranged between 2 and 5 indicating that an ordinal scaling level was optimal for these data. Should the quantifications have been more numerous and corresponded to a roughly straight line, then a numerical transformation would have been more appropriate. The fact that few quantifications were obtained indicated that the distinction amongst many of the values was unnecessary and that the categories could be combined.

For scenario 1, only the frequency of neuropathic pain (S1I) reached statistical significance at the adjusted alpha level (p = .002). Both knowledge and group were statistically significant, negative predictors of pain frequency responses. As revealed by the quantification values, respondents who reported their knowledge of SC to be poor through very good reported higher frequencies of secondary complications than those who reported excellent knowledge of SC. As seen by the group quantifications, Phy-LCPs reported the highest frequency of neuropathic pain, followed by Phy-Non-LCPs, and LCPs reported the lowest frequencies.

For Scenario 2, only the model predicting ratings of frequency of urinary tract infections was statistically significant (p = .003). Knowledge was a statistically significant and positive predictor. As indicated by the quantifications for knowledge, frequencies essentially increased for each successive step in reported knowledge (although those reporting fair and good knowledge received the same quantification).

Table 51

*Descriptive statistics for **LCP Scenario 1:** Frequency of secondary complications*

				n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
	M (SD)	Md	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
SB-S	4.4 (6.6)	0	25	17	16	3	7	10	1	0	0	0	5	0	0	2	0	2	0	0	0	0	1	0	0	0	1	5
SB-H	9.5 (7.8)	10	6	3	7	9	4	16	3	1	1	0	20	0	3	0	0	5	0	0	0	0	5	0	0	0	1	12
PNA	7.8 (7.8)	5	6	9	11	10	9	13	3	1	0	0	13	0	0	0	0	2	0	0	0	0	1	0	0	0	1	25
HO	5.2 (7.0)	1	18	23	12	6	0	8	1	0	2	0	8	0	0	1	0	5	0	0	0	0	2	0	1	0	0	5
AD	10.4 (9.1)	25	10	6	5	9	5	13	1	1	0	0	7	0	2	0	0	8	0	1	0	0	9	0	0	0	0	17
DVT	5.5 (6.7)	2	10	19	20	6	3	12	0	0	1	0	9	0	0	0	0	5	0	0	0	0	3	0	0	0	0	5
CVD	8.3 (9.0)	1	8	16	15	4	2	12	2	0	0	0	10	0	0	0	0	4	0	1	0	0	1	0	0	0	1	16
SMI	3.3 (5.2)	0	31	27	3	4	1	8	0	1	2	0	9	1	0	0	0	0	1	0	0	0	1	0	0	0	0	2
NP	9.5 (9.5)	1	7	15	8	7	2	13	2	0	0	0	5	0	2	0	0	6	0	0	0	0	7	0	0	0	0	17
RD	9.7 (8.4)	10	6	3	11	6	6	13	4	1	2	0	16	0	0	0	0	2	0	0	1	0	6	0	3	0	0	13
UTI	15.9 (8.6)	25	2	0	1	5	2	8	3	0	5	2	11	1	2	0	0	4	0	1	1	1	11	0	0	0	0	37
OP/F	8.4 (8.9)	5	7	13	13	9	3	14	1	0	0	0	6	2	0	0	0	3	1	0	1	0	3	0	1	1	0	14
RMI	7.4 (8.6)	0	22	12	8	5	2	6	3	1	0	0	13	0	1	0	0	4	0	0	1	0	2	0	0	1	1	11

Note. Md = Mode; SB-S = skin breakdown requiring surgery, SB-H = skin breakdown requiring home wound care, PNA = pneumonia (atelectasis, and/or aspiration), HO = heterotopic ossification, AD = autonomic dysreflexia, DVT = deep vein thrombosis, CVD = cardiovascular disease, SMI = syringomyelia, NP = neuropathic pain, RD = respiratory dysfunction, UTI = urinary tract infections, OP/Fx = osteoporosis/bone fractures, RMI = repetitive motion injury/overuse syndrome.

Table 52

Descriptive statistics for ***Physiatrist-Non-LCP Scenario 1****:Frequency of secondary complications*

				n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
	M (SD)	Md	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
SB-S	2.9 (3.9)	1	3	23	7	3	2	5	1	0	0	0	3	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0
SB-H	6.9 (7.2)	3	1	3	4	12	5	8	0	0	1	2	5	0	0	0	0	0	0	0	0	0	1	0	0	0	0	5
PNA	7.3 (7.4)	2	0	4	9	7	4	5	0	3	1	0	5	0	0	0	0	2	0	0	0	0	1	0	0	1	1	4
HO	2.7 (4.0)	1	6	16	10	5	1	5	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
AD	10.5 (9.6)	25	2	4	2	3	3	5	2	1	2	0	6	0	0	0	0	2	0	0	0	0	0	0	0	0	1	13
DVT	3.0 (3.5)	1	3	16	9	5	4	4	0	1	0	0	3	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
CVD	5.9 (7.8)	1	5	14	5	4	0	5	0	1	0	1	5	0	0	0	0	0	0	0	0	0	1	0	0	0	0	5
SMI	3.0 (5.8)	1	11	20	3	5	0	2	1	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2
NP	10.8 (9.8)	25	4	9	3	0	1	2	1	7	2	0	6	0	0	0	0	1	0	0	0	0	3	0	0	0	0	11
RD	8.2 (7.7)	2	0	7	3	4	4	1	0	1	2	1	7	0	1	0	0	1	0	0	1	0	2	0	0	0	0	5
UTI	15.9 (8.7)	25	1	2	0	0	2	4	2	0	1	2	4	0	0	0	0	6	0	0	0	0	4	0	0	0	0	18
OP/F	5.9 (7.5)	1	0	14	8	5	2	8	0	0	0	0	1	0	0	1	0	1	1	0	0	0	0	0	0	0	1	4
RMI	6.2 (6.7)	2	6	4	8	2	2	7	1	2	1	0	17	0	0	0	0	0	1	0	0	0	1	0	0	0	0	3

Note. Md = Mode; SB-S = skin breakdown requiring surgery, SB-H = skin breakdown requiring home wound care, PNA = pneumonia (atelectasis, and/or aspiration), HO = heterotopic ossification, AD = autonomic dysreflexia, DVT = deep vein thrombosis, CVD = cardiovascular disease, SMI = syringomyelia, NP = neuropathic pain, RD = respiratory dysfunction, UTI = urinary tract infections, OP/Fx = osteoporosis/bone fractures, RMI = repetitive motion injury/overuse syndrome.

Table 53

*Descriptive statistics for **Physiatrist LCP Scenario 1**: Frequency of secondary complications*

	M (SD)	Md	**0**	n **1**	n **2**	n **3**	n **4**	n **5**	n **6**	n **7**	n **8**	n **9**	n **10**	n **11**	n **12**	n **13**	n **14**	n **15**	n **16**	n **17**	n **18**	n **19**	n **20**	n **21**	n **22**	n **23**	n **24**	n **25**
SB-S	4.6 (6.9)	0	8	4	7	3	0	2	0	0	0	0	2	0	0	0	0	0	0	1	0	0	2	0	0	0	0	1
SB-H	9.7 (7.8)	10	1	1	2	3	1	6	1	0	0	0	8	0	1	0	0	2	0	0	0	0	0	0	0	0	0	5
PNA	8.8 (6.8)	5	1	2	1	1	2	9	0	1	0	1	5	0	2	0	1	1	0	1	0	0	2	0	0	0	0	2
HO	4.8 (5.9)	1	4	7	4	5	0	4	0	0	0	0	1	0	0	0	1	2	0	0	0	0	2	0	0	0	0	0
AD	11.3 (8.9)	5	1	2	1	3	0	7	0	0	0	0	4	0	1	0	0	2	0	0	0	0	3	0	0	0	0	6
DVT	4.14 (4.8)	1	3	7	6	2	1	4	1	0	0	1	2	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0
CVD	9.8 (9.13)	1	1	5	3	1	0	4	1	0	0	0	4	0	0	1	1	0	0	0	0	1	0	0	1	0	0	5
SMI	1.7 (2.3)	0	13	5	3	2	3	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NP	11.7 (10.2)	25	2	5	2	0	0	3	2	1	0	0	3	0	1	0	0	1	0	0	0	0	0	0	0	0	0	10
RD	11.7 (9.3)	25	1	4	0	0	2	5	1	1	0	2	2	0	2	0	0	1	0	0	0	0	2	1	0	0	0	7
UTI	18.6 (7.8)	25	0	0	0	0	0	2	2	1	0	0	2	0	2	0	0	1	0	0	0	0	4	0	0	0	1	14
OP/F	6.5 (8.47)	2	4	4	5	3	3	4	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	1	0	3
RMI	9.1 (8.7)	3	4	3	1	5	0	3	0	0	0	0	4	0	0	1	0	2	1	0	0	0	2	0	0	0	0	4

Note. Md = Mode; SB-S = skin breakdown requiring surgery, SB-H = skin breakdown requiring home wound care, PNA = pneumonia (atelectasis, and/or aspiration), HO = heterotopic ossification, AD = autonomic dysreflexia, DVT = deep vein thrombosis, CVD = cardiovascular disease, SMI = syringomyelia, NP = neuropathic pain, RD = respiratory dysfunction, UTI = urinary tract infections, OP/F = osteoporosis/bone fractures, RMI = repetitive motion injury/overuse syndrome.

Table 54

*Descriptive statistics for **LCP Scenario 2**: Frequency of secondary complications*

	M (SD)	Md	**0**	n **1**	n **2**	n **3**	n **4**	n **5**	n **6**	n **7**	n **8**	n **9**	n **10**	n **11**	n **12**	n **13**	n **14**	n **15**	n **16**	n **17**	n **18**	n **19**	n **20**	n **21**	n **22**	n **23**	n **24**	n **25**
SB-S	3.9 (6.2)	0	25	22	14	3	3	7	1	0	0	0	4	0	2	1	0	1	0	0	0	0	2	0	0	0	0	4
SB-H	7.3 (7.3)	5	7	12	7	12	3	15	8	0	1	0	6	0	2	0	0	8	0	0	1	0	2	0	0	0	0	8
PNA	4.4 (5.9)	1	18	21	15	7	1	6	0	1	1	0	11	0	1	0	0	2	0	0	0	0	2	0	0	0	0	3
HO	4.1 (6.4)	0	25	24	11	5	1	5	1	0	2	0	6	0	1	1	0	2	0	1	0	0	0	0	0	0	0	5
AD	4.7 (7.1)	0	28	18	9	3	1	10	0	0	3	0	6	0	1	0	0	2	0	1	0	0	0	0	0	0	0	7
DVT	4.5 (6.4)	1	15	24	14	5	7	9	0	0	1	0	3	0	1	0	0	3	1	0	2	0	1	1	0	0	0	4
CVD	6.9 (8.5)	1	13	16	13	10	2	9	1	0	0	0	6	0	0	0	0	5	0	0	0	1	2	0	0	0	0	12
SMI	2.3 (4.2)	0	37	25	5	3	2	8	1	0	1	0	5	0	1	0	0	0	0	0	0	1	0	0	0	0	0	1
NP	8.9 (9.2)	1	8	20	10	2	2	10	0	0	1	0	11	0	1	1	0	4	0	1	0	0	3	0	0	0	0	17
RD	5.8 (7.3)	0	19	11	14	7	5	8	0	2	0	0	12	1	0	0	0	2	0	0	0	0	3	0	0	0	0	7
UTI	12.9 (9.2)	25	5	2	8	5	0	10	4	0	2	1	13	0	2	0	0	6	1	0	2	0	5	0	0	1	0	6
OP/F	6.7 (7.7)	1	8	19	12	7	2	11	3	0	0	1	8	1	0	0	1	5	0	0	0	1	1	0	0	0	0	9
RMI	8.6 (8.3)	2	6	10	14	2	8	11	4	1	1	0	12	0	0	0	0	3	0	0	1	0	4	1	0	1	1	11

Note. Md = Mode; SB-S = skin breakdown requiring surgery, SB-HWC = skin breakdown requiring home wound care, PNA = pneumonia (atelectasis, and/or aspiration), HO = heterotopic ossification, AD = autonomic dysreflexia, DVT = deep vein thrombosis, CVD = cardiovascular disease, SMI = syringomyelia, NP = neuropathic pain, RD = respiratory dysfunction, UTI = urinary tract infections, OP/F = osteoporosis/bone fractures, RMI = repetitive motion injury/overuse syndrome.

Table 55

*Descriptive statistics for **Physiatrist Non-LCP Scenario 2**: Frequency of secondary complications*

	M (SD)	Md	**0**	n **1**	n **2**	n **3**	n **4**	n **5**	n **6**	n **7**	n **8**	n **9**	n **10**	n **11**	n **12**	n **13**	n **14**	n **15**	n **16**	n **17**	n **18**	n **19**	n **20**	n **21**	n **22**	n **23**	n **24**	n **25**
SB-S	2.6 (4.1)	1	9	20	9	0	0	3	1	0	0	0	3	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0
SB-H	6.2 (7.6)	1	0	8	8	8	3	5	1	0	1	0	3	0	0	0	0	1	0	0	0	0	1	0	0	0	0	5
PNA	2.6 (2.9)	1	10	13	8	5	1	5	0	0	1	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HO	1.9 (2.4)	1	11	19	5	2	2	6	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AD	3.6 (6.4)	0	18	11	6	2	1	1	0	0	0	0	3	0	0	0	0	2	0	0	0	0	1	0	0	0	0	2
DVT	2.9 (3.1)	1	5	15	10	3	4	4	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CVD	6.2 (7.8)	1	5	13	5	3	1	5	1	1	2	0	3	0	1	0	0	1	0	0	0	0	1	0	0	0	0	5
SMI	2.3 (5.0)	0	16	15	5	6	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
NP	8.5 (9.3)	1	5	9	4	4	3	2	0	0	0	1	7	0	0	0	0	1	0	0	0	0	1	0	0	0	0	9
RD	3.3 (4.9)	0	15	8	7	2	2	4	1	0	0	0	5	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
UTI	14.7 (9.2)	25	1	3	2	3	1	1	0	1	1	1	8	0	0	0	0	4	0	0	0	0	4	0	0	1	0	16
OP/F	4.2 (4.9)	1	2	13	11	3	2	6	1	0	1	0	5	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
RMI	9.6 (8.7)	25	5	2	6	2	1	5	2	1	1	0	7	0	2	0	0	1	0	1	1	0	1	0	0	0	0	8

Note. Md = Mode; SB-S = skin breakdown requiring surgery, SB-HWC = skin breakdown requiring home wound care, PNA = pneumonia (atelectasis, and/or aspiration), HO = heterotopic ossification, AD = autonomic dysreflexia, DVT = deep vein thrombosis, CVD = cardiovascular disease, SMI = syringomyelia, NP = neuropathic pain, RD = respiratory dysfunction, UTI = urinary tract infections, OP/F = osteoporosis/bone fractures, RMI = repetitive motion injury/overuse syndrome.

Table 56

*Descriptive statistics for **Physiatrist LCP Scenario 2**: Frequency of secondary complications*

				n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
	M (SD)	Md	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
SB-S	4.7 (6.9)	0	8	6	2	3	2	2	0	0	0	0	2	0	0	0	0	1	0	0	0	0	2	0	0	0	0	1
SB-H	8.7 (8.9)	25	2	2	3	4	4	4	0	0	1	0	2	0	1	0	0	1	0	0	0	0	0	0	0	0	1	5
PNA	3.4 (4.4)	0	8	7	0	3	3	3	0	1	1	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
HO	3.2 (4.0)	1	7	9	3	2	0	1	2	0	0	1	3	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
AD	4.1 (6.0)	0	11	2	4	1	4	2	0	0	0	0	4	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
DVT	3.3 (4.4)	2	6	6	7	2	0	3	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
CVD	9.1 (9.3)	25	3	4	5	0	0	2	2	0	0	1	4	0	0	1	0	0	1	0	0	0	0	0	0	0	0	6
SMI	1.3 (2.0)	0	16	5	2	0	1	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NP	9.3 (9.9)	25	4	5	1	2	2	3	1	0	1	0	2	0	0	0	0	1	0	0	0	0	1	0	0	0	0	7
RD	3.8 (6.4)	1	7	9	3	3	0	3	1	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
UTI	16.7 (8.8)	25	0	1	0	0	1	3	0	0	2	1	5	0	0	0	1	0	0	0	0	0	1	0	1	0	0	14
OP/F	6.5 (8.5)	1	3	8	3	5	1	1	0	0	0	0	2	0	0	1	0	0	0	0	0	0	1	0	1	0	0	3
RMI	12.5 (9.3)	25	1	2	2	2	1	2	1	1	1	0	4	0	0	0	0	1	1	0	2	0	1	0	0	0	0	8

Note. Md = Mode; SB-S = skin breakdown requiring surgery, SB-H = skin breakdown requiring home wound care, PNA = pneumonia (atelectasis, and/or aspiration), HO = heterotopic ossification, AD = autonomic dysreflexia, DVT = deep vein thrombosis, CVD = cardiovascular disease, SMI = syringomyelia, NP = neuropathic pain, RD = respiratory dysfunction, UTI = urinary tract infections, OP/F = osteoporosis/bone fractures, RMI = repetitive motion injury/overuse syndrome.

Table 57. *Categorical Regression with Optimal Scaling --- Prediction of Scenario 1 Frequency of Hospitalizations due to Secondary Complications from LCP and Physiatrist Variables*

Model Statistics	S1A SB-Sx	S1B SB-HWC	S1C PNA	S1D HO	S1E AD	S1F DVT	S1G CVD	S1H SMI	S1I NP	S1J RD	S1K UTI	S1L OP/Fx	S1M RMI
Standardized Coefficients (β)													
Certification	-.016	.113	.071	-.134	.071	-.097	-.119	.060	-.077	-.134	.025	-.117*	-.087
Knowledge	-.085	.114	.186*	-.186	.156*	-.080	-.110	.164**	-.283*	-.129	.268***	-.052	-.081
Group	-.223***	.068	.177**	-.182**	.147*	-.063	-.212**	.188***	-.189**	-.191**	.072	-.158**	-.164**
Model Summary													
F	1.972	1.362	2.052	3.430	1.540	0.574	2.724	1.902	4.354	2.719	2.374	1.470	1.413
df	5,165	4,168	7,162	4,162	6,162	6,160	4,160	5,159	4,161	4,161	6,164	5,160	5,161
p	.085	.249	.052	.010*	.168	.750	.030*	.097	**.002****	.032*	.032*	.202	.222
Adj R2	.028	.008	.042	.055	.019	-.016	.040	.027	.075	.040	.046	.014	.012
Number of Quantifications													
Outcome	2	2	3	4	3	2	4	4	3	2	3	2	3
Certification	2	2	2	2	2	2	2	2	2	2	2	2	2
Knowledge	3	2	5	2	4	4	2	3	2	2	4	3	3
Group	3	3	3	3	3	3	3	3	3	3	3	3	3
Certification Quantifications													
Non-Certified												-2.008	
Certified												.498	
Knowledge Quantifications													
Poor			-6.933		-3.094			-.7689	-.802		-1.593		
Fair			-2.160		-1.567			-1.238	-.802		-1.513		
Good			-1.210		-1.567			-1.238	-.802		-1.513		
Very Good			.387		.568			.548	-.802		.182		
Excellent			.696		.657			.548	1.247		.945		
Group Quantifications													
LCP	.636		-.252	-.098	-.760		.079	-.051	.743	.067		.468	.826
Phy-LCP	.548		2.089	-1.748	-.040		-2.055	-1.849	-1.968	-1.938		1.055	-1.745
Phy-Non-LCP	-1.623		-.849	1.298	1.579		1.047	1.225	-.251	1.135		-1.579	-.582

Note. SB-Sx = skin breakdown requiring surgery, SB-HWC = skin breakdown requiring home wound care, PNA = pneumonia (atelectasis, and/or aspiration), HO = heterotopic ossification, AD = autonomic dysreflexia, DVT = deep vein thrombosis, CVD = cardiovascular disease, SMI = syringomyelia, NP = neuropathic pain, RD = respiratory dysfunction, UTI = urinary tract infections, OP/Fx = osteoporosis/bone fractures, RMI = repetitive motion injury/overuse syndrome. Optimal scaling levels for outcomes and knowledge of SC were set at ordinal, whereas certification and group were set at a nominal scaling level. Adjusted alpha for model significance = .05/13 = .004.
$^{*}p<.05$, $^{**}p<.01$, $^{***}p<.001$.

Table 58. *Categorical Regression with Optimal Scaling --- Prediction of Scenario 2 Frequency of Hospitalizations due to Secondary Complications from LCP and Physiatrist Variables*

Model Statistics	S2A SB-Sx	S2B SB-HWC	S2C PNA	S2D HO	S2E AD	S2F DVT	S2G CVD	S2H SMI	S2I NP	S2J RD	S2K UTI	S2L OP/Fx	S2M RMI
Standardized Coefficients (β)													
Certification	.024	.082	.023	.032	-.038	-.108	-.033	-.040	-.053	-.103	.075	-.071	.030
Knowledge	.219**	.241***	.174*	.138	-.237*	-.120	-.120	-.126	-.215	-.075	.275***	-.050	.226**
Group	.102	.067	.188**	.069	-.177**	-.097	-.195**	-.149*	-.087	-.189**	.117	-.080	.096
Model Summary													
F	1.986	2.143	2.373	0.975	2.534	0.848	1.623	1.688	2.048	1.858	3.445	0.376	2.147
df	5,158	6,161	4,159	4,160	5,159	6,158	5,159	4,160	4,161	5,160	6,162	6,156	6,161
p	.084	.051	.055	.423	.031*	.535	.157	.155	.090	.105	**.003****	.893	.051
Adj R2	.029	.039	.033	-.001	.045	-.006	.019	.017	.025	.025	.080	-.024	.040
Number of Quantifications													
Outcome	4	4	3	2	3	2	4	3	3	4	5	2	4
Certification	2	2	2	2	2	2	2	2	2	2	2	2	2
Knowledge	3	4	2	2	3	4	3	2	2	3	4	4	4
Group	3	3	3	3	3	3	3	3	3	3	3	3	3
Certification Quantifications													
Non-Certified													
Certified													
Knowledge Quantifications													
Poor	-1.355	-1.500	-1.555		-1.554						-2.514		-2.036
Fair	-1.355	-1.500	-1.555		-1.554						-.841		-1.508
Good	-1.355	-1.456	-1.555		-1.554						-.841		-1.508
Very Good	-.088	.059	.643		.517						-.671		.198
Excellent	1.125	1.035	.643		.748						1.282		.951
Group Quantifications													
LCP			.912		.053		.511	.314		-.905			
Phy-LCP			-.872		-1.935		-2.206	1.429		.957			
Phy-Non-LCP			-1.208		1.093		.335	-1.451		1.188			

Note. SB-Sx = skin breakdown requiring surgery, SB-HWC = skin breakdown requiring home wound care, PNA = pneumonia (atelectasis, and/or aspiration), HO = heterotopic ossification, AD = autonomic dysreflexia, DVT = deep vein thrombosis, CVD = cardiovascular disease, SMI = syringomyelia, NP = neuropathic pain, RD = respiratory dysfunction, UTI = urinary tract infections, OP/Fx = osteoporosis/bone fractures, RMI = repetitive motion injury/overuse syndrome. Optimal scaling levels for outcomes and knowledge of SC were set at ordinal, whereas certification and group were set at a nominal scaling level. Adjusted alpha for model significance = .05/13 = .004.
**p*<.05, ***p*<.01, ****p*<.001.

Research Question 4 Results

RQ 4: Do LCPs, LCP physiatrists and non-LCP physiatrists differ in their summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI?

Summary of Methods

Table 59

List of variables, coding/measurement levels, and methods for RQ4

Survey #	List of Variables	Coding / Measurement	Statistical Method
Explanatory Variables			
(coded)	Group LCP, Phy-LCP, or Phy-Non-LCP	Categorical; LCP = 1, Phy-LCP = 2, Phy-Non-LCP = 3	
Outcome Variables			
(scored and transformed)	S1 likelihood of SC – average rating	Numeric; -1 to 1	1-way ANOVA
(scored and transformed)	S1 hosp/treatment frequency – average rating	Numeric; -1 to 1	1-way ANOVA
(scored and transformed)	S2 likelihood of SC – average rating	Numeric; -1 to 1	1-way ANOVA
(scored and transformed)	S2 hosp/treatment freq – average rating	Numeric; -1 to 1	1-way ANOVA

Note. Scenario items were averaged to create summary scores, then transformed using the box-cox transformation and standardized to a mean of 0 and an SD of 1. S1 = scenario 1, S2 = scenario 2. Adjusted alpha for model significance for each analysis = .05/4 = .013.

This research question was addressed via one-way ANOVAs for each of the four summarized scenario scores. As described previously, the scenario scores were created by averaging across all 13 items within each section (for cases with 75% or more responses). Thus, for each scenario there was a mean score pertaining to likelihood of secondary complications (SC) and another score pertaining to frequency of hospitalizations due to SC.

After of which, the mean scores were transformed using the box-cox transformation to reduce skewness. The transformation was also specified to yield final scores with means of 0 and standard deviations of 1. Preliminary analyses investigated the relationship between the dependent variables, the groups, and demographic variables using hierarchical regression analyses. Controlling for demographic effects had no impact on the outcomes as pertained to the results of group. As such, no demographic variables were included in these analyses.

Each one-way ANOVA was conducted separately. The grouping factor consisted of three levels: life care planners (LCP), physiatrist life care planners (Phy-LCP), and physiatrist non-life care planners (Phy-Non-LCP). Where indicated by a significant omnibus F test, Bonferroni post-hoc comparisons were conducted between the means.

The assumptions of the one-way ANOVA were evaluated and were assumed. First, the data was transformed to obtain normality of the dependent variables. Furthermore, ANOVA is generally robust to violations of the normality assumptions given sufficient cell sizes. Levene's tests of homogeneity of variances were all non-significant ($p > .05$) indicating that the assumptions of homogeneity of variance could be assumed. Finally, the samples were statistically independent. The Bonferroni-adjusted alpha level for this RQ was .013 (.05/4).

Results

The results of the one-way ANOVAs indicated significant differences among groups only for the likelihood of secondary complications in scenario 2, $F(2,185) = 46.29$, $p < .001$, Adj. $R^2 = .326$. Bonferroni post-hoc tests indicated that the mean for LCPs was higher than the means for either of the physiatrist groups, which did not differ from one another. Thus, on average, LCPs provided higher ratings pertaining to likelihood of secondary complications for this scenario (T6 complete paraplegia) than did physiatrists.

Table 60

Descriptive statistics for LCPs, Phy-LCPs, and Phy-Non-LCP: Likelihood of SCs for S1

	M	SD	n
LCP	.103	1.064	110
LCP-Physiatrist	-0.19	8.42	34
Physiatrist-Non-LCP	-.192	.949	53
Total	.0025	1.00	197

Table 61

One-way ANOVA summary for S1: Likelihood of SCs

Source	SS	df	MS	F	*P* value
Between Groups	3.127	2	1.563	1.566	.211
Within Groups	193.6	194	.998		
Total	196.7	196			

Note. $R^2 = .016$ (adj. $R^2 = .006$)

Table 62

Descriptive statistics for LCPs, Phy-LCPs, and Phy-Non-LCP: Hospitalization of SCs for S1

	M	SD	n
LCP	-.033	1.097	91
LCP-Physiatrist	.239	.877	29
Physiatrist-Non-LCP	-.095	.868	46
Total	-.0025	1.00	166

Table 63

One-way ANOVA summary: Hospitalization of SCs for S1

Source	SS	df	MS	F	*P* value
Between Groups	2.162	2	1.08	1.077	.343
Within Groups	163.6	163	1.00		
Total	165.8	165			

Note. R^2 = .013 (adj. R^2 = .001)

Table 64

Descriptive statistics for LCPs, Phy-LCPs, and Phy-Non-LCP: Likelihood of SCs for S2

	M	SD	n
LCP	.526	.879	103
LCP-Physiatrist	-.521	.746	32
Physiatrist-Non-LCP	-.689	.740	53
Total	.0054	.999	188

Table 65

One-way ANOVA summary: Likelihood of SCs for S2

Source	SS	df	MS	F	*P* value
Between Groups	62.359	2	31.2	46.3	.000
Within Groups	125	185	.674		
Total	186.9	187			

Note. R^2 = .334 (adj. R^2 = .326)

Table 66

Descriptive statistics for LCPs, Phy-LCPs, and Phy-Non-LCP: Frequency of Hospitalization S2

	M	SD	n
LCP	-.040	1.09	89
LCP-Physiatrist	.204	.907	29
Physiatrist-Non-LCP	-.057	.879	46
Total	-.0012	1.00	164

Table 67

One-way ANOVA summary: Frequency of hospitalization for S2

Source	SS	df	MS	F	*P* value
Between Groups	1.43	2	.747	.740	.479
Within Groups	162.4	161	1.00		
Total	164	163			

Note. R^2 = .009 (adj. R^2 = .003)

Research Question 5 Results

RQ 5: Is there a relationship between summary ratings regarding the likelihood of SC occurrence and frequency of hospitalization due to SCs incurred by persons with SCI, life care planners versus LCP-physiatrists, and whether the bulk of life care plans are identified as plaintiff or defense cases?

Summary of Methods

Table 68

List of variables, coding/measurement levels, and methods for RQ5

Survey #	List of Variables	Coding / Measurement	Statistical Method
Explanatory Variables			
L21/P15	Plaintiff or Defense	Dichotomous; Plaintiff = 1, Defense = 2	
(coded)	Group: LCP or Phy-LCP	Dichotomous; LCP = 1, Phy-LCP = 2	
Outcome Variables			
(scored and transformed)	S1 likelihood of SC – average rating	Numeric; -1 to 1	2-way ANOVA
(scored and transformed)	S1 hosp/treatment frequency – average rating	Numeric; -1 to 1	2-way ANOVA
(scored and transformed)	S2 likelihood of SC – average rating	Numeric; -1 to 1	2-way ANOVA
(scored and transformed)	S2 hosp/treatment freq – average rating	Numeric; -1 to 1	2-way ANOVA

Note. Scenario items were averaged to create summary scores, then transformed using the box-cox transformation and standardized to a mean of 0 and an SD of 1. S1 = scenario 1, S2 = scenario 2. Adjusted alpha for model significance for each analysis = .05/4 = .013.

This research question was addressed through two-way ANOVAs for each of the four summarized scenario scores. Preliminary analyses investigated the relationship between the dependent variables, the predictors, and demographic variables using hierarchical regression analyses. Controlling for demographic effects had no impact on the outcomes as pertained to the predictor. As such, no demographic variables were included in these analyses.

Each ANOVA was conducted separately. The primary predictor consisted of a dichotomous item where respondents indicated whether the bulk of life care plans were plaintiff cases (coded 1) or defense cases (coded 2). A grouping factor was also included with two levels (LCP, Phy-LCP) to determine the relevance of the type of practitioner to outcome, and to determine whether there were any interactions between group and type of case on the dependent variable scores. Non-LCP physiatrists were excluded from these analyses (they did not complete this item). Where indicated by a significant omnibus F test, Bonferroni comparisons were conducted between the means. Data met the assumptions of the ANOVA analyses, namely approximate normality of residuals, homogeneity of variance ($p > .05$), and independence of observations. The Bonferroni-corrected alpha level for these analyses was .013 (.05/4).

Results

First, LCPs and Physiatrist-LCPs both reported *preparing* life care plans for plaintiff cases to a greater degree than defense cases. The percentage of LCPs reporting that the bulk of their plans were for plaintiff cases ranged from 75-76% depending on the comparison. For Physiatrist-LCPs, plaintiff cases were reported to account for the bulk of life care plans for 67-70% of respondents. In addition, as there were few Physiatrist-LCPs in the sample, some of the cell sizes were quite small (8-10 respondents).

There were no differences between either groups or type of case for scenario 1 likelihood of occurrence or frequency of hospitalization scores, nor for scenario 2 hospitalization scores. However, group differences were noted for the likelihood of secondary complications in scenario 2, $F(1, 126) = 23.86$, $p < .001$, partial $\eta^2 = .16$. Furthermore, there was also a significant yet small interaction effect between group and type of case in this analysis, $F(1,126) = 4.26$, $p = .04$, partial $\eta^2 = .03$. The main effect of group indicated that LCPs reported higher overall average ratings than did physiatrists, with an estimated difference of .911 (95% CI 0.54-1.28; $p < .001$). However, the difference between LCPs and physiatrists was only notable if the bulk of their plans were for plaintiff cases. Bonferroni pairwise comparisons indicated that the mean difference between plaintiff LCP and plaintiff physiatrist ratings was 1.296 (95% CI 0.88-1.71; $p < .001$). LCP and physiatrist ratings did not differ significantly if the bulk of their cases were defense.

In summary, averaged ratings regarding frequency of occurrence and hospitalization incurred by persons with SCI generally did not differ according to whether the bulk of life care plans were identified as plaintiff or defense cases. However, for the second scenario (T6 complete paraplegia), LCPs reported a higher likelihood of secondary complications than did LCP-physiatrists overall. Further inspection of means indicated that the difference was only statistically significant for the subset of practitioners who worked more frequently on plaintiff cases.

Table 69

Descriptive statistics % for Plaintiff and Defense cases: Likelihood of SCs scenario 1

	M	SD	n
LCP Plaintiff Cases > 51%	.241	1.03	75
LCP Defense Cases > 51%	-.072	1.05	25
LCP-Phy Plaintiff Cases > 51%	-.160	.701	21
LCP-Phy Defense Cases > 51%	.973	.230	10
Total Plaintiff Cases > 51%	.153	.980	96
Total Defense Cases > 51%	.014	1.02	35

Table 70

Two-way ANOVA summary for Group and Plaintiff/Defense, and likelihood of SCs in scenario 1

Source	SS	df	MS	F
Group	.048	1	.048	.049
Plaintiff/Defense	.030	1	.030	.031
Interaction	2.460	1	2.460	2.533
Error	123.3	127	.971	

Note. R^2 = .030 (adj. R^2 = .007)
p > .001(Group, *p* = .824; Plaintiff/Defense, *p* = .860; Interaction, *p* = .114)

Table 71

Descriptive statistics % of Plaintiff and Defense cases: Hospital frequencies for Scenario 1

	M	SD	n
LCP Plaintiff Cases > 51%	.040	1.11	66
LCP Defense Cases > 51%	-.181	.853	21
LCP-Phy Plaintiff Cases > 51%	.144	.828	19
LCP-Phy Defense Cases > 51%	.393	.997	8
Total Plaintiff Cases > 51%	.063	1.05	85
Total Defense Cases > 51%	-.022	.914	29

Table 72

Two-way ANOVA summary for Group, Plaintiff/Defense, and Hospital Frequencies in Scenario 1

Source	SS	df	MS	F
Group	1.912	1	1.912	1.849
Plaintiff/Defense	.003	1	.003	.003
Interaction	.915	1	.915	.884
Error	113.770	110	1.034	

Note. R^2 = .019 (adj. R^2 = .008)
p > .001(Group, *p* = .177; Plaintiff/Defense, *p* = .955; Interaction, *p* = .349)

Table 73

Descriptive statistics % of Plaintiff and Defense: Likelihood of SCs in Scenario 2

	M	SD	n
LCP Plaintiff Cases > 51%	.619	.833	75
LCP Defense Cases > 51%	.3594	.903	25
LCP-Phy Plaintiff Cases > 51%	-.683	.810	20
LCP-Phy Defense Cases > 51%	-.1664	.551	10
Total Plaintiff Cases > 51%	.340	.981	95
Total Defense Cases > 51%	.209	.845	35

Table 74

Two-way ANOVA summary for Group and Plaintiff/Defense, and Likelihood of SCs in Scenario 2

Source	SS	df	MS	F
Group	16.318	1	16.318	23.86
Plaintiff/Defense	3.40	1	.340	.497
Interaction	2.915	1	2.915	4.262
Error	86.187	126	.684	

Note. $R^2 = .251$ (adj. $R^2 = .233$)

$p < .001$(Group, ***p* < .00001**; Plaintiff/Defense, *p* = .482; Interaction, ***p* = .041**)

Table 75

Descriptive statistics % of Plaintiff and Defense cases: Frequency of Hospitalizations of SCs in Scenario 2

	M	SD	n
LCP Plaintiff Cases > 51%	-.0027	1.12	65
LCP Defense Cases > 51%	-.0478	.924	21
LCP-Phy Plaintiff Cases > 51%	.116	.921	19
LCP-Phy Defense Cases > 51%	.3177	.923	8
Total Plaintiff Cases > 51%	.024	1.07	84
Total Defense Cases > 51%	.053	.922	29

Table 76

Two-way ANOVA summary for Group and Plaintiff/Defense, and Hospital Frequencies of SCs in Scenario 2

Source	SS	df	MS	F
Group	.975	1	.975	.896
Plaintiff/Defense	.102	1	.102	.094
Interaction	.253	1	.253	.232
Error	118.572	109	1.088	

Note. $R^2 = .008$ (adj. $R^2 = .019$)

$P > .001$ (Group, *p* = .346; Plaintiff/Defense, *p* = .760; Interaction, *p* = .631)

Research Question 6 Results

RQ 6: Are ratings pertaining to the likelihood of SCs if preventative measures are taken/not taken a function of physiatrist demographics?

Summary of Methods

Table 77

List of variables, coding/measurement levels, and methods for RQ6

Survey #	List of Variables	Coding / Measurement	Statistical Method
Explanatory Variables			
P3	Certified or non-certified	Dichotomous; Non-certified = 0, Certified = 1	
P4	Have worked at SCI model system	Dichotomous; No = 1, Yes = 2	
P5	Group: Phy-LCP or Phy-Non-LCP	Dichotomous; Phy-Non-LCP = 1, Phy-LCP = 2	
P17	Knowledge of SCs related to SCI	Ordinal 1-5; (1 = Poor, 5 = Excellent)	
Outcome Variables			
P18	Likelihood of SC *with* preventative measures	Ordinal 1-5; (1 = 0%, 5 – 76-100%)	POM
P19	Likelihood of SC *without* preventative measures	Ordinal 1-5; (1 = 0%, 5 – 76-100%)	POM

Note. Survey # prefix L or P refers to the item on the LCP survey (L) or the physiatrist survey (P). Phy-LCP = Physiatrist life care planner, Phy-Non-LCP = Physiatrist non-life care planner, POM = proportional odds model (i.e., all explanatory variables met parallel lines assumption). Adjusted alpha for model significance for each scenario = .05/2 = .025.

Two items served as outcome measures for this RQ, which asked physiatrists to rate how likely secondary complications are to occur if preventative measures ARE taken, and if preventative measures ARE NOT taken. Responses to both items were on the same ordinal scale from 1 (0%) to 5 (76-100%). Analyses were conducting using generalized ordered logistic regression calculated with the `gologit2` program in STATA. All explanatory variables within each model met the parallel lines (PL) assumption, thus, the results were equivalent to the proportional odds model. A Bonferroni corrected alpha level of .025 (.05/2) was used to determine model significance for each item.

Results

Both analyses met the PL assumptions for all explanatory variables. The model predicting the likelihood of secondary complications if preventative measures are taken was not significant ($p = .424$). In contrast, the model predicting the likelihood of secondary complications *without* preventative measures reached statistical significance at the adjusted alpha level ($p = .021$). Knowledge of SCs related to SCI was a significant positive predictor ($p < .01$). Thus, higher levels of knowledge were associated with higher reported likelihoods of secondary complications without preventative measures.

Table 78

POM for likelihood of secondary complications with and without preventative measures

Variable	SC with preventative measures	SC without preventative measures
Model coefficients b (se(b))		
Certified	-.064 (.441)	-.284 (.538)
Employed SCI	.467 (.391)	.380 (.498)
Knowledge	.193 (.209)	.752** (.264)
Group: Phy-LCP or Phy-Non-LCP	.292 (.401)	-.079 (.545)
Model Summary		
LR $\chi 2$ (df = 4)	3.87	11.56
p	.424	.021*
Pseudo R^2	.015	.078
Wald test of PL p	.211	.997
N	105	106

Note. SC = secondary complications. Certified coded 0 = non-certified and 1 = certified. Employed SCI coded 1 = No, 2 = Yes. Knowledge coded 1-5 (1 = poor, 5 = excellent). Group coded 1 = Phy-Non-LCP, 2 = Phy-LCP. Outcome measures coded 1-5 (1 = 0%, 5 = 76-100%). Adjusted alpha for model significance = .05/2 = .025.
*p<.05, **p<.01, ***p<.001.

Research Question 7 Results

RQ 7: Do certified and non-certified LCPs and LCP-physiatrists differ on whether they have felt pressure to increase costs when developing plans for plaintiff cases?

Summary of Methods

Table 79

List of variables, coding/measurement levels, and methods for RQ7

Survey #	List of Variables	Coding / Measurement	Statistical Method
Explanatory Variables			
L3/P3	Certified or non-certified	Dichotomous; Non-certified = 0, Certified = 1	
(coded)	Group: LCP or Phy-LCP	Dichotomous; LCP = 1, Phy-LCP = 2	
Outcome Variables			
L22 / P16	Pressure to include SC to increase costs	Dichotomous; Yes = 1, No = 2	Binomial Test, Chi-square, Mantel-Haenszel

The dependent variable for this RQ was a dichotomous variable asking respondents whether they had ever felt pressure to include secondary complications to increase costs on plaintiff cases, with response options of ‘yes’ (coded 1) or ‘no’ (coded 2). First, binomial tests and confidence intervals using exact methods were computed to compare the proportions of respondents who answered yes and no to the item. Chi-square tests were used to compare the proportions of yes and no responses between certified and non-certified respondents. Mantel-

Haenszel statistics were then used to compare the independence of certification and item response, controlling for practitioner type (LCP or LCP-physiatrist).

Table 80

Descriptive statistics for pressure to include costs

	M (SD)	Yes n (%)	No n (%)	Total # of Cases	Did not respond
LCP-Certified	1.84 (.37)	14 (16)	71 (84)	91	20 (22)
LCP-Non-Certified	1.64 (.50)	7 (33)	14 (66.7)	29	18 (62)
Group Phy-LCP	1.88 (.33)	3 (12)	29 (90.6)	46	12 (26)

Descriptive statistics revealed 16% of certified LCP cases (n = 14) had felt pressure to include costs imbedded within a life care plan to secure future employment among attorneys with 22% (n = 20) choosing not to respond. Among non-certified LCP cases, 33% (n = 7) had indicated pressure to include costs however 66.7% (n = 14) reported no pressure; 38.29% (n = 18/47) of non-certified LCP cases chose not to answer the question. For group physiatrist-LCPs, 90.6% (n = 29) indicated no pressure although 26% (n = 12/26) did not respond to the question. A total of 30.66% (n = 50/166) did not respond to the question.

Results

Greater proportions of respondents reported that they had *not* experienced pressure to include secondary complications to increase costs in plaintiff cases. This was the case for LCPs (80.2%, 95% CI .71-.87; p < .001) physiatrist-LCPs (90.6%, 95% CI .75-.98; *p* < .001) and overall (82.6%, 95% CI .75-.89; *p* < .001).

No relationship (*p* > .05) was observed between whether respondents were certified or non-certified and their response to the item, either overall or within each group. For LCPs the relative risk ratio (RR) for a “yes” response in non-certified cases compared to certified cases was 2.024 but with a large confidence interval that included 1 (95% CI .94-4.38). The RR indicated that the proportion of non-certified LCPs reporting pressure to increase costs was approximately two times the proportion of certified LCPs reporting pressure, but the difference was not statistically significant. For physiatrists, there were only three non-certified respondents and none of them reported pressure to increase costs, making the RR for this group incalculable. Overall, the RR for non-certified "yes" responses compared to certified "yes" responses was 1.956, but again with a large confidence interval encompassing 1 (95% CI .91-4.19).

Tests of homogeneity of the odds ratios across categories of the layer variable (practitioner type) indicated no evidence of heterogeneity across categories (Breslow-Day $\chi2(1) = .802$, $p = .37$). The Mantel-Haenszel common odds ratio estimate was 2.201 with a large confidence interval and was not statistically significant (95% CI .78-6.21, $p = .136$). Thus, adjusting for type of practitioner, no significant difference was found for certified and non-certified rates of "yes" responses regarding pressure to increase costs. Similarly, the Mantel-Haenszel test of conditional independence was not statistically significant ($\chi2(1) = 1.442$, $p = .230$).

In summary, the proportion of respondents who did *not* feel pressure to increase costs was greater than those who responded affirmatively. No differences were observed between certified and non-certified individuals after controlling for practitioner type.

Table 81

Cross tabulation between Certification and Pressure to Increase Costs, Within Strata of Practitioner Type (LCP or Phy-LCP)

Group	Pressure to Increase Costs	Non-Certified n (%)	Certified n (%)	Total n (%)	χ^2 (exact sig.)	RR (Non-Certified)
LCP	Yes	7 (33.3%)	14 (16.5%)	21 (19.8%)	$\chi^2(1)$ = 3.014, p = .123	2.024 (95% CI .94-4.38)
	No	14 (66.7%)	71 (83.5%)	85 (80.2%)		
	Total	21	85	106		
Phy-LCP	Yes	0 (0.0%)	3 (10.3%)	3 (9.4%)	$\chi^2(1)$ = 0.342, p = 1.000	--
	No	3 (100.0%)	26 (89.7%)	29 (90.6%)		
	Total	3	29	32		
Total	Yes	7 (29.2%)	17 (14.9%)	24 (17.4%)	$\chi^2(1)$ = 2.804, p = .134	1.956 (95% CI .91-4.19)
	No	17 (70.8%)	97 (85.1%)	114 (82.6%)		
	Total	24	114	138		

Note. Exact significance results are reported for chi-square analyses rather than asymptotic values due to small expected cell counts. RR = Relative risk of “yes” response for non-certified in comparison to certified respondents.

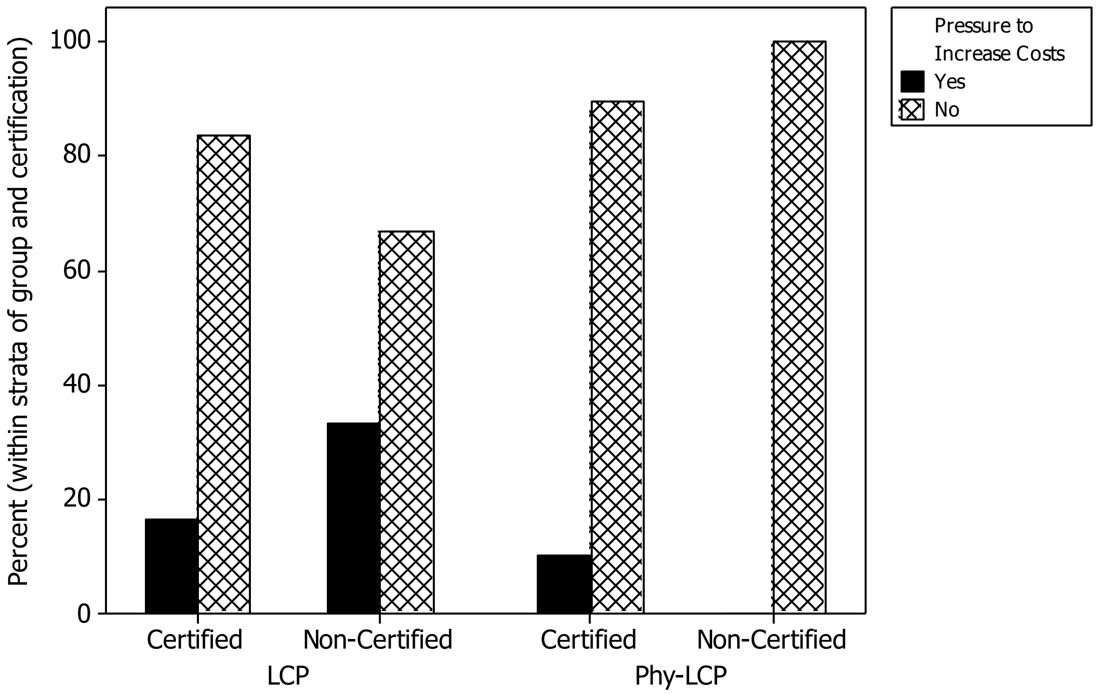


Figure 6. Percent of Certified and Non-Certified LCPs and Phy-LCPs reporting that they have or have not experienced pressure to increase costs in plaintiff cases (LCP n = 106, Phy-LCP n = 32).

CHAPTER V

DISCUSSION

The current study was intended to deliver life care planners with a guide as to whether or not secondary complications (SCs) should be included within the LCP, while providing life care planners with additional support from other physiatrists as to whether the inclusion of a cost should be added for specific SCs. Each research question was designed to determine whether differences exist between life care planners (LCPs) and physiatrists in their knowledge regarding SCs while comparing their responses with empirical research. In addition, it was determined to investigate whether costs should be included in a LCP based on the reports given from certified and non-certified LCPs; even though it meets the possibility (less than 50%) threshold rather than the probable (51% or greater) threshold. Further examination to determine whether the percentage of plans that are plaintiff cases has any bearing towards LCPs as more likely to include costs regardless of a person with a SCI acquiring a SC or not was a critical focus of this study. Lastly, this researcher wanted to examine the ethical considerations of LCPs as to whether they ever felt pressure to include costs in an effort to secure future employment by attorneys. The following entails a summary of results pertaining to each of the seven research questions as well as providing a detailed discussion of the limitations of the study and recommendations for future research.

Research question one was designed to determine whether a relationship exists between LCP and physiatrist-LCP demographics and ratings concerning the possibility versus probability of SC costs imbedded within a life care plan. What is most interesting is how non-certified LCPs, non-certified physiatrists LCPs, and physiatrist LCPs as a whole believed costs should be included within a plan even if deemed only possible. In contrast, however, the majority of certified-LCPs indicated their inclination to include only costs that are associated with SCs that are deemed probable; a small percentage, however, did indicate they include both possible and probable SCs within a plan.

Overall, LCPs tended to report nearly equal responses with most questions pertaining to the inclusion of costs. However, they slightly reported higher incidences of including costs for the following: (1) SCs that are deemed probable, (2) deemed only probable by empirical statistics, (3) deemed probable by a physician, (4) with a vast majority reported they include costs deemed probable by empirical statistics or a physician, and (5) consult an expert related to SCs and their life care plans. Lastly, there was a strong consensus towards believing the life care planning field would benefit from empirical validation on possible versus probable SCs. However, certified LCPs showed higher agreement with the statement than non-certified respondents. Furthermore, knowledge of SC revealed that among those whom reported a higher level of knowledge for SCs were more likely to report less agreement as to the life care planning field benefiting from empirical validation with regards to SCs.

Ideally, life care planners should only make cost inclusion predictions based on empirical literature, physiatrist affirmation, and through the overall consensus among LCPs generally accepted in the field. Excluding scientific facts based on research that has been conducted solely to provide a professional opinion is not only unethical, but removes the driving force the life care planning community and various foundations created to provide and encourage a standardized approach. The process involved in life care planning requires an ethical responsibility to develop an objective and impartial document that accurately depicts the long-term future medical needs of the injured party (Sutton, Deutsch, Weed, & Berens, 2010). A critical component in determining future medically reasonable care needs involves the reliability of the life care plan as it provides a predictive outcome. As demonstrated through *Daubert v. Merrill Dow Pharmaceuticals,* the plaintiff provided eight expert witnesses. However, the evidence was considered inadmissible by the court specifically due to the lack of empirical research that could be validated among fellow experts within their respective field (Solomon & Hacket, 1996).

Additional requirements stemming from the *Daubert* ruling were four factors relating to providing expert testimony that are now generally required in most U.S. courts. These factors involve the need for (1) the argument or theory to be validated by one's peers within the scientific community when discussing the specific technique implemented; (2) publication involving the peer review process of theory and technique; (3) the rate of error should be considered and provided; and (4) whether the process of deriving to a particular conclusion has been done in a reliable fashion; (Hoyt & Aalberts, 2001; Johnston, & Sartwelle, 2013).

Daubert v. Merrill Dow Pharmaceuticals court ruling attempted to enforce more stringent standardization for those providing expert testimony. As such, certified LCPs are ideally supposed to follow the ethical standards and Standards of Practice for Life Care Planners (2006). These LCP standards are similar to the *Daubert* principles that include: Using reliable current literature or published sources, research used should be readily available for review and reflect the plan developed, be able to interpret and analyze data, and promote successful collaboration with others (preferably with those knowledgeable of the care needed) is strongly encouraged. The criterion for obtaining certification is adhering to the ethical guidelines created in an effort to only include probable financial expenditures expected as a result due to injury while providing impartial and objective professional opinions; not speculation.

In the present study; however, physiatrist-LCPs were generally not in agreement with LCPs when asked their method of including costs in a life care plan within their professional practice. For example, the majority of physiatrist-LCPs disagreed with including costs if deemed probable by empirical statistics; however, they did agree that costs should be included if deemed probable by a physician. In addition, physiatrist LCPs were asked whether they include costs in plans if SCs are deemed probable as determined by empirical statistics and/or a physician. Nearly half reported they both agree and disagree, favoring "agree" only slightly more. The finding of nearly half of respondents choosing to agree could be due to the fact that "physician" was included within the statement. One could draw from this conclusion that physiatrist LCPs were not in agreement to include costs if deemed probable by empirical statistics. For physiatrist LCPs to include costs only deemed probable by a physician without regards to the empirical research is not only unethical as brought upon by the International academy of life care planners standards of practice (International Academy of Life Care Planners, 2006), but considered inadmissible in court for states adhering to the *Daubert* principles. The *Daubert* ruling continues to provide a standard to be implemented during litigation in an effort to promote reliable and unbiased expert testimony. "No longer would an expert's bare assurance that he or she had utilized generally accepted scientific methodology be sufficient. Nor would an expert's subjective belief or unsupported speculation be a substitute for real science" (Johnston, & Sartwelle, 2013, p. 488). In developing life care plans, the expert's opinions must be in line with what is generally accepted in the field by his or her peers and must be validated by scientific methodology with reliable empirical support. However, many physiatrists LCPs in the present study clearly ignored these core principles.

Also, the majority of physiatrist LCPs believed costs associated with possible SCs should be included within a life care plan in conjunction to including both possible and probable SCs costs. A strong consensus among those involved in tort cases (including the standards) indicate that only probable "more likely than not" future medical conditions should be embedded within a plan, and that possible complications should be placed in a separate section without including what are otherwise speculative future medical issues (Slesnick, 1990; Marini, 2012). In summary, non-certified LCPs, and non-certified physiatrist LCPs, and those who indicated higher knowledge of SCs (specifically physiatrist LCPs), reported a higher inclination to include costs associated with possible SCs, and did not feel the life care planning community would benefit from empirical validation. By dismissing the findings obtained throughout the scientific community and only taking into account one's professional opinion personifies one as having a "God" complex. Moreover:

> No single physician or rehabilitation professional completing a life care plan can do so in a vacuum. Each must reach out to establish a medical, case management and rehabilitation foundation for the plan. This cannot be done without consulting with other team members, working with clinical practice guidelines and relevant research literature. Life care planners should not work in isolation… (Deutsch, 2014).

As will be discussed in the upcoming sections, physiatrist LCP's knowledge of the frequency of occurrence of SCs is not in line with the empirical research found, and in most cases, far from accurate. Furthermore, physiatrist LCPs reported the bulk of their life care plans (67-70%) were plaintiff. This finding begs the question as to whether physiatrist LCPs who include possible secondary complication costs and due primarily plaintiff work, do so for the financial incentive of future cases from such attorneys? However, not all LCPs (certified or uncertified) as well as physiatrist LCP's operate using this methodology.

Prior to discussing the findings of the two scenario questions, a brief description of the each will first be provided. Each scenario question given was developed to determine whether demographic variables were predictive factors of such responses and compare the knowledge of respondents to that of the empirical literature. The list of explanatory variables used included certification, knowledge of SCs, and Group (i.e., LCP, physiatrist LCP, and physiatrist non-LCP). The first scenario focused on an otherwise healthy male with a C5-C6 level of injury with Likert scale responses ranging from 0%, 1-25%, 26-50%, 51-75% and 76-100% followed by the same scenario. However, asking participants to report the frequency of each SC that would likely require hospitalization and/or treatment within one's lifetime for a person with a SCI and were asked to provide a number that ranging from 0-25+. Scenario two provided the exact same response choices, however, involved an otherwise healthy male with a T6 level of injury with Likert scaled responses followed by a second part with answer choices ranging from 0-25+.

Ratings of the likelihood of 13 SCs for a person with a C5 level of injury (scenario one with Likert scaled responses) are a function of demographics or type of practitioner, certification, knowledge of SCs, Group (i.e., LCP, Physiatrist-LCP, or Physiatrist non-LCP), and plaintiff versus defense cases were used as the explanatory variables in the various statistical analysis. Findings revealed LCPs had higher ratings for the SCs (skin breakdown requiring surgery, heterotopic ossification, and deep vein thrombosis) than physiatrist-LCPs or physiatrist non-LCPs with regards to scenario one. Furthermore, descriptive statistics revealed that among 108 LCPs, at least half or more reported skin breakdown requiring home wound care, autonomic dysreflexia, respiratory dysfunction, urinary tract infection (UTI), and osteoporosis/bone fractures as likely to occur more than 51% of the time. Lastly, at least 40% of LCPs reported pneumonia, neuropathic pain, and repetitive motion injury as likely to occur more than 51% of the time. In summary, a significant number of LCPs reported eight of 13 SCs as meeting the probability threshold (more than 51% likelihood to occur within one's life time).

For physiatrist-LCPs, 34 participants responded to scenario one and although no statistically significant findings were found between this group and non-physiatrist LCPs, more than half rated the following to meet the probability threshold: Neuropathic pain, respiratory dysfunction, UTI, and repetitive motion injury while approximately half reported cardiovascular disease to occur more than 51% of the time as found using descriptive statistics. Furthermore, skin breakdown requiring surgery, skin breakdown requiring home wound care, and osteoporosis/bone fractures were reported to occur at the probability threshold by more than 40% of physiatrist-LCP respondents. In summary, more than 40% of physiatrist-LCPs reported eight of 13 SCs as meeting the probability threshold (more than 51% likelihood to occur within one's life time). Additionally, knowledge was considered a positive predictor for the high ratings of UTI in scenario one. In other words, those who indicated higher knowledge reported higher percentages for the UTI secondary complication.

Interestingly, physiatrist-non LCPs had the lowest ratings for SCs regarding scenario one. Among the 54 respondents, only three complications were reported to occur more than 51% of the time by descriptive statistics. These included neuropathic pain, UTI, and osteoporosis/bone fractures followed by autonomic dysreflexia by a little more than 40% of physiatrist-non LCPs; overall, only four of 13 SCs were reported as meeting the probability threshold by the vast majority of this group. This finding is of much practical significance in that physiatrists who are not LCP's have no invested or incentive bias either way in providing their opinions. Since they are not involved in life care planning, their unbiased opinions cannot be later used against them in court.

The second part of scenario one focused on asking respondents to provide the frequency of hospitalization and/or treatment for the 13 SCs provided. When assessing one's knowledge as a predictor for the frequency of SCs in scenario one (response choices ranging from 0-25+), persons who indicated their knowledge of SCs as poor, fair, good, and very good, reported higher frequencies of neuropathic pain in comparison to those who reported excellent knowledge of SCs. Furthermore, the group (physiatrist-LCPs) reported the highest frequency for neuropathic pain, followed by physiatrist non-LCPs and LCPs. Moreover, the overall mean scores was higher for physiatrist LCPs and LCPs than physiatrist non-LCPs with regards to all remaining SCs. Once again, the practical significance of physiatrist non-LCPs providing unbiased opinions without any incentive to support plaintiff or defense work becomes quite plausible as to why these differences in opinions were found.

For scenario two, respondents were given a similar case, however, the difference was of an otherwise healthy male who had a T6 level of injury; Likert scale answer choices were provided for the first part. Similar findings could be compared with the first scenario. LCPs overall provided higher frequency ratings than physiatrist-LCPs and physiatrist non-LCPs with regards to six SCs that included skin breakdown requiring home wound care, cardiovascular disease, respiratory dysfunction, UTIs, neuropathic pain, and osteoporosis/bone fractures. However, when summing the scores for all SCs for this specific scenario, findings revealed that LCPs overall provided higher ratings, yet the differences were only significant when the vast majority of LCP cases were plaintiff. The demographics for LCPs and physiatrist LCPs reported preparing life care plans for plaintiff cases to a greater degree than defense cases. The percentage of LCPs reporting that the bulk of their plans were plaintiff fell into the range of 75-76%.

The concern as to whether acting as a LCP for plaintiff cases more often than defense can bring about ethical concerns. For example, are LCPs more likely to report higher frequencies of SCs when developing their plans in an effort to secure future referrals by attorneys? It should be noted that although there was a statistically significant difference found among LCPs and both physiatrist groups with regards to reporting higher frequency ratings of SCs, the majority of LCPs reported all but UTI and repetitive motion injury as meeting the probability threshold (likely to occur within one's lifetime more than 51% of the time). Although LCPs (certified and non-certified) may not have reported all but UTI and repetitive motion injury as likely to occur more than 51% of the time, non-certified LCPs believe possible and probable SCs should be included within a plan; therefore, the costs embedded will increase significantly for the client's plan in contrast to certified LCPs.

For the second part of the scenario, (frequency of hospitalization and/or treatment for 13 SCs) descriptive statistics revealed both LCPs and physiatrist LCPs reported higher frequency counts for ten SCs than non-LCP physiatrists. Furthermore, "knowledge" was found to be a positive predictor for one SC (UTI). In other words, persons who indicated higher levels of knowledge (i.e., very good and excellent) tended to rate this SC as higher.

In summary, the majority of all SCs for each of four scenarios were found to be higher for LCPs, and physiatrist LCP in comparison to non-LCP physiatrists as demonstrated through descriptive statistics. However, careful consideration should be taken from this finding as there were no statistically significant differences other than what was previously discussed, primarily due to the stringent alpha level created due to Bonferroni corrections. However, the practical significance of these findings cannot be ignored as incentives and biases in providing expert opinions seem to exist.

When addressing both physiatrist groups as to their professional opinion of the likelihood of SCs occurring if preventative measures are *not* taken, participants who reported higher levels of knowledge indicated higher frequencies of SCs as more likely to occur. Yet, when comparing the findings from chapter four with the empirical research, aside from neuropathic pain, all groups (i.e., LCPs, physiatrist LCPs, and physiatrist non-LCPs) provided inaccurate estimated opinions regarding the likelihood of SCs actually occurring among persons with either a C5-C6 level of injury or a T6 level of injury. The literature review demonstrates that among the SCs, only repetitive motion injury had at least three studies revealing an incidence rate meeting the probability threshold (Eriks-Hogland et al. 2013; Escobedo et al. 1997; and Hetz et al. 2011).

Almost all other SCs did not meet the probability threshold; however, a few studies indicated the incidence rate greater than 50% for the following: Urinary tract infection (UTI) by Togan et al. (2014) revealed the incidence rate of 67.7% however, four other studies indicated a possible rather than probable likelihood of acquiring this SC. Neuropathic pain by Siddall et al. (1999) and Siddall et al. (2003) found an incidence rate of 64% and 81% respectively for persons with tetraplegia; however, two other studies did not replicate these findings. Respiratory dysfunction that included pneumonia, aspiration, and atelectasis was found by Jackson and Grooms (1994) to be at an incidence rate of 84%, 60%, and 65% for persons with a level of injury at C1-C4, C5-C8, and T-T12 respectively; however, four additional studies revealed the percentage meeting the possible threshold rather than probable.

In a longitudinal study, Groot et al. (2013) found the incidence rate of respiratory dysfunction among tetraplegia and paraplegia patients ranging from 63% to 95% respectively, although four additional studies revealed no similar findings for meeting the probability threshold. With regards to the SC of bone fracture, the occurrence as studied by Frisbie (1997) for persons with a thoracic level of injury was at 80%; however, the sample size was small (seven participants). An additional seven studies found the incidence rate ranging from 1% - 34%, with six of the studies showing prevalence rates of 6% or less.

Previous researchers have found a probability threshold of 56% for the SC of pressure ulcers among persons with SCI was found by Ash (2000); however, five studies revealed the incidence ranging from 11.5% to 49.5%. In addition, heterotopic ossification was a SC with findings ranging from 57% and 73% by Banovac and Gonzalez (1997) and Jaovisidha et al. (1998), yet four studies revealed a possible rather than probable likelihood of acquiring this complication (1.82% - 21.9%). In addition, the literature review for syringomyelia, deep vein thrombosis, and autonomic dysreflexia indicated no findings for meeting the probability threshold. Therefore, the use of empirical research is strongly recommended for both LCPs and physiatrist-LCPs when developing plans for persons with a SCI. It should be noted, however, that although LCPs as a whole may not have accurate knowledge of SCs, certified LCPs did report the use of empirical literature when creating their plans.

For the ethical question of whether respondents ever felt pressured to include costs within a life care plan to secure future employment by attorneys, a greater number of respondents felt they had not experienced pressure and no statistical differences were found. Although no statistical differences were found, of practical significance; however, was the fact that 31% of non-certified LCPs, 26% of physiatrist LCPs, and 22% of certified LCPs chose not to respond to this question with an overall 22% among all participants not answering. Furthermore, 33.3% of non-certified LCPs, 16.5% of certified LCPs, and 17.4% of physiatrist LCPs indicated they had felt pressure to include costs. In a study conducted by Colella, Johnson, and Tinari (1995) to evaluate the purpose of hiring financial economists by attorneys, findings revealed the majority had hired and *preferred* the life care planner to serve as an advocate for their client. Moreover, this study revealed the association towards the inclusion of costs and the number of plans and certification status. Persons who conducted more plans identified as non-certified (including physiatrist LCPs) reported including costs associated with both possible and probable SCs. Interestingly, the number of respondents reported the majority of plans they conduct are for plaintiff cases. A reason behind such findings could be due to the following as stated by Judge (2009):

> The life care plan, a creature that exists solely in the realm of litigation, purports to predict various medical (and other) needs of the injured plaintiff, for the remainder of the plaintiff's life. While there is often no dispute that a particular plaintiff has sustained serious injuries, and requires some future care, life care plans are often disappointingly used by plaintiff's counsel to "run up the score" with exaggerated costs, unrealistic life expectancies, and services that are neither needed nor helpful to the injured plaintiff… The question of advocacy vs. neutrality is important because there is considerable variation both in data sources and in acceptable methodologies available to forensic economists. Therefore, different forensic economists can arrive at substantially different loss estimates even in simple cases (p. 19).

Although this specific issue focuses primarily on plaintiff cases, those who are hired for the defense face similar challenges as pressure seems to exist for LCPs to create or rebut a plan that favors the opposing side. (Tinari, 1993). Furthermore, the manipulation of methodology (e.g., how one arrives at the conclusion of financial expenditures) often occurs. For example, as the literature review from chapter two showed, *some* studies demonstrated particular SCs reached the probability threshold while others revealed opposite results. Those acting on behalf of the plaintiff or defense seem to "cherry pick" studies that favor an opinion favorable to the side that has retained them.

Conclusion

This dissertation revealed the vast majority of certified-LCPs reported favoring only the inclusion of costs associated with probable SCs rather than possible; a clear indication that the standards of practice as set forth by various foundations for certification instills the principles necessary for the profession. Furthermore, the majority of all respondents reported conducting plans more so for plaintiff rather than for defense cases. It is not uncommon for defense attorneys not to hire a LCP other than to discredit the opposing side by implying advocacy and not neutrality, to address the ratio of plaintiff versus defense cases, and question the rates of consultation hourly fees (Thornton & Ward, 1999). However, it makes sense from this researcher's point of view that having a significantly larger number of plaintiff cases is not uncommon or unethical as the opportunities may not occur as often to work for the defense.

Does the method for conducting a plan change based upon whether the LCP is acting on behalf of the plaintiff or defense side? As reported by Deutsch (2014):

> Regardless of the referral source (e.g., plaintiff attorney, defense attorney, hospital administrator, etc.), respected life care planners employ a systematic approach to case analysis and base recommendations upon the demonstrated needs of each individual as dictated by the onset of a disability. The fundamental process does not change when approaching the life care planning process from a defense perspective. Consistency in the approach is still critical and the plan one develops should not be influenced by the referral source…

Irrespective of whether or not the methods for conducting a plan is different or subject to change when acting on behalf of a plaintiff or defense case, the standards and methods of practice differ among those who are certified versus non-certified. Furthermore, it is the physiatrist-LCP who believes conducting a life care plan should only include costs recommended by a physician *rather* than both a medical professional in conjunction with the empirical literature that supports their position. Additionally, physiatrist LCPs and non-certified LCPs who feel the use of empirical research is not warranted when developing plans, and do not believe empirical validation regarding whether to include possible complications versus probable complications to allow for consistency among the field is necessary. This brings about one yet viable question. Do these two groups feel they should be allowed the freedom to do as they wish without regulatory standards? Nevertheless, guidelines should be required for *all* that work within this field as a lack of consistency among professionals indicates a "gaping hole" in the tort reform arena. Whether requiring certification for those who act as a LCP be subject to audits to assess for consistency in the development of plans or *Daubert* challenged, the process/field is in need of stricter regulations for those who are not certified as based on the current findings of this study.

Limitations of the Study

There were various limitations that could be found in the research conducted. First, a lack of proportionate number of respondents was needed to compare differences between groups and within groups. For example, LCPs and physiatrist LCPs tended to work plaintiff cases significantly more than defense; there were a significantly larger number of certified LCPs than non-certified; and over 97% of LCPs and 67% of physiatrists were Caucasian limiting the researcher from comparing differences with regards to ethnicity; and training disciplines among LCP demographics had too few cases for each (i.e., physician, registered nurse, certified rehabilitation counselor, etc.) in an effort to compare differences against several of the dependent variables. In other words, the generalizability of results should be used with caution.

Second, although probability sampling (i.e., random sampling) is a preferred method for gathering a representative sample of the population, it was not feasible due to the inability of a sampling frame (i.e., no identifiable information for physiatrists that operate as LCPs). Furthermore, many participants were unwilling to take the survey (e.g., several LCPs emailed stating their concern over the results of the study being held against them during litigation), followed by the inability to gather the specified number of participants to obtain the required number of respondents based upon the power analysis. However, no sampling method, regardless of whether random sampling is implemented, guarantees the sample will be generalizable to the population (Gay, Mills, & Airasian, 2009).

Third, considering the amount of independent variables, a larger sample size was required and therefore, various analyses had to be removed which; one can hypothesize that an increase in sample size could have greatly improved the findings. Difficulty in obtaining the number of participants could have been due to various LCPs specifying their reluctance to take part in the study; many of which stated they were unwilling to fill out the survey as they were concerned their responses would be held against them during litigation.

Fourthly, for the scenario questions designed to assess one's knowledge of SCs, the validity of the findings should only be considered reliable when comparing to the empirical research that has been conducted otherwise, merely speculating based on professional experience should not merit consideration during litigation. Therefore, including a physiatrist's professional opinion solely on this study without consideration to the findings revealed by the empirical literature as demonstrated in chapter two, does meet the required Standard of Practice as set forth by the International Association for Life Care Planners. As such, the opinions gathered from the study along with the literature specifying the incidence rate for each SC should be used, although caution should always be taken. For example, a person's age, gender, level of injury, current health status, etc. are all factors that may increase the incidence rate for a particular SC.

An additional limitation was the necessary omission, separation, and/or inclusion of particular SCs. For example, bone fracture/osteoporosis is two separate and distinct complications. Although a person may be at risk for developing osteoporosis, it does not mean one will develop bone fractures. Therefore, it would have been beneficial to have those two conditions separated and given a response choice for each. In addition, pneumonia, atelectasis, and aspiration could have been combined with one overarching SC, respiratory dysfunction.

Recommendations for Future Research

The research conducted sought out to determine the method of practice by professionals within the life care planning community in an effort to facilitate a process of standardization when conducting plans. By asking all life care planners (physiatrists included) as to their opinion regarding the inclusion of costs that are deemed possible and probable, followed by assessing one's knowledge of SCs in relation to person's with a SCI, two separate and distinct studies could be developed to fully examine these topics. For example, increasing the number of questions solely focused on the method of practice one uses when developing a plan followed by a qualitative section asking participants to describe their methods when including costs could have been provided. Questions that could be imbedded within the survey include: What incidence rate/percentage of a SC would you consider permissible to include within a life care plan? Allowing participants to enter a continuous number (i.e., 1, 2, 3, - 100 etc.) with each value representing a percentage rather than providing Likert scale responses could provide a detailed interpretation of how LCPs develop plans. For the qualitative piece, subjects could be provided with follow-up questions by allowing the respondent to elaborate and/or provide justification as to reasons for including costs that are deemed only possible. An additional question that could be included: What methods are often used when you develop a plan? In addition, various answer choices focusing on the various functions (i.e., Plan Development Research, Assessments, Data Analysis, Planning, etc.) provided by the standards of practice could be included, followed by an open-ended answer choice so LCPs could further elaborate. In conclusion, the overall study could have focused specifically addressing the method of practice in conjunction with providing ethical scenarios to improve upon the process, and assisting in a standardized approach when conducting plans.

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APPENDIX A

APPENDIX A

RECRUITMENT LETTERS

Dear Life Care Planners,

I am a PhD student completing my dissertation at the University of Texas- Pan American under the guidance of Dr. Irmo Marini regarding the topic "Possible Versus Probable Secondary Complications among Individuals with Spinal Cord Injury and Inclusion of Such Complications within a Life Care Plan." I am interested in obtaining life care planner's opinions about secondary complications of SCI and their likely prevalence of occurring over one's lifetime, and to what extent life care planners believe certain complications reach the threshold for including these future costs into a life care plan. This approximate 10- 12 minute survey is IRB approved and supported by the Foundation for Life Care Planning Research. If you do choose to be involved in the study and during which time there are any questions when taking the survey that you prefer not to answer, you may skip them. Your participation will be anonymous, is voluntary and no individual responses will be reported; all findings/results will be collectively reported. The results of the study will be submitted for presentation at the International Symposium on Life Care Planning as well as submitted to the Journal of Life Care Planning. You may complete the survey by clicking the link below, and if you have any questions, please feel free to contact me (Noel Ysasi) at naysasi@utpa.edu or Dr. Irmo Marini at imarini@utpa.edu.

Survey Link: https://utpa.qualtrics.com/SE/?SID=SV_9pjOBlcFxmU2CK9

Thank you once again,

Noel A. Ysasi, PhD Candidate

Dear Physiatrists,

I am a PhD student completing my dissertation at the University of Texas- Pan American under the guidance of Dr. Irmo Marini regarding the topic "Possible Versus Probable Secondary Complications among Individuals with Spinal Cord Injury and Inclusion of Such Complications within a Life Care Plan." I am interested in obtaining Physiatrist's opinions about secondary complications of SCI and their likely prevalence of occurring over one's lifetime. This approximate 10- 12 minute survey is IRB approved and supported by the Foundation for Life Care Planning Research. If you do choose to be involved in the study and during which time there are any questions when taking the survey that you prefer not to answer, you may skip them. Your participation would be anonymous, is voluntary and no individual responses will be reported; all findings/results will be collectively reported. The results of the study will be submitted for presentation at the International Symposium on Life Care Planning as well as submitted to the Journal of Life Care Planning. You may complete the survey by clicking the link below, and if you have any questions, please feel free to contact me (Noel Ysasi) at naysasi@utpa.edu or Dr. Irmo Marini at imarini@utpa.edu.

Survey Link: https://utpa.qualtrics.com/SE/?SID=SV_9pjOBlcFxmU2CK9

Thank you once again,

Noel A. Ysasi, PhD Candidate

APPENDIX B

APPENDIX B

LIFE CARE PLANNER SURVEY AND PHYSIATRIST SURVEY

The subspecialty of Life Care Planning (LCP) in consultation with medical professionals aims to project, address, and financially account for an individual's future medical care needs by providing preventative recommendations such as annual physician visits, appropriate medications and supplies, needed home health care, annual diagnostic testing, medical monitoring, etc. Please address the following questions based on your overall education, training, and experience concerning the secondary complications of spinal cord injury and life care plans (LCPs). Please answer the survey <u>even if you are not involved</u> in any way with life care plans.

1. What is your gender?
   - ○ Female
   - ○ Male

2. Please specify your race/ethnicity. Select all that apply.
   - ( ) White
   - ( ) American Indian or Alaska Native
   - ( ) Asian
   - ( ) Black or African American
   - ( ) Native Hawaiian or Pacific Islander
   - ( ) Hispanic or Latino
   - ( ) Other ___________________________

3. Which of the following training disciplines apply to you? Please select all that apply.
   - ( ) Certified Life Care Planner
   - ( ) Non-Certified Life Care Planner
   - ( ) Physician
   - ( ) Registered Nurse
   - ( ) Certified Rehabilitation Counselor
   - ( ) Certified Case Manager
   - ( ) Licensed Professional Counselor
   - ( ) None

4. How would you describe your current employment status?

○ Employed full time as a Life Care Planner (+40 hours weekly)
○ Employed part time as a Life Care Planner (less than 40 hours weekly

5. In your career, how many life care plans have you developed *(total to date)* for individuals with spinal cord injuries?

○ 0
○ 1-25
○ 26-50
○ 76-100
○ 101 +

6. How many spinal cord injury patients do you develop life care plans for *(on average)* per year?

○ 0
○ 1-10
○ 11-20
○ 21-30
○ 31-40
○ 50+

7. Describe your knowledge base regarding ***secondary complications*** (e.g., decubiti, UTI's, DVT) related to spinal cord injuries.

○ Poor
○ Fair
○ Good
○ Very Good
○ Excellent

8. When developing an SCI life care plan, I often include costs that are associated with:

○ Possible Secondary Complications (49% likelihood of occurrence or lower)
○ Probable Secondary Complications (51% likelihood of occurrence or higher)
○ Possible (49% or less) and Probable (51% and greater) Secondary Complications.

9. I believe that life care plans should include costs for future secondary complications related to spinal cord injury and other conditions even if they are only ***possible so the funds will be there***.

○ Strongly Disagree
○ Disagree
○ Agree
○ Strongly Agree

10. When developing life care plans, I typically (more than 51% of the time) include costs for future secondary complications related to spinal cord injury and other conditions ***only if*** they are deemed ***probable (51%)*** by empirical statistics.

○ Strongly Disagree
○ Disagree
○ Agree
○ Strongly Agree

11. When developing life care plans, I typically **(more than 51% of the time)** include costs for future secondary complications related to spinal cord injury and other conditions only if they are deemed **probable (51%)** by a treating physician specialist.

- ○ Strongly Disagree
- ○ Disagree
- ○ Agree
- ○ Strongly Agree

12. **When developing life care plans, I typically (more than 51% of the time) include costs for future secondary complications related to spinal cord injury and other conditions *only if*** they are deemed ***probable (51%)*** by empirical statistics **AND** a treating physician specialist.

- ○ Strongly Disagree
- ○ Disagree
- ○ Agree
- ○ Strongly Agree

13. When developing life care plans, I typically (more than 51% of the time) include costs for secondary complications related to spinal cord injury and other conditions ***only if*** they are deemed ***probable (51%)*** by empirical statistics **OR** a treating physician specialist.

- ○ Strongly Disagree
- ○ Disagree
- ○ Agree
- ○ Strongly Agree

14. I always consult a physician, physiatrist, or other relevant expert to determine the likelihood and validity of potential secondary complications related to spinal cord injury life care plans.

- ○ Strongly Disagree
- ○ Disagree
- ○ Agree
- ○ Strongly Agree

15. I believe the field of life care planning would benefit from empirical validation regarding whether to include possible complications versus probable complications to allow for consistency among the field.

- ○ Strongly Disagree
- ○ Disagree
- ○ Agree
- ○ Strongly Agree

16. For the FIRST of two case scenarios, please consider an otherwise healthy lifestyle **male in his mid-20s with a C5-C6 complete tetraplegia**, of average height and weight with no pre-injury medical conditions or diseases. In your professional opinion, <u>how ***likely*** will it be that the following secondary complications occur at least once</u> in one's lifetime ***if reasonable and medically necessary life care planning preventive care and treatment measures are taken?***

A. Skin breakdown, decubitus ulcers, or pressure sores ***REQUIRING SURGERY***

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

B. Skin breakdown, decubitus ulcers, or pressure sores ***REQUIRING HOME WOUND CARE***

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

C. Pneumonia, Atelectasis, Aspiration

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

D. Heterotopic Ossification

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

E. Autonomic dysreflexia

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

F. Deep vein thrombosis

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

G. Cardiovascular disease

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

H. Syringomyelia

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

I. Neuropathic/Spinal Cord Pain

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

J. Respiratory Dysfunction

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

K. Urinary Tract Infections

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

L. Osteoporosis/fractures

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

K. Repetitive motion injury/overuse syndrome

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

17. Considering our same patient in scenario ONE with a C5-C6 injury, how ***frequently*** are the following conditions likely to occur **that** **require hospitalization and/or treatment** in one's lifetime ***if reasonable and medically necessary life care planning care and treatment preventive measures are taken?***

A. Skin breakdown, decubitus ulcers, or pressure sores ***REQUIRING SURGERY***
_____ Indicate a # from 0 – 25+

B. Skin breakdown, decubitus ulcers, or pressure sores ***REQUIRING HOME WOUND CARE***
_____ Indicate a # from 0 – 25+

C. Pneumonia, Atelectasis, Aspiration
_____ Indicate a # from 0 – 25+

D. Heterotopic Ossification
_____ Indicate a # from 0 – 25+

E. Autonomic dysreflexia
_____ Indicate a # from 0 – 25+

F. Deep vein thrombosis
_____ Indicate a # from 0 – 25+

G. Cardiovascular disease
_____ Indicate a # from 0 – 25+

H. Syringomyelia
_____ Indicate a # from 0 – 25+

I. Neuropathic spinal cord pain
_____ Indicate a # from 0 – 25+

J. Respiratory Dysfunction
_____ Indicate a # from 0 – 25+

K. Urinary tract infections
_____ Indicate a # from 0 – 25+

L. Osteoporosis or bone fractures
_____ Indicate a # from 0 – 25+

M. Repetitive motion injury/overuse syndrome
_____ Indicate a # from 0 – 25+

18. For the SECOND case scenario, please consider an otherwise healthy lifestyle male in his mid-20s with a T6 complete paraplegia of average height and weight with no pre-injury medical conditions or diseases. In your professional opinion, how ***likely*** will it be that the following secondary complications occur at least once in one's lifetime ***if reasonable and medically necessary life care planning preventive care and treatment measures are taken?***

A. Skin breakdown, decubitus ulcers, or pressure sores ***REQUIRING SURGERY***

○ 0% ○ 1-25% ○ 26-50 ○ 51-75% ○ 76-100%

B. Skin breakdown, decubitus ulcers, or pressure sores ***REQUIRING HOME WOUND CARE***

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

C. Pneumonia, Atelectasis, Aspiration

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

D. Heterotopic Ossification

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

E. Autonomic dysreflexia

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

F. Deep vein thrombosis

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

G. Cardiovascular disease

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

H. Syringomyelia

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

I. Neuropathic/Spinal Cord Pain

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

J. Respiratory Dysfunction

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

K. Urinary Tract Infections

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

L. Osteoporosis/fractures

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

M. Repetitive motion injury/overuse syndrome

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

19. Considering our same patient in scenario TWO with a T6 injury, how ***frequently*** are the following conditions likely to occur **<u>that</u>** **<u>require hospitalization and/or treatment</u>** in one's lifetime ***if reasonable and medically necessary life care planning preventive care and treatment measures are taken?***

A. Skin breakdown, decubitus ulcers, or pressure sores ***REQUIRING SURGERY***
_____ Indicate a # from 0 – 25+

B. Skin breakdown, decubitus ulcers, or pressure sores ***REQUIRING HOME WOUND CARE***
_____ Indicate a # from 0 – 25+

C. Pneumonia, Atelectasis, Aspiration
_____ Indicate a # from 0 – 25+

D. Heterotopic Ossification
_____ Indicate a # from 0 – 25+

E. Autonomic dysreflexia
_____ Indicate a # from 0 – 25+

F. Deep vein thrombosis
_____ Indicate a # from 0 – 25+

G. Cardiovascular disease
_____ Indicate a # from 0 – 25+

H. Syringomyelia
_____ Indicate a # from 0 – 25+

I. Neuropathic spinal cord pain
_____ Indicate a # from 0 – 25+

J. Respiratory Dysfunction
_____ Indicate a # from 0 – 25+

K. Urinary tract infections
_____ Indicate a # from 0 – 25+

L. Osteoporosis or bone fractures
_____ Indicate a # from 0 – 25+

M. Repetitive motion injury/overuse syndrome
_____ Indicate a # from 0 – 25+

20. On average, what percentage of your current/past life care plans have been plaintiff cases?

○ 0%
○ 1-25%
○ 26-50%
○51-75%
○76-100%

21. Which do you consider to be the bulk of your life care plans?

○ Plaintiff cases (more than 51%+ of the time)
○ Defense cases (more than 51%+ of the time)

22. When developing life care plans, have you ever felt the need or pressure to include any and all complications that are possible of occurring to increase cost when developing plans for **plaintiff** cases to obtain future employment by attorneys? *Note: Once again, this survey is strictly confidential. Your honest opinion and answer can help the life care planning community.*

○Yes
○ No

23. Please provide any additional comments regarding your above responses that require further clarification. Detailed responses are greatly appreciated.

____
____
____
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____
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____

PHYSIATRIST SURVEY

The subspecialty of Life Care Planning (LCP) in consultation with medical professionals aims to project, address, and financially account for an individual's future medical care needs by providing preventative recommendations such as annual physician visits, appropriate medications and supplies, needed home health care, annual diagnostic testing, medical monitoring, etc. Please address the following questions based on your overall education, training, and experience concerning the secondary complications of spinal cord injury and life care plans (LCPs). Please answer the survey even if you are not involved in any way with life care plans.

1. What is your gender?
   ○ Female
   ○ Male

2. Please specify your race/ethnicity. Select all that apply.
   ( ) White
   ( ) American Indian or Alaska Native
   ( ) Asian
   ( ) Black or African American
   ( ) Native Hawaiian or Pacific Islander
   ( ) Hispanic or Latino
   ( ) Other ___________________________

3. Are you a Board Certified in Physical Medicine and Rehabilitation?
   ○ Yes
   ○ No

4. Please check all that apply:
   ( ) I have worked at a SCI model system.
   ( ) I am currently working at a SCI model system.
   ( ) I have worked at a university hospital.
   ( ) I am currently working at a university hospital.
   ( ) I have never worked at any of the SCI medical systems above.

5. How would you describe your current employment status?
   ○ Employed full time as a Physiatrist and develop LCPs part time
   ○ Employed part time as a Physiatrist and full time develop LCPs
   ○ Employed full time as a Physiatrist but only consult on LCPs
   ○ A full or part time Physiatrist who is not involved in LCP

6. How many *(on average)* spinal cord injury patients do you see per year?
   ○ Less than 25
   ○ 26-50
   ○ 51-75
   ○ 76-100
   ○ 101 +

7. How many life care plans have you developed *(total to date)* for individuals with spinal cord injuries?

○ 1-25
○ 26-50
○ 51-75
○ 76-100
○ 101 +

8. When developing an SCI life care plan, I often include costs that are associated with:

○ Possible Secondary Complications (49% likelihood of occurrence or lower)
○ Probable Secondary Complications (51% likelihood of occurrence or higher)
○ Possible (49% or less) and Probable (51% and greater) Secondary Complications.

9. When developing life care plans, I typically (more than 51% of the time) include costs for future secondary complications related to spinal cord injury and other conditions ***only if*** they are deemed ***probable (51%)*** by a treating physician specialist**.**

○ Strongly Disagree
○ Disagree
○ Agree
○ Strongly Agree

10. I believe that life care plans should include costs for future secondary complications related to spinal cord injury and other conditions even if they are only ***possible (49%) so the funds will be there***.

○ Strongly Disagree
○ Disagree
○ Agree
○ Strongly Agree

11. When developing life care plans, I typically **(more than 51% of the time)** include costs for future secondary complications related to spinal cord injury and other conditions only if they are deemed **probable (51%)** by empirical statistics.

○ Strongly Disagree
○ Disagree
○ Agree
○ Strongly Agree

12. When developing life care plans, I typically (more than 51% of the time) include costs for future secondary complications related to spinal cord injury and other conditions ***only*** *if* they are deemed ***probable (51%)*** by empirical statistics **AND** a treating physician specialist.

○ Strongly Disagree
○ Disagree
○ Agree
○ Strongly Agree

13. When developing life care plans, I typically (more than 51% of the time) include costs for secondary complications related to spinal cord injury and other conditions ***only*** *if* they are deemed ***probable (51%)*** by empirical statistics **OR** a treating physician specialist.

○ Strongly Disagree
○ Disagree
○ Agree
○ Strongly Agree

14. On average, what percentage of your current/past life care plans have been plaintiff cases?

○ 0%
○ 1-25%
○ 26-50%
○51-75%
○76-100%

15. Which do you consider to be the bulk of your life care plans?

○ Plaintiff cases (more than 51%+ of the time)
○ Defense cases (more than 51%+ of the time)

16. When developing life care plans, have you ever felt the need or pressure to include any and all complications that are possible of occurring to increase cost when developing plans for **plaintiff** cases to obtain future employment by attorneys? *Note: Once again, this survey is strictly confidential. Your honest opinion and answer can help the life care planning community.*

○Yes
○ No

17. Describe your knowledge base regarding ***secondary complications*** (e.g., decubiti, UTI's, DVT) related to spinal cord injuries?

○ Poor
○ Fair
○ Good
○ Very Good
○ Excellent

18. Generally, how likely are secondary complications to occur if preventive are measures (regular MD visits, diagnostics, diligent home health care, diet, etc.) are taken?

○ 0%
○ 1-25%
○ 26-50%
○ 51-75%
○ 76-100%

19. Generally, how likely are secondary complications if preventive measures are NOT taken?

○ 0%
○ 1-25%
○ 26-50%
○ 51-75%
○ 76-100%

20. For the FIRST of two case scenarios, please consider an otherwise healthy lifestyle male in his mid-20s with a C5-C6 complete tetraplegia, of average height and weight with no pre-injury medical conditions or diseases. In your professional opinion, how likely will it be that the following secondary complications occur at least once in one's lifetime if reasonable and medically necessary life care planning preventive care and treatment measures are taken?

A. Skin breakdown, decubitus ulcers, or pressure sores ***REQUIRING SURGERY***

○ 0% ○ 1-25% ○ 26-50 ○ 51-75% ○ 76-100%

B. Skin breakdown, decubitus ulcers, or pressure sores ***REQUIRING HOME WOUND CARE***

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

C. Pneumonia, Atelectasis, Aspiration

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

D. Heterotopic Ossification

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

E. Autonomic dysreflexia

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

F. Deep vein thrombosis

○ 0% ○ 1-25% ○ 26-50 ○ 51-75% ○ 76-100%

G. Cardiovascular disease

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

H. Syringomyelia

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

I. Neuropathic/Spinal Cord Pain

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

J. Respiratory Dysfunction

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

K. Urinary Tract Infections

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

L. Osteoporosis/fractures

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

M. Repetitive motion injury/overuse syndrome

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

21.Considering our same patient in scenario ONE with a C5-C6 injury, how frequently are the following conditions likely to occur that require hospitalization and/or treatment in one's lifetime if reasonable and medically necessary life care planning care and treatment preventive measures are taken?

A. Skin breakdown, decubitus ulcers, or pressure sores ***REQUIRING SURGERY***
_____ Indicate a # from 0 – 25+

B. Skin breakdown, decubitus ulcers, or pressure sores ***REQUIRING HOME WOUND CARE***
_____ Indicate a # from 0 – 25+

C. Pneumonia, Atelectasis, Aspiration
_____ Indicate a # from 0 – 25+

D. Heterotopic Ossification
_____ Indicate a # from 0 – 25+

E. Autonomic dysreflexia
_____ Indicate a # from 0 – 25+

F. Deep vein thrombosis
_____ Indicate a # from 0 – 25+

G. Cardiovascular disease
_____ Indicate a # from 0 – 25+

H. Syringomyelia
_____ Indicate a # from 0 – 25+

I. Neuropathic spinal cord pain
_____ Indicate a # from 0 – 25+

J. Respiratory Dysfunction
_____ Indicate a # from 0 – 25+

K. Urinary tract infections
_____ Indicate a # from 0 – 25+

L. Osteoporosis or bone fractures
_____ Indicate a # from 0 – 25+

M. Repetitive motion injury/overuse syndrome
_____ Indicate a # from 0 – 25+

22. For the **SECOND case scenario**, please consider an otherwise healthy lifestyle male in his **mid-20s with a T6 complete paraplegia** of average height and weight with no pre-injury medical conditions or diseases. In your professional opinion, how likely will it be that the following secondary complications occur at least once in one's lifetime if reasonable and medically necessary life care planning preventive care and treatment measures are taken?

A. Skin breakdown, decubitus ulcers, or pressure sores ***REQUIRING SURGERY***

○ 0% ○ 1-25% ○ 26-50 ○ 51-75% ○ 76-100%

B. Skin breakdown, decubitus ulcers, or pressure sores ***REQUIRING HOME WOUND CARE***

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

C. Pneumonia, Atelectasis, Aspiration

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

D. Heterotopic Ossification

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

E. Autonomic dysreflexia

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

F. Deep vein thrombosis

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

G. Cardiovascular disease

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

H. Syringomyelia

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

I. Neuropathic/Spinal Cord Pain

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

J. Respiratory Dysfunction

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

K. Urinary Tract Infections

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

L. Osteoporosis/fractures

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

M. Repetitive motion injury/overuse syndrome

○ 0% ○ 1-25% ○ 26-50% ○ 51-75% ○ 76-100%

23. Considering our same patient in scenario **TWO with a T6 injury**, how frequently are the following conditions likely to occur that require **hospitalization and/or treatment in one's lifetime** if reasonable and medically necessary life care planning preventive care and treatment measures are taken?

A. Skin breakdown, decubitus ulcers, or pressure sores ***REQUIRING SURGERY***
_____ Indicate a # from 0 – 25+

B. Skin breakdown, decubitus ulcers, or pressure sores ***REQUIRING HOME WOUND CARE***
_____ Indicate a # from 0 – 25+

C. Pneumonia, Atelectasis, Aspiration
_____ Indicate a # from 0 – 25+

D. Heterotopic Ossification
_____ Indicate a # from 0 – 25+

E. Autonomic dysreflexia
_____ Indicate a # from 0 – 25+

F. Deep vein thrombosis
_____ Indicate a # from 0 – 25+

G. Cardiovascular disease
_____ Indicate a # from 0 – 25+

H. Syringomyelia
_____ Indicate a # from 0 – 25+

I. Neuropathic spinal cord pain
_____ Indicate a # from 0 – 25+

J. Respiratory Dysfunction
_____ Indicate a # from 0 – 25+

K. Urinary tract infections
_____ Indicate a # from 0 – 25+

L. Osteoporosis or bone fractures
_____ Indicate a # from 0 – 25+

M. Repetitive motion injury/overuse syndrome
_____ Indicate a # from 0 – 25+

24. Please provide any additional comments regarding your above responses that require further clarification. Detailed responses are greatly appreciated.

BIOGRAPHICAL SKETCH

Noel Arnoldo Ysasi Jr. served the military armed forces from 1996-2000 and after his honorable discharge, he immediately enrolled at the University of Texas – Pan American (UTPA) and graduated in 2005 with a double major and minor: Bachelor of Arts in Psychology, Sociology, and Criminal Justice, respectively. In 2007, Noel graduated with a Master of Science in Rehabilitation Counseling and completed his doctoral degree within the Department of Rehabilitation at UTPA in 2015. During his time at the university, Noel worked as a vocational expert with Marini and Associates, was a professional guidance counselor within the College of Business in 2007 until 2009, and shortly after, became the Manager for the Veterans Services Center at UTPA. During his time as manager, he provided an array of services for veterans within the university, earning him a lifetime achievement award by the Veterans Affairs in 2012. Throughout his time at UTPA, he instructed nine different courses at the undergraduate level and co-instructed four graduate courses. As a doctoral student, he published nine refereed articles and book chapters with 12 additional articles/studies in progress at the time of his doctoral completion. In 2015, he was awarded the American Rehabilitation Counseling Association Doctoral Student of the Year and the National Council on Rehabilitation Education Doctoral Student of the Year.