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Recommended Citation

Ysasi, N. A., Marini, I., McDaniels, B., Chen, R. K., Dunkley, L., & Kerwin, S. (2016). Physiatrists' Professional Opinions of Secondary Complications After SCI. *Journal of Life Care Planning*, 14(1), 59–70.

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Physiatrists' Professional Opinions of Secondary Complications After SCI

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Abstract

The professional opinions of physiatrists were collected to ascertain the likelihood of occurrence, frequency of hospitalization, and treatment required as a direct result of 13 secondary complications (SCs) of two otherwise healthy males in their mid-20s, one with a C5-C6 tetraplegia and the other with T6 paraplegia spinal cord injury. Physiatrists responded to our online survey and overall, a general consensus was found among practitioners. Descriptive statistics was implemented with details outlining the frequency, mean, standard deviations, and the probability (51% or greater) versus possibility (50% or less) of SC occurrence is provided. Implications for life care planners and recommendations for future research are discussed.

Keywords: Spinal Cord Injury; secondary complications; physiatrists; life care planning

Physiatrists' Professional Opinions of Secondary Complications After SCI

In 2013, the estimated number of persons living with a spinal cord injury (SCI) within the United States was approximately 238,000 to 332,000 (National SCI Statistical Center, 2013). Published reports by the National Spinal Cord Injury Statistical Center (2013) indicate the overall annual rate of hospitalized individuals with a SCI is approximately 40 cases per every one million or roughly 12,000 new cases each year in the United States. Etiological differences in SCI are apparent upon initial examination with the most prevalent cause resulting from motor vehicle accidents (36.5%), falls (28.5%), and acts of violence and sports-related injuries (9.2%). Furthermore, the most frequently occurring neurological level of lesion utilizing the American Spinal Injury Association (ASIA) Impairment Scale has been reported as follows: incomplete tetraplegia (40.6%); incomplete paraplegia (18.7%); complete paraplegia (18.0%); and complete tetraplegia (11.6%) (National Spinal Cord Injury Statistical Center, 2013).

Often, spinal cord injured individuals seek long-term medical treatment from physiatrists, practitioners with expertise in physical medicine and rehabilitation (PM&R) among areas that include but are not limited to traumatic brain injury, sports medicine, and SCI. Physiatrists assist

towards the medical diagnosis, implementation of preventative measures, and treatment for secondary complications (SCs), a direct result of the SCI. This group of specialized medical practitioners often treat patients directly or collaborate with a multidisciplinary team in an effort to reduce health impediments (Physical Medicine and Rehabilitation, 2015); all based on the individual needs of the patient. Awareness of the most commonly occurring complications as a direct result of SCI is critical towards the development of a proactive, preventative-of-complications life care plan and improved quality of life. According to the *Standards of Practice for Life Care Planners* (IARP, 2015), the first goal of a life care plan is "to assist the evaluatee [defined as the person who is the subject of the life care plan] in achieving optimal outcomes by developing an appropriate plan of rehabilitation, prevention, and/or reduction of complications (Section II, A)."

Secondary complications have been defined as either physical (i.e., respiratory dysfunction, urinary tract infection, repetitive motion injury, etc.) or mental health conditions (i.e., depression, PTSD, etc.) resulting in functional limitations, impairments, and even increase the risk for additional disabilities (World Health Organization [WHO], 2013). Furthermore, it is the existence of a primary disability such as SCI that facilitates high risk factors for SC; therefore, a SC that does occur is specifically the result of the primary condition or it otherwise would not normally have been acquired (Pope & Tarlov, 1991). For individuals with SCI, nearly 95% sustain at least one SC as a direct result of their injury. 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). This special edition of the *Journal of Life Care Planning* provides a comprehensive literature review on 13 SCs while exploring differences between age of onset, minority status, smoking/alcohol use, gender, time since injury, comorbid disabilities, and severity and completeness of injury.

According to the World Health Organization (2013), the most commonly occurring SCs 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. 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 life care plan (Myers, Andresen, & Hagglund, 2000). Although the specialization of life care planning has developed over the last 30 years through establishing a standard, methodological protocol for developing life care plans (Weed & Berens, 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 due to the opposing experts frequently relying upon different information when considering the inclusion or not of SC into the life care plan.

The present study aimed to collect the professional opinions of physiatrists not involved in life care planning as to the likelihood of occurrence, frequency of hospitalization, and treatment of two otherwise healthy males in their mid-20s, one with a C5-C6 tetraplegia and the other with T6 paraplegia level of injury, respectively. Physiatrists were asked to rate each of these hypothetical cases in relation to the following 13 SCs:

1. Skin breakdown requiring surgery
2. Skin breakdown 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/bone fractures
13. Repetitive motion injury/overuse syndrome

The purpose of the study was an effort to obtain not only the professional opinions of medical experts who specialize in SCI, but attain objective and impartial estimations for the aforementioned SCs occurring within one's lifetime.

Method

Participants

A total of 71 physiatrists participated in this study. Although detailed demographics are provided in Table 1, approximately 51% ($n = 36$) were male, 58% ($n = 41$) Caucasian, followed by 28% ($n = 20$) Asian. Of the total number of participants, 72% ($n = 51$) reported being board-certified. Regarding employment history, 66% stated having worked at a SCI model system, 39% were currently employed at a SCI model system at the time of the study, and had either worked ($n = 41$; 58%) or were currently working ($n = 38$; 54%) at a university hospital. Details outlining participant demographics can be found in Table 1. Self-reported knowledge of SCs related to spinal cord injuries is reported as the following: Poor ($n = 2$; 2.8%); Fair ($n = 2$; 2.8%); Good ($n = 17$; 24%); Very Good ($n = 24$; 34%); Excellent ($n = 26$; 37%).

Table 1

Physiatrist Participant Demographics

<i>Identified Demographic</i>	<i>n</i>	<i>%</i>
Race/Ethnicity		
Caucasian (non-Hispanic)	41	58
African-American	3	4
Hispanic	6	9
Asian	20	28
Gender		
Male	36	51
Female	35	49
Certified vs. Non-Certified		
Board Certified Physiatrist	51	72
Non-Board Certified Physiatrist	20	28
Area of Employment (Multiple Answer Choices Were Allowed)		
I have worked at a SCI model system.	47	66
I am currently working at a SCI model system.	28	39
I have worked at a university hospital.	41	58
I am currently working at a university hospital.	38	54
I have never worked at any of the SCI medical systems above.	5	7
Spinal cord injury patients seen per year		
Less than 25	6	9
26-50	3	4
51-75	4	6
76-100	8	11
101+	15	21
Total	N = 71	

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

Instrumentation

The survey contained demographic questions requesting gender, age, race/ethnicity, whether board certified or not, assessing previous or current experience working at a SCI Model System Rehabilitation Hospital, incurring if physiatrists are currently employed at a university hospital, and employment status (i.e., part-time or full-time physiatrist). Following the demographic questionnaire, four scenarios were given (two involved a male with C5-C6 injury and two involved a male with a T6 complete paraplegia injury). The first pertained to an individual with C5-C6 tetraplegia and queried respondents on a five-point Likert scale (0%, 1%-25%, 26%-50%, 51%-75%, and 76%-100%) regarding the previously listed 13 SCs of SCI and their legally defined possibility versus probability of occurrence.

Specifically, the first case scenario asked the following: *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?

The second case scenario involved the same patient from scenario one; however, respondents were given numerical answer choices ranging from 0-25+. Specifically, the case scenario 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 and treatment preventative measures are taken?*

The third case scenario involved an individual with T6 complete paraplegia and queried respondents on a five-point Likert scale (0%, 1%-25%, 26%-50%, 51%-75%, and 76%-100%) regarding 13 secondary complications of SCI. Specifically, the scenario asked the following: *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 fourth case scenario centered on the aforementioned patient with a T6 complete paraplegia injury; however, respondents were given answer choices ranging from 0-25+. Specifically, the case scenario asked the following: *Considering our same patient in scenario three 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 and treatment preventative measures are taken?*

Procedure

This study was conducted using the Qualtrics™ online survey, a web-based survey site for researchers. The study was anonymous, with physiatrists notified of the research questionnaire in a variety of ways that included both email and posting the link of the survey to their listserv. Prospective participants' contact information was obtained through 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.

Data Analysis

The data analysis conducted necessitated the use of descriptive statistics for demographic questions including gender, race/ethnicity, certified versus non-certified, employment, patients seen per year, and of all four case scenarios. This research aimed only to investigate how physiatrists report the likelihood and frequency of 13 SCI secondary complications occurring within one's lifetime. Initial data screening was conducted to ensure data were imported correctly and to remove any unsuitable cases.

Results

Likelihood of SC for C5-C6 Injury (Scenario 1)

Regarding the likelihood of SCs for persons with a C5-C6 level of injury (answer choices included a five-point Likert scale: 0%, 1%-25%, 26%-50%, 51%-75%, and 76%-100%), 54 physiatrists responded to the scenario and reported 10 SCs as meeting the possibility threshold (less than 50% chance of occurrence). However, three SCs were reported as meeting the probability (51% or greater) threshold by slightly more than half of respondents. These included neuropathic pain ($n = 27$; 50.9%), urinary tract infection ($n = 32$; 60.4%), and osteoporosis ($n = 27$; 50.9%). Table 2 provides means, standard deviations, and frequencies for all 13 SCs related to Scenario 1.

Table 2

Descriptive statistics for Scenario 1: Likelihood of secondary complications (C5-C6 injury)

Secondary Complications	0%		1-25%		26-50%		51-75%		76-100%		Total
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)		
Skin breakdown requiring surgery (SB-Sx)	2 (3.7)	36 (66.7)	11 (20.4)	4 (7.4)	1 (1.9)	54					
Skin breakdown requiring HWC (SB-HWC)	N/A	18 (34.0)	17 (32.1)	10 (18.9)	8 (15.1)	53					
Pneumonia, Atelectasis, Aspiration (PNA)	N/A	23 (44.2)	14 (26.9)	9 (17.3)	6 (11.5)	52					
Heterotopic Ossification (HO)	1 (1.9)	41 (75.9)	11 (20.4)	1 (1.9)	N/A	54					
Autonomic dysreflexia (AD)	N/A	14 (26.4)	17 (32.1)	13 (24.5)	9 (17.0)	53					
Deep vein thrombosis (DVT)	1 (1.9)	36 (67.9)	13 (24.5)	3 (5.7)	N/A	53					
Cardiovascular disease (CVD)	N/A	20 (37.7)	16 (30.2)	11 (20.8)	6 (11.3)	53					
Syringomyelia (SMI)	2 (3.8)	44 (83.0)	5 (9.4)	2 (3.8)	N/A	53					
Neuropathic/Spinal Cord Pain (NP)	N/A	12 (22.6)	14 (26.4)	17 (32.1)	10 (18.9)	53					
Respiratory Dysfunction (RD)	1 (1.9)	17 (32.1)	14 (26.4)	11 (20.8)	10 (18.9)	53					
Urinary Tract Infections (UTI)	N/A	7 (13.2)	14 (26.4)	6 (11.3)	26 (49.1)	53					
Osteoporosis/fractures (OP/Fx)	N/A	10 (18.9)	16 (30.2)	13 (24.5)	14 (26.4)	53					
Repetitive motion injury/overuse syndrome (RMI)	2 (3.8)	13 (24.5)	18 (34.0)	9 (17.0)	11 (20.8)	53					

Frequency of SCs for C5-C6 Injury (Scenario 2)

For the frequency of SCs for a person with a C5-C6 level of injury, physiatrists were given a numerical range consisting of 0-25+. A total of 54 physiatrists responded to the scenario question. Highest ratings included the following SCs: urinary tract infection ($M = 15.9$, $SD = 8.7$), neuropathic pain ($M = 10.8$, $SD = 9.8$), and autonomic dysreflexia ($M = 10.5$, $SD = 9.6$). Remaining SCs were reported in the single digits with lowest frequency ratings for deep vein thrombosis ($M = 3.0$, $SD = 3.5$), syringomyelia ($M = 3.0$, $SD = 5.8$), skin breakdown requiring surgery ($M = 2.9$, $SD = 3.9$), and heterotopic ossification ($M = 2.7$, $SD = 4.0$). Table 3 provides means, standard deviations, and frequencies for all 13 SCs related to Scenario 2.

Descriptive statistics for Scenario 2: Frequency of secondary complications (C5-C6 injury)

		Md	M (SD)	n	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	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	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	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	0	0	1
AD	10.5 (9.6)	25	2	4	2	3	3	5	2	1	2	0	6	0	0	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	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	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	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	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	0	1	0	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	0	6	0	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	1	0	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	0	1	0	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.

Likelihood of SCs for T6 Injury (Scenario 3)

For scenario three, answer choices included the following: a five-point Likert scale (0%, 1%-25%, 26%-50%, 51%-75%, and 76%-100%). On average, the vast majority of all physiatrists reported the likelihood of SCs as meeting the *possibility* threshold. Specifically, 100% ($n = 54/53/52$) of respondents indicated a less than 50% chance for the resulting seven SCs: (1) skin breakdown requiring surgery, (2) pneumonia, (3) heterotopic ossification, (4) autonomic dysreflexia, (5) deep vein thrombosis, (6) syringomyelia, and (7) respiratory dysfunction. Skin breakdown requiring home wound care was reported by physiatrists at a range of 0-50% ($n = 51$; 96.2%), cardiovascular disease ($n = 48$; 88.9%), neuropathic pain ($n = 46$; 86.8%), and osteoporosis/bone fractures ($n = 46$; 88.5%), followed by repetitive motion injury and urinary tract infection at 69.2% ($n = 36$) and 69.8% ($n = 37$), respectively. Table 4 provides means, standard deviations, and frequencies for all 13 SCs related to Scenario 3.

Descriptive statistics for Scenario 3: Likelihood of secondary complications (T6 injury)

Secondary Complications	Likelihood of secondary complications (T6 injury)					Total
	0%	1-25%	26-50%	51-75%	76-100%	
	n (%)	n (%)	n (%)	n (%)	n (%)	
Skin breakdown requiring surgery (SB-Sx)	35 (64.8)	16 (29.6)	3 (5.6)	N/A	N/A	54
Skin breakdown requiring HWC (SB-HWC)	24 (45.3)	17 (32.1)	10 (18.9)	2 (3.8)	N/A	53
Pneumonia, Atelectasis, Aspiration (PNA)	39 (72.2)	12 (22.2)	3 (5.6)	N/A	N/A	54
Heterotopic Ossification (HO)	37 (68.5)	17 (31.5)	N/A	N/A	N/A	54
Autonomic dysreflexia (AD)	39 (72.2)	13 (24.1)	2 (3.7)	N/A	N/A	54
Deep vein thrombosis (DVT)	32 (59.3)	18 (33.3)	4 (7.4)	N/A	N/A	54
Cardiovascular disease (CVD)	21 (38.9)	15 (27.8)	12 (22.2)	6 (11.1)	N/A	54
Syringomyelia (SMI)	46 (86.8)	6 (11.3)	1 (1.9)	N/A	N/A	53
Neuropathic/Spinal Cord Pain (NP)	14 (26.4)	15 (28.3)	17 (32.1)	7 (13.2)	N/A	53
Respiratory Dysfunction (RD)	38 (71.7)	12 (22.6)	3 (5.7)	N/A	N/A	53
Urinary Tract Infections (UTI)	9 (17.3)	13 (25.0)	14 (26.9)	16 (30.8)	N/A	52
Osteoporosis/fractures (OP/Fx)	15 (28.8)	21 (40.4)	10 (19.2)	6 (11.5)	N/A	52
Repetitive motion injury/overuse syndrome (RMI)	5 (9.4)	16 (30.2)	16 (30.2)	16 (30.2)	N/A	53

Scenario four sought to investigate the frequency of SCs for a person with a T6 level of injury if preventative measures are taken. Participants were given answer choices that consisted of a numerical value ranging from 0-25+. Highest frequency rating occurred for the SC urinary tract infection ($M = 14.7$, $SD = 9.2$) and repetitive motion injury ($M = 9.6$, $SD = 8.7$). More than 50% of physiatrists reported the following with a numerical range of 0-3: (1) skin breakdown requiring surgery, (2) pneumonia, (3) heterotopic ossification, (4) autonomic dysreflexia, (5) deep vein thrombosis, (6) cardiovascular disease, (7) syringomyelia, (8) respiratory dysfunction, and (9) osteoporosis/bone fractures. Table 5 provides means, standard deviations, and frequencies for all 13 SCs related to Scenario 4.

Descriptive statistics for Scenario 4: Frequency of secondary complications (T6injury)

	$M(SD)$		n																									
	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	2.6(4.1)	1	9	20	9	0	0	3	1	0	0	3	0	0	0	0	1	0	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	1	0	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	2	0	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	1	0	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	1	0	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.

Discussion

This is a first-time study designed to solicit the opinions of practicing physiatrists who are not involved in the life care planning field regarding the likelihood of occurrence and frequency of hospitalization and treatment of two otherwise healthy males in their mid-20s, one with a C5-C6 tetraplegia and the other with T6 paraplegia level of injury. Physiatrists were asked to rate each of these four hypothetical cases in relation to 13 SCs of SCI. As expected and generally empirically supported in the prevalence literature (Blackwell, Krause, Winkler, & Steins, 2001; Garschick et al., 2005; Jensen et al., 2012; Krause, 1996; Krause, Saunders, DiPiro, & Reed, 2013), persons with tetraplegia statistically succumb to more SCs on average than those with paraplegia. Specifically, participants endorsed a greater likelihood and frequency of occurrence of SCs for the hypothetical individual with tetraplegia.

In terms of the C5-C6 hypothetical case, almost slightly more than half of physiatrists endorsed a 51% or greater probability of neuropathic pain and osteoporosis; while over 60% of respondents endorsed the likelihood of a urinary tract infection (UTI). These three complications are generally supported in the empirical literature as co-occurring conditions, but not in all cases (i.e., dependent upon health status at time of injury, gender, level of injury, etc.). The T6 injury case scenario, however, had all physiatrists indicating a less than probable likelihood of any of the SCs occurring within a certain degree of medical probability over one's lifetime. Regarding the frequency of SCs occurring, greater than 50% of physiatrists reported 0 to 3 episodes of skin breakdown requiring surgery, pneumonia, heterotrophic ossification, autonomic dysreflexia, deep vein thrombosis, cardiovascular disease, syringomyelia, respiratory dysfunction, and osteoporosis/bone fractures occurring over one's lifetime. The highest mean for the T6 group was 14.7 episodes of UTI and 9.6 average incidences of repetitive motion injury. Although this may appear to be contradictory to their less than 51% response to any of the 13 SCs occurring, many did respond with a 1%-25% and 26%-50% incidence rate.

Considering osteoporosis, Morse et al. (2008) found 54% of 128 medical practitioners had ordered osteoporosis medication for their SCI patients and 78% had ordered physical therapy. Furthermore, 79% of the medical providers reported treating patients with SCI for osteoporosis-related fractures. Similarly, Lazo et al. (2001) studied 41 males and found 61% met the criteria for osteoporosis and 34% of these patients had sustained a lower extremity bone fracture post-injury primarily from a wheelchair fall. Overall, the majority of treating physicians tend to agree on a probable incidence of osteoporosis for patients with SCI (Zehnder et al., 2004), although far fewer occurrences of bone fracture occur as a result of osteoporosis (Lazo et al., 2001; Vestergaard, Krogh, Rejnmark, & Mosekilde, 1998). However, research has suggested preventative measures can be taken to reduce the

likelihood of osteoporosis of actually occurring or decreasing the time for it to transpire. Furthermore, gender and level of injury can be a predictive factor for the increase likelihood of this SC arising. Specifically, females and persons with a higher level of SCI (i.e., C5-C6) are at a higher risk for osteoporosis.

Neuropathic pain (NP), however, does not have a consistent body of literature supporting a 51% or higher probability of severe chronic pain experience among persons with SCI. Blackwell et al. (2001) discuss an overall range between 34%-94% across a multitude of studies, but specify that of the samples, 25%-45% of patients across research findings indicate the pain is severe enough to negatively impact quality of life and activities of daily living. Werhagen, Budh, Hulting, and Molander (2004) studied 402 SCI patients over a five-year period and found 40% met the criteria for NP; the incidence rate increased among persons aged 50+ (58%) and decreased for those under the age of 19 (26%). Werhagen, Hulting, and Molander (2007) performed a follow-up study among 95 patients with a SCI, overall reporting a 38% neuropathic pain incidence. Siddall, Taylor, McClelland, Rutkowski, and Cousins (1999) similarly reported a 38% incidence rate of NP that remained constant six months post injury. Overall, various factors tend to be contributors towards higher frequencies of NP.

Regarding UTI, the likelihood and frequency rate was the highest endorsed SC by 60% of respondents who reported an average of 15.9 episodes over one's lifetime. When considering UTI, researchers often focus on hospital-based bacteria; a type of voiding method (i.e., catheterizing, condom drainage, indwelling catheter, etc.) and asymptomatic bacteria (ASB) that is present but does not translate into UTI symptoms (Goetz et al., 2013). For example, Weld and Dmochowski (2000) studied the medical records of 314 persons with SCI and found 53.5% of UTIs were recorded for those using indwelling catheters, 27.2% for those who were intermittently catheterized, 32.4% who used condom drainage, and 44.4% for individuals who used a suprapubic catheter. Togan, Azap, Durukan, and Arslan (2014) conducted a retrospective study with 93 patients with SCI, finding 67.5% had ASB, but only 22.6% of the sample had contracted a UTI.

Having a history of UTI following SCI is often predictive of future UTI problems. Barboi and Peruzzi (2003) and Opperman (2010) discuss a 57% incidence rate of UTI post injury during acute hospitalization care with UTI being the primary cause for re-hospitalization thereafter. However, researchers cited a lower community incidence of 1.82 to 2.6 reported UTI episodes per year among the populations they studied. Generally, UTI incidence with symptoms does not appear in the literature as meeting the probability threshold; however, hospitalization and method of voiding has shown to be a determining factor towards meeting the probability level. The physiatrist's opinion in this instance is not consistently supported by the UTI

literature we explored.

Implications for Life Care Planners

Life care planners now have for the first time the collective opinions of over 50 physiatrists who do not operate as a life care planner and have provided objective and impartial opinions based on their education, training, and experience regarding the occurrence and frequency of 13 SCs of SCI. Although it might be tempting to include a number of these SCs and their related costs into a SCI life care plan, decisions should be based on the individual needs and differences for each client. This consideration of individual factors is echoed in the consensus and majority statements promulgated by the previously-held Life Care Planning Summits, 2000-2015; specifically No. 50 "Life Care Plans shall be individualized" (Johnson, 2015). Instead, however, this information can create a better consultation dialogue with a treating physician, independent medical examiner (IME), or physiatrist in relation to the patient in which a life care plan is being developed. Specifically, having a better grasp of the SC literature contained in this special issue, in addition to the physiatrist opinions and the patient's medical history, life care planners can discuss the likely future probability of the higher endorsed SCs cited in the current study and whether or not to include the costs for one or more probable future complications.

Limitations of the Study

A number of limitations to the research conducted limit generalizability to the results. Secondary complications of SCI in the present study were only related for two mid-20s otherwise healthy males with C5-C6 tetraplegia and T6 paraplegia. As such, and noting that each individual will have a number of differing premorbid characteristics, generalizability to individuals not falling within this age range is limited. Although a thorough review of literature was conducted for SCI and SCs, not all studies were obtained due to unavailability and/or cost required for purchase. In addition, some SCs should have been separated or removed; for example, osteoporosis/bone fractures. More specifically, a person who acquires osteoporosis may be at higher risk for bone fractures; however, they are two separate and distinct SCs. Other limitations include potential gender bias, since no female case scenarios are included and thus generalizability to female SCI patients may be limited, and the use of a small sample/respondent size ($n = 71$).

Conclusion

Mean scores fell in the majority range among practicing physiatrists for either a possible or probable likelihood of SCs of actually occurring. For example, even though differences existed among practitioners, a general consensus was reported as either possible or probable for specific SCs. Only three SCs were endorsed with a probability threshold for the case scenario of a C5-C6 level of injury; these

included UTI, neuropathic pain, and osteoporosis. Osteoporosis appears to have the strongest empirical support in the literature for a probability of occurrence, while UTI and neuropathic pain have some support for a probability level, but not a consistent base of empirical support. At a minimum, these findings can assist life care planners in opening up a dialogue with a patient's treating physician, independent medical evaluator, and/or physiatrist in determining future SCs and their probability or possibility of occurrence for individuals with SCI.

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