

SECONDARY HEALTH CONDITIONS IN INDIVIDUALS WITH ACQUIRED LONG-TERM DISABILITIES

MARLENA DUDA

Maria Curie-Skłodowska University, ul. Narutowicza 12, 20-004 Lublin, Poland,
contact: marlena.duda@poczta.umcs.lublin.pl

Received: 04.01.2021.

Accepted: 27.04.2021.

Review article

UDK: 613-056.26

doi: <https://doi.org/10.31299/hri.57.1.9>

Abstract: *The aim of this study is to advance our understanding of the secondary health conditions (SHCs) experienced by individuals with acquired long-term disabilities. This review is based on published literature and addresses the nature and perspectives associated with the phenomenon of disability, as well as the terminology used to describe it. The current understanding of SHCs limits and explains the range of information on somatic and mental illness with respect to the following criteria: SHCs are secondary to the primary disorder; they are preventable and modifiable, they manifest in different ways and for different durations of time, and that they exacerbate the severity of the primary condition. This review attempts to describe particular aspects associated with functioning in the context of acquired physical disabilities, practical implications of research on this subject, and perspectives for the future.*

Keywords: *secondary health condition, long-term disability, acquired disability*

INTRODUCTION

Developing a permanent physical disability is among the most traumatic life experiences that one can face. The prevalence of this phenomenon (Jazayeri, Beygi, Shokraneh, Hagen, & Rahimi-Movaghar, 2015) is illustrated by the fact that, on average, 500,000 people across the globe sustain a spinal cord injury each year; this results in permanent impairment of mobility (Simpson, Eng, Hsieh, & Wolfe, 2012) and significant psychosocial consequences manifesting as restrictions in autonomy and participation (Dijkers, Yavuzer, Ergin, Weitzenkamp, & Whiteneck, 2002; Hilberink, van der Slot, & Klem, 2016; Larsson Lund, Nordlund, Bernspång, & Lexell, 2007; Larsson Lund, Nordlund, Nygård, Lexell, & Bernspång, 2005; Magasi, Heinemann, & Whiteneck, 2008). Disabilities occur as a result of pathogenic, neurodegenerative, or environmental factors, and may be both chronic (e.g., progressive loss of performance in the course of multiple sclerosis) and rapid (e.g., as a result of amputation, stroke, or spinal cord injury) in nature.

The International Classification of Functioning, Disability, and Health (ICF, 2001) provides a definition of the modern framework of thinking about disability, and emphasises both the biological and social dimensions of limitations in human functioning. According to the functional approach, acquired disability (as opposed to inborn disability) is a result of external factors that can damage the structure and functioning of the body during one's lifetime (ICF, 2001). It is accompanied by a wide range of contextual factors and leads to a permanent change in one's activities and social participation (Byra, 2016, 2019a, 2019b; Byra & Duda, 2019). Research on acquired disabilities has consistently demonstrated the importance of the negative and positive consequences of long-term disabilities on one's psychological and physical adjustment. The presence of secondary health complications can exacerbate the negative consequences or make it more difficult to create positive ones.

Understanding the different consequences related to acquired physical disabilities and the impact of secondary health complications allows for an effective intervention. Among the key features

characterising the phenomenon of acquiring a permanent physical disability is the process of psychosocial adaptation to living one's life after accepting all consequences (Livneh & Martz, 2014, 2016; Livneh, McMahon, & Rumrill Jr., 2019; Martz & Livneh, 2016; Martz, Livneh, Priebe, Wuermser, & Ottomanelli, 2005), as well as being open to post-traumatic growth, (Byra, 2016, 2019a; Byra, Mróz, & Kaleta, 2020; Kalpakjian et al., 2014; Kunz, Joseph, Geyh, & Peter, 2017, 2019; Martz, Livneh, Southwick, & Pietrzak, 2018), dealing with different types of injuries (Byra, 2019a), and the temporal dimension of acquiring disabilities (age, duration) (Byra & Duda, 2019; Kalpakjian et al., 2014; Molton & Jensen, 2010). When we describe the consequences of an acquired permanent motor disability, it is important to note that all factors contributing to the patient's post-injury health status are equally critical. Owing to the current advances in medicine and technology, individuals with acquired disabilities have access to higher quality treatment, care, and rehabilitation. Consequently, the life expectancy of patients is longer, which in turn brings about a number of different phenomena characterising the life-long psychosocial functioning of human beings (Adriaansen et al., 2013, 2016; Barker et al., 2009; Charlifue, Weitzenkamp, & Whiteneck, 1999; Kennedy, Kilvert, & Hasson, 2016). Hence, "an understanding of the health status, long-term care needs, and secondary complications is essential to inform prevention care practice" (Pilusa, Myezwa, & Potterton, 2019, p. 1). One of the specific properties characterising the functioning of individuals with long-term physical disabilities is the development of secondary health conditions (Battalio, Jensen, & Molton, 2019; Brinkhof et al., 2016).

SECONDARY HEALTH CONDITIONS – DEFINITION

Individuals with long-term motor disabilities develop multiple physical (Bauman, 2006; Esclarin De Ruz, García Leoni, & Herruzo Cabrera, 2000; Jensen et al., 2012; Joseph & Nilsson Wikmar, 2016; Kinne, 2008; Krause & Broderick, 2004; Suzuki, Krahn, McCarthy, & Adams, 2007) and mental disorders (Kemp, 2006; Peter et al., 2015; Peterson, Kamdar, Chiodo, & Tate, 2020; Psarra & Kleftras, 2013). As a consequence, they are more

prone to social limitations (Kinne, Patrick, & Doyle, 2004) associated with their health status (Marge, 2008). Empirical studies involving individuals with acquired physical disabilities reveal high incidence rates of health conditions related to the primary disorder, including chronic pain, fatigue, muscle spasms, pressure ulcers, spasticity, osteoporosis, bowel and bladder problems, fall-related injuries, heart burn, weight problems, sleep problems, anxiety, and depressive symptoms (Bauman, 2006; Chien, Wu, & Chang, 2017; Coyle, Santiago, Shank, Ma, & Boyd, 2000; Hetz, Latimer, Arbour-Nicitopoulos, & Martin Ginis, 2011; Hughes, Swedlund, Petersen, & Nosek, 2001; Noreau, Proulx, Gagnon, Drolet, & Laramée, 2000; Nosek et al., 2006; Pilusa et al., 2019; Ravesloot, Seekins, & Walsh, 1997; J. H. Rimmer, Chen, & Hsieh, 2011; Vogeli et al., 2007; Wilber et al., 2002). These conditions can exacerbate the overall health status of the patient (Havercamp, Scandlin, & Roth, 2004; Kinne, 2008), aggravate the disability, and increase mortality rates (Kinne et al., 2004, p. 443; Whiteneck et al., 1992; Wilber et al., 2002). The ubiquity of this phenomenon was further confirmed by Kinne et al. (2004), whose research shows that over 87% of respondents with disabilities (n = 545) reported experiencing at least one SHC. Researchers additionally concluded that as many as 73% of the respondents from the disability group reported several conditions, and more than 25% experienced, on average, nine disorders (Kinne, 2008). Therefore, SHCs continue to be problematic in approx. 20% of the population with acquired disabilities (Chiodo et al., 2007).

Previous literature states that SHCs encompass a wide spectrum of health problems that directly or indirectly accompany acquired (Marge, 1988, 2008). The term was first listed in the ICF under the body functions and structures category. It was subsequently broadened to encompass autonomy and participation, which is a reflection on two separate dimensions of the problem: the somatic and the mental disorders (Chan et al., 2005; Marge, 1988, 2008; Seekins, Clay, & Ravesloot, 1994; Turk, 2006). More recently, the social dimension has also been taken into account (Coyle et al., 2000; Lollar, 2001). This approach combines organic damage with psychological and social problems (Campbell, Sheets, & Strong, 1999; Seekins et al., 1994; White,

Gutierrez, & Seekins, 1996). The last of the listed dimensions remains a point of contention, since it is considered to be a repetition of certain elements that have previously been included in the definition of disability. Hence, “issues related to quality of life and social participation were not included under the classification of secondary conditions, because they were already an integral part of the paradigm for the development of an effective habilitation or rehabilitation program of therapy” (Marge, 2008, p. 68). According to Rimmer et al. (2011, p. 1730), “in the former definition, only physical and mental health conditions are considered secondary conditions”.

In the end, the term “secondary health conditions” was coined to emphasize both the secondary relationship to the primary disorder, as well as its link to the biopsychosocial dimension of health as classified by ICF (2001). Despite these guidelines, some researchers have defined SHCs as problems that may range from medical complications to psycho-social adjustments, resulting directly or indirectly from an initial impairment (Kinne, 2008; Kinne et al., 2004). This is due to a wide range of health problems occurring in the biological, psychological, and social fields, which in turn affect the general state of health, autonomy, and participation of these individuals in family and social situations.

Marge (2008) calls for extreme precision when defining SHCs, highlighting that maintaining the original terminology will be beneficial for diagnostics and rehabilitation: “A secondary condition is a disease adversely affecting mental and/or physical health and has the following characteristics: 1) It is the result of increased risk or susceptibility to such health conditions caused by the primary disability; 2) The primary disability could be adventitious or congenital; 3) It is distinguished from other health conditions by the lapse in time from the acquisition of the primary disability to the occurrence of the condition; 4) It may exacerbate the primary disability, increasing the level of dysfunction; 5) Many of the identified secondary conditions are considered preventable; and 6) Knowledge about the specific additional health complications related to the primary disability has major implications for developing a program of disease prevention and health promotion for the individual in a program of habilitation or rehabilitation” (Marge, 2008, p. 68).

Previous studies have debated in detail about the meaning of the term “secondary health conditions” (Institute of Medicine, 1991, 2007; Nosek et al., 2006; J. H. Rimmer et al., 2011; Seekins et al., 1994). Sustaining a permanent injury to the motor system is not equivalent to the development of secondary disability, and not every health problem developed by an individual with a disability can be described as a SHC. The remarkable discrepancy when it comes to terminology is, thus, a reflection of the complicated nature of this phenomenon and the limited pool of research focusing on specific types of disability. A majority of the currently available definitions do not describe the full spectrum of the problem, and focus solely on selectively chosen disease entities and their effect on functioning. This approach is evident in the published literature about this subject.

The range of diseases listed as SHCs is expanding continuously, owing to intense clinical trials whose outcomes suggest that some entities that were previously considered as being unrelated to primary disabilities are, in fact, determined by it. This can occur in the case of diabetes (Cragg & Krassioukov, 2012; Cragg et al., 2013) or neurological disorders (Amanat, Vaccaro, Salehi, & Rahimi-Movaghar, 2019), although this relationship is still unclear. Further studies are required to validate these findings and to investigate the underlying pathophysiological mechanisms responsible for the positive association between primary disabilities and SHCs. Considering the findings of empirical studies involving non-specific disability groups, SHCs most commonly included: pressure ulcers, muscle spasms (spasticity), respiratory infections, chronic pain, weight problems, bladder or bowel problems, urinary tract infections, falls, sexual dysfunction, fatigue, circulatory problems, contractures, autonomic dysreflexia, postural hypotension, heterotopic ossification, depression, sleep problems, and isolation (Callaway, Barclay, McDonald, Farnworth, & Casey, 2015; Coyle et al., 2000; Dudley-Javoroski & Shields, 2006; Kalpakjian, Scelza, Forchheimer, & Toussaint, 2007; Kinne, 2008; Kinne et al., 2004; New, 2016; Nosek et al., 2006; J. Rimmer, Wang, Eisenberg, & Vasudevan, 2010; Seekins et al., 1994; Wilber et al., 2002). These studies reported a set of most commonly occurring physical and mental health conditions that can develop in the aftermath of acquiring a physical disability

and significantly modifying one's functioning. The need for more precise criteria to qualify a disorder as a SHC is present as a result of the inconsistent conceptualization of the notion directly affecting the quality of research about disability. During the analysis of secondary health complications, it is important to keep the key constitutive features of the issue in mind (Rimmer et al., 2011; Turk, 2006).

SECONDARY HEALTH CONDITIONS – ESSENTIAL ELEMENTS

Although the concept of SHCs is quite new, the phenomenon of increased incidence of diseases experienced by people with long-term physical disabilities has been known to both patients and specialists for a long time (Turk, 2006). Hence, there are many terms with similar meanings concerning diseases associated with primary disabilities in published literature, including secondary medical problems (Kinne, 2008), secondary conditions (Kinne et al., 2004; Ravesloot et al., 1997; Seekins et al., 1994; Turk, 2006), treatment complications (Rimmer et al., 2011), and associated conditions or comorbidities (Turk, 2006). The interchangeable use of these descriptions with reference to SHCs is unacceptable, since it results in unjustified simplification and naming chaos. Rimmel et al. (2011, p. 1730) stated that “there is a need for a core set of criteria that separate secondary conditions from risk factors, associated conditions, and comorbidities”. The differences between these health problems are apparent due to differences in aetiology, their influence on human functioning, and remedial possibilities. Turk (2006, pp. 189–190) emphasised that “associated conditions are aspects of the pathology of the primary condition; they are expected—if not universal—features or characteristics of the condition itself. [...] Comorbidities are health conditions unrelated to the primary condition, in essence, unassociated conditions. There may be pre-existing familial or genetic reasons for these conditions, but there is usually no known causal association with the primary disabling conditions”.

The need for an accurate description and differentiation of conditions affecting people with motor disability stems from an urge to precisely define SHCs. This would reduce the difficulties in conceptualizing, diagnosing, and interpreting the phenomenon, thus allowing for thorough research aimed at defining the

nature, circumstances, and interrelations of SHCs in the context of other occurrences typical for functioning with acquired limits to motor ability. For a disorder to be qualified as a SHC, we first need to establish its aetiology and potential relation to the primary disability. Current findings clearly indicate that **disability is a risk factor** for the development of SHCs (Marge, 1988, 2008; Seekins et al., 1994; Turk, 2006), which in itself sets them apart from pre-existing conditions (acquired before the onset of disability), associated conditions (direct association with the aetiology/progression of disability), comorbidities (not related to the disability), and treatment complications (caused by treatment/surgery/drugs) (J. H. Rimmer et al., 2011).

Another assumption is the fact of being **secondary to the primary disorder**, which emphasizes an indirect or direct link to the primary disability (Chan et al., 2005; Coyle et al., 2000; Institute of Medicine, 2007; Kinne, 2008; Kinne et al., 2004; Marge, 1988, 2008; Nosek et al., 2006; Rimmer et al., 2011; Seekins et al., 1994; Turk, 2006; Wilber et al., 2002). Time of onset is also very important. There is a clear consensus among researchers that secondary conditions develop after acquiring the disability. Numerous findings from empirical studies (Chan et al., 2005; Kinne, 2008; Nosek et al., 2008) confirm that SHCs in individuals with motor disability are secondary to the primary disorder. Otherwise, they would have been one of the pre-existing conditions (Rimmer et al., 2011). Kinne et al. (2004) indicated that disability is an important predictive factor for physical and mental illnesses. Similar outcomes have been reported by Chan et al. (2005), who found that over 70% of respondents were treated for SHCs and that number positively correlated with the level of motor limitation and difficulties in performing activities of daily living. Therefore, the notion of SHCs can only be employed to describe a condition accompanied by other permanent disorders (primary to secondary health conditions that consistently affect functioning), which goes on to develop at a later point in time. Moreover, the characteristics of the condition are not associated with the trauma or progression of the disability (Rimmer et al., 2011), which is true of the so-called associated conditions (Turk, 2006).

Studies suggest that secondary health conditions are **preventable** (Adriaansen et al., 2013, 2016; Chan

et al., 2005; Coyle et al., 2000; Joseph & Nilsson Wikmar, 2016; Nosek et al., 2006; van Loo, Post, Bloemen, & van Asbeck, 2010; Wilber et al., 2002). As indicated by Paker et al. (2006), exacerbation of health problems and more frequent re-hospitalizations within five years of acquiring motor disabilities are associated with significant shortcomings in rehabilitation and home care. It appears that better health awareness and higher self-esteem go hand in hand with fewer SHCs (Tederko, Krasuski, Krasuski, Długołęcka, & Tarnacka, 2017), which in turn confirms an important role of health-related behaviors in preventing SHCs (Mashola & Mothabeng, 2019). Hence, it may be assumed that effective prevention is possible and should be based on education, health promotion, support in developing personal capacities, and good access to healthcare, as well as technological support that is convenient for individuals with a disability (Rimmer et al., 2011; Turk, 2006). Furthermore, secondary conditions may **be modified** by a variety of factors, such as type and level of primary impairment, age of acquiring the disability, duration since the accident, sex, and other contextual factors (personal and environmental). If the same condition affects two different people, it must not necessarily be associated with the same type of management. SHCs may also be secondary to different disabilities, since they develop at different ages and times. This is likely to generate a wide range of outcomes that can vary in severity and require different therapeutic/preventive modalities; these outcomes must be addressed after taking individual physical and mental statuses, as well as the needs of affected individuals into account. According to Turk (2006, p. 189), “once a secondary condition comes into existence, personal, social, and environmental factors may modify the condition or its impact”.

We must also consider that these conditions are likely to **fluctuate over time, change in severity, and degree** (Kinne, 2008; Kinne et al., 2004). For instance, a patient surviving a spinal injury can experience eight to 14 conditions a year, with many of them occurring simultaneously (Richardson, Samaranayaka, Sullivan, & Derrett, 2019). Disability in itself is a dynamic entity that is prone to multifaceted influences from contextual factors, including SHCs. Their presence alone **exacerbates the existing disability** (Richardson et al., 2019), sig-

nificantly reduces autonomy and social participation (Byra & Duda, 2019; Piatt, Van Puymbroeck, Zahl, Rosenbluth, & Wells, 2016), contributes to multiple hospitalizations (DeJong et al., 2013; Gabbe & Nunn, 2016; van Loo et al., 2010), and forces a person with a disability (along with their environment) to continually adapt and prevent recurrences.

Risk factors and preventive care for secondary health conditions

SHCs are complicated constructs; they define the interrelations between an individual, their functioning, and behaviour, as well as the disability with all its facets within the broader social context. Empirical studies revealed that SHCs are linked to the primary disorder, but they do not necessarily develop in all patients with disabilities. More importantly, disabilities seem to be risk factors for the development of SHCs, but that development depends on additional variables. Preliminary findings suggest that factors contributing to greater intensity of secondary conditions include limited awareness of the disability, mental characteristics of the patient, deficient or lack of medical care and rehabilitation, as well as environmental barriers (Paker et al., 2006). The presence of secondary complications is a product of multiple interrelated personal and environmental factors (Rimmer et al., 2011), however, the relationship is not based on a simple cause and effect principle.

Apart from risk factors for SHCs, factors affecting the development, exacerbation, or intensification of complications are just as important. Non-modifiable antecedents are not direct risk factors, but they play a role in shaping secondary health status by directly or indirectly affecting the risk factors. The most commonly reported non-modifiable antecedents are socio-demographic factors, pre-existing conditions, disability-related factors, and other associated conditions (Rimmer et al., 2011). For example, extreme disabilities and certain types of spinal cord injuries are significantly associated with the total number of SHCs (New, 2016). Risk factors are likely to occur together or in isolation, as well as in varied configurations, and can be divided into two areas: personal and environmental risk factors (Pilusa et al., 2019). “The multiple combinations that can occur from non-modifiable antecedents (e.g., severe disability, mental health conditions) and modifiable risk factors

(e.g., high rates of sedentary behaviour, poor diet) should prove helpful in designing interventions that address modifiable risk factors within the context of non-modifiable antecedents” (Rimmer et al., 2011, p. 1734). This model perceives secondary health conditions in the broader context of environmental and behavioural factors. Identifying risk factors for SHCs in the population affected by long-term disabilities will likely improve their quality of life, as well as reduce the cost of care and medical interventions.

The following analyses may prove useful when attempting to identify low- and high-risk groups for SHCs, as well as to plan for the effective prevention of SHCs. At present, one of the most effective prevention measures is health education for patients and caregivers with respect to self-care and rehabilitation (Cardenas, Hoffman, Kelly, & Mayo, 2004; Garber, Rintala, Holmes, Rodriguez, & Friedman, 2002; May, Day, & Warren, 2006; McColl, Gupta, Smith, & McColl, 2017; Potter, Wolfe, Burkell, & Hayes, 2004). These activities typically encompass teaching people about risk factors, and the ways to prevent secondary health conditions and treat them (Pilusa et al., 2019). “Health promotion and amelioration of the primary disabling condition—the traditional aim of rehabilitation—are the principal strategies for minimizing the risk of a secondary condition. Because the presence of a disabling condition and, consequently, vulnerability to secondary conditions are lifelong, approaches to prevention should focus on the long-term effects and the whole person. Critical elements of interventions include regular monitoring of health status, continuity of care, availability of appropriate assistive technology, training in coping with limitations, and community support including measures that ensure access to transportation, housing, and opportunities for employment” (Institute of Medicine, 1991, p. 215). Unfortunately, people with physical disabilities and their families are not always provided with adequate medical support and rehabilitation. In terms of public health, significant and systematic efforts should be made to diagnose the prevalence of SHCs and their need for support, access to medicines, and free medical care. Understanding the experiences and needs of these patients can strengthen patient-oriented approaches to providing care. There is a need to pursue screening for SHCs during medical check-ups and to teach rehabilitators about the consequences of SHCs. A holistic

approach comprising of prevention strategies (such as health education, screening, and prevention protocols) is necessary to minimize the occurrence of SHCs. The implementation of new effective programs for the prevention of SHCs requires changes in professional health education, public health procedures, and structures, as well as in the organisation of clinical practice and research priorities.

FUNCTIONAL PROPERTIES OF SECONDARY HEALTH CONDITIONS

The broad purpose of understanding the functional properties of SHCs is to demonstrate a more precise understanding of the complicated interplay between biological, psychological, and social factors affecting individuals with long-term motor disabilities. The key physical and mental dimensions of the phenomenon are reflected in the understanding of SHCs as unique disease entities observed in individuals with disabilities (Conti et al., 2019; Kalpakjian et al., 2007; Seekins et al., 1994; Turk, 2006). Their occurrence typically contributes to a deterioration in health status (Joseph & Nilsson Wikmar, 2016). Additional disorders also modify the degree of the existing disability (Byra & Duda, 2019) by exacerbating it (Richardson et al., 2019). They are also more likely to be life-threatening than the primary impairment and the principal health problem (Craven, Hitzig, & Mittmann, 2012; Krause & Saunders, 2011).

Extensive research on this subject has allowed for a better understanding of SHCs and their relationship to other psychosocial phenomena affecting individuals with acquired disabilities, such as quality of life, autonomy, and participation. SHCs are the strongest predictor for perceived quality of life in individuals with acquired disabilities (Barker et al., 2009). A number of studies have shown that SHCs significantly deteriorate quality of life (Coyle et al., 2000; McColl et al., 2017; Middleton, Lim, Taylor, Soden, & Rutkowski, 2004; Post et al., 2011; Post & van Leeuwen, 2012; Rivers et al., 2018) by increasing functional limitations (Sweet, Noreau, Leblond, & Dumont, 2014). Exacerbation of disorders that are secondary to the primary disability are also likely to burden caregivers (Conti et al., 2019).

Empirical research has revealed a link between secondary conditions and activity and participation of

people with motor impairment (Ipsen, 2016; Koritsas & Iacono, 2009). First and foremost, they significantly impair daily functioning (Cobb et al., 2014; Rivers et al., 2018) and socialisation (Marti, Boes, Lay, Reuben Escorpizo, & Trezzini, 2016; Suttiwong, Vongsirinavarat, & Hiengkaew, 2018). SHCs also limit employability potential and act as a barrier to employment (Anderson & Vogel, 2002; Fiedler, Indermuehle, Drobac, & Laud, 2002; Franceschini et al., 2012; Marti, Reinhardt, Graf, Escorpizo, & Post, 2012; Yasuda, Wehman, Targett, Cifu, & West, 2002). Their effect is not unequivocal, but it reveals a multitude of associations with other variables (Meade, Forchheimer, Krause, & Charlifue, 2011). Studies on the mediating role of secondary conditions such as chronic pain, pressure ulcers, and urinary tract infections demonstrate that their development made it significantly more difficult for the older respondents with disability to find a job (Marti et al., 2016). According to Meade et al. (2011), the number of SHCs was correlated to the chance of obtaining and maintaining a job, but these results were not statistically significant.

Among the key health-related variables, the strongest correlation was observed for hospitalizations (i.e., very poor health status). Effectiveness of employment was far more influenced by the number of years of previous employment, education, or level of impairment. It is important to note that this may have occurred as a result of the limitations of the research model. “While previous secondary conditions and hospitalizations may influence attempts or motivation to obtain employment, they may be too related to variables already accounted for in these models to be independently significant” (Meade et al., 2011, p. 431). Recent findings seem to confirm that SHCs are likely to limit employment opportunities, but this should be considered in conjunction with the additional disability-related variables (chronological age, age at injury, time since injury, severity of injury, personal and environmental factors). Some SHCs may also accelerate the aging process of the body (Campbell et al., 1999; Jensen et al., 2012; Krause, Saunders, DiPiro, & Reed, 2013). Early exacerbating symptoms of SHCs (typical of old age) that affect adults with long-term disabilities are known as premature aging (Jensen et al., 2012). For example, Hitzig, Eng, Miller, and Sakakibara (2011) described the early onset of such disorders in spinal cord injury patients.

Further research on the nature of SHCs can contribute to a better understanding of the complex circumstances surrounding individuals with long-term motor impairment. This is essential from the point of view of maintaining the long-term health and wellbeing of individuals with disabilities. The topics addressed in this review are fundamental for the advancement of knowledge on SHCs, as well as for developing effective rehabilitation and prevention programs.

CONCLUSIONS

The growing interest in SHCs is a reflection of a larger global trend in long-term rehabilitation and patient-adapted care, which puts a greater emphasis on the dynamic nature of disability itself. Complicated interdependencies between primary disabilities and secondary conditions, as well as the complex mechanism of their development call for further empirical research. Impairments associated with acquired disabilities are highly subjective in nature and thus constitute an important challenge while planning preventive measures.

SHCs are both an individual and a social problem, since their occurrence can contribute to premature aging (Campbell et al., 1999; Krause et al., 2013) and mortality of people with disabilities (Krause & Saunders, 2011). There is a need for further research on the way in which this phenomenon is measured (operationalisation, scales, and tools), the nature of the SHCs, the properties and etiology of SHCs, as well as the causal factors associated with SHCs. Considering the conditions and consequences of the SHCs associated with disabilities can contribute to building a preventive strategy that can evade the development of SHCs (Ravesloot, Seekins, & White, 2005; Turk, 2006). The limited knowledge regarding these common disease entities and the ways to prevent them has resulted in the need for further research into the SHCs that can develop over the lifetime of individuals with motor impairment. Practical interventions are aimed at preventing health problems by raising awareness about SHCs among patients and caregivers and providing better access to medical care. These findings may be useful for prioritizing preventive health strategies and planning long-term care for individuals with long-term disabilities.

REFERENCES

- Adriaansen, J. J. E., Post, M. W. M., de Groot, S., van Asbeck, F. W. A., Stolwijk-Swüste, J. M., Tepper, M., & Lindeman, E. (2013). Secondary health conditions in persons with spinal cord injury: A longitudinal study from one to five years post-discharge. *Journal of Rehabilitation Medicine*, *45*(10), 1016–1022. <https://doi.org/10.2340/16501977-1207>
- Adriaansen, J. J. E., Ruijs, L. E. M., Koppenhagen, C. F. van, Asbeck, F. W. A. van, Snoek, G. J., Kuppevelt, D. van, ... ALLRISC. (2016). Secondary health conditions and quality of life in persons living with spinal cord injury for at least ten years. *Journal of Rehabilitation Medicine*, *48*(10), 853–860. <https://doi.org/10.2340/16501977-2166>
- Amanat, M., Vaccaro, A. R., Salehi, M., & Rahimi-Movaghar, V. (2019). Neurological conditions associated with spinal cord injury. *Informatics in Medicine Unlocked*, *16*. <https://doi.org/10.1016/j.imu.2019.100245>
- Anderson, C. J., & Vogel, L. C. (2002). Employment outcomes of adults who sustained spinal cord injuries as children or adolescents. *Archives of Physical Medicine and Rehabilitation*, *83*(6), 791–801. <https://doi.org/10.1053/apmr.2002.32742>
- Barker, R. N., Kendall, M. D., Amsters, D. I., Pershouse, K. J., Haines, T. P., & Kuipers, P. (2009). The relationship between quality of life and disability across the lifespan for people with spinal cord injury. *Spinal Cord*, *47*(2), 149–155. <https://doi.org/10.1038/sc.2008.82>
- Battalio, S. L., Jensen, M. P., & Molton, I. R. (2019). Secondary health conditions and social role satisfaction in adults with long-term physical disability. *Health Psychology*, *38*(5), 445–454. <https://doi.org/10.1037/hea0000671>
- Bauman, W. A. (2006). Secondary Conditions with Spinal Cord Injury. In M. J. Field, A. M. Jette, & L. Martin (Eds.), *Workshop on Disability in America: A New Look* (pp. 222–233). Washington, D.C.: Institute of Medicine, The National Academies Press. <https://doi.org/10.17226/11579>
- Brinkhof, M. W. G., Al-Khodairy, A., Eriks-Hoogland, I., Fekete, C., Hinrichs, T., Hund-Georgiadis, M., ... SwiSCI Study Group. (2016). Health conditions in people with spinal cord injury: Contemporary evidence from a population-based community survey in Switzerland. *Journal of Rehabilitation Medicine*, *48*(2), 197–209. <https://doi.org/10.2340/16501977-2039>
- Byra, S. (2016). Posttraumatic growth in people with traumatic long-term spinal cord injury: Predictive role of basic hope and coping. *Spinal Cord*, *54*(6), 478–482. <https://doi.org/10.1038/sc.2015.177>
- Byra, S. (2019a). Basic hope and posttraumatic growth in people with traumatic paraplegia- the mediating effect of acceptance of disability. *Spinal Cord*, *57*(4), 301–307. <https://doi.org/10.1038/s41393-018-0215-7>
- Byra, S. (2019b). Pozytywne aspekty funkcjonowania osób z niepełnosprawnością ruchową—Analityczne możliwości, trudności i perspektywy. *Niepełnosprawność i Rehabilitacja*, (2), 15–27.
- Byra, S., & Duda, M. (2019). Postrzeganie własnej autonomii a satysfakcja z życia u osób z nabytą niepełnosprawnością ruchową. *Człowiek - Niepełnosprawność - Społeczeństwo*, *45*(3), 17–36. <https://doi.org/10.5604/01.3001.0013.6222>
- Byra, S., Mróz, J., & Kaleta, K. (2020). Forgiveness and acceptance of disability in people with traumatic spinal cord injury-the mediating role of disability appraisal. A cross-sectional study. *Spinal Cord*. <https://doi.org/10.1038/s41393-020-0507-6>
- Callaway, L., Barclay, L., McDonald, R., Farnworth, L., & Casey, J. (2015). Secondary health conditions experienced by people with spinal cord injury within community living: Implications for a National Disability Insurance Scheme. *Australian Occupational Therapy Journal*, *62*(4), 246–254. <https://doi.org/10.1111/1440-1630.12206>
- Campbell, M. L., Sheets, D., & Strong, P. S. (1999). Secondary health conditions among middle-aged individuals with chronic physical disabilities: Implications for unmet needs for services. *Assistive Technology: The Official Journal of RESNA*, *11*(2), 105–122. <https://doi.org/10.1080/10400435.1999.10131995>
- Cardenas, D. D., Hoffman, J. M., Kelly, E., & Mayo, M. E. (2004). Impact of a urinary tract infection educational program in persons with spinal cord injury. *The Journal of Spinal Cord Medicine*, *27*(1), 47–54. <https://doi.org/10.1080/10790268.2004.11753730>

- Chan, L., Shumway-Cook, A., Yorkston, K. M., Ciol, M. A., Dudgeon, B. J., & Hoffman, J. M. (2005). Design and validation of a methodology using the International Classification of Diseases, 9th Revision, to identify secondary conditions in people with disabilities. *Archives of Physical Medicine and Rehabilitation*, *86*(5), 1065–1069. <https://doi.org/10.1016/j.apmr.2004.11.011>
- Charlifue, S. W., Weitzenkamp, D. A., & Whiteneck, G. G. (1999). Longitudinal outcomes in spinal cord injury: Aging, secondary conditions, and well-being. *Archives of Physical Medicine and Rehabilitation*, *80*(11), 1429–1434. [https://doi.org/10.1016/S0003-9993\(99\)90254-X](https://doi.org/10.1016/S0003-9993(99)90254-X)
- Chien, H.-J., Wu, C.-H., & Chang, K.-H. (2017). Secondary health conditions in people with different types of disabilities. *Journal of the Formosan Medical Association*, *116*(10), 733–735. <https://doi.org/10.1016/j.jfma.2017.06.003>
- Chiodo, A. E., Scelza, W. M., Kirshblum, S. C., Wuermser, L.-A., Ho, C. H., & Priebe, M. M. (2007). Spinal cord injury medicine. 5. Long-term medical issues and health maintenance. *Archives of Physical Medicine and Rehabilitation*, *88*(3 Suppl 1), 76–83. <https://doi.org/10.1016/j.apmr.2006.12.015>
- Cobb, J., Dumont, F. S., Leblond, J., Park, S. E., Noonan, V. K., & Noreau, L. (2014). An Exploratory Analysis of the Potential Association Between SCI Secondary Health Conditions and Daily Activities. *Topics in Spinal Cord Injury Rehabilitation*, *20*(4), 277–288. <https://doi.org/10.1310/sci2004-277>
- Conti, A., Clari, M., Nolan, M., Wallace, E., Tommasini, M., Mozzone, S., & Campagna, S. (2019). The Relationship Between Psychological and Physical Secondary Conditions and Family Caregiver Burden in Spinal Cord Injury: A Correlational Study. *Topics in Spinal Cord Injury Rehabilitation*, *25*(4), 271–280. <https://doi.org/10.1310/sci2504-271>
- Coyle, C. P., Santiago, M. C., Shank, J. W., Ma, G. X., & Boyd, R. (2000). Secondary conditions and women with physical disabilities: A descriptive study. *Archives of Physical Medicine and Rehabilitation*, *81*(10), 1380–1387. <https://doi.org/10.1053/apmr.2000.9169>
- Cragg, J. J., & Krassioukov, A. (2012). Autonomic dysreflexia. *CMAJ*, *184*(1), 66. <https://doi.org/10.1503/cmaj.110859>
- Cragg, J. J., Noonan, V. K., Dvorak, M., Krassioukov, A., Mancini, G. B. J., & Borisoff, J. F. (2013). Spinal cord injury and type 2 diabetes: Results from a population health survey. *Neurology*, *81*(21), 1864–1868. <https://doi.org/10.1212/01.wnl.0000436074.98534.6e>
- Craven, C., Hitzig, S. L., & Mittmann, N. (2012). Impact of impairment and secondary health conditions on health preference among Canadians with chronic spinal cord injury. *The Journal of Spinal Cord Medicine*, *35*(5), 361–370. <https://doi.org/10.1179/2045772312Y.0000000046>
- DeJong, G., Tian, W., Hsieh, C.-H., Junn, C., Karam, C., Ballard, P. H., ... Backus, D. (2013). Rehospitalization in the first year of traumatic spinal cord injury after discharge from medical rehabilitation. *Archives of Physical Medicine and Rehabilitation*, *94*(4 Suppl), S87-97. <https://doi.org/10.1016/j.apmr.2012.10.037>
- Dijkers, M. P. J. M., Yavuzer, G., Ergin, S., Weitzenkamp, D., & Whiteneck, G. G. (2002). A tale of two countries: Environmental impacts on social participation after spinal cord injury. *Spinal Cord*, *40*(7), 351–362. <https://doi.org/10.1038/sj.sc.3101310>
- Dudley-Javoroski, S., & Shields, R. K. (2006). Assessment of physical function and secondary complications after complete spinal cord injury. *Disability and Rehabilitation*, *28*(2), 103–110. <https://doi.org/10.1080/09638280500163828>
- Esclarín De Ruz, A., García Leoni, E., & Herruzo Cabrera, R. (2000). Epidemiology and risk factors for urinary tract infection in patients with spinal cord injury. *The Journal of Urology*, *164*(4), 1285–1289.
- Fiedler, I., Indermuehle, D., Drobac, W., & Laud, P. (2002). Perceived Barriers to Employment in Individuals with Spinal Cord Injury. *Topics in Spinal Cord Injury Rehabilitation*, *7*(3), 73–82. <https://doi.org/10.1310/G7N8-81XN-E12K-CCM0>
- Franceschini, M., Pagliacci, M. C., Russo, T., Felzani, G., Aito, S., Marini, C., & Italian Group for the Epidemiological Study of Spinal Cord Injuries. (2012). Occurrence and predictors of employment after traumatic spinal cord injury: The GISEM Study. *Spinal Cord*, *50*(3), 238–242. <https://doi.org/10.1038/sc.2011.131>

- Gabbe, B. J., & Nunn, A. (2016). Profile and costs of secondary conditions resulting in emergency department presentations and readmission to hospital following traumatic spinal cord injury. *Injury*, 47(8), 1847–1855. <https://doi.org/10.1016/j.injury.2016.06.012>
- Garber, S. L., Rintala, D. H., Holmes, S. A., Rodriguez, G. P., & Friedman, J. (2002). A structured educational model to improve pressure ulcer prevention knowledge in veterans with spinal cord dysfunction. *Journal of Rehabilitation Research and Development*, 39(5), 575–588.
- Havercamp, S. M., Scandlin, D., & Roth, M. (2004). Health disparities among adults with developmental disabilities, adults with other disabilities, and adults not reporting disability in North Carolina. *Public Health Reports*, 119(4), 418–426. <https://doi.org/10.1016/j.phr.2004.05.006>
- Hetz, S. P., Latimer, A. E., Arbour-Nicitopoulos, K. P., & Martin Ginis, K. A. (2011). Secondary complications and subjective well-being in individuals with chronic spinal cord injury: Associations with self-reported adiposity | Spinal Cord. *Spinal Cord*, 49(2), 266–272. <https://doi.org/10.1038/sc.2010.100>
- Hilberink, S. R., van der Slot, W. M. A., & Klem, M. (2016). Health and participation problems in older adults with long-term disability. *Disability and Health Journal*, 10(2), 361–366. <https://doi.org/10.1016/j.dhjo.2016.12.004>
- Hitzig, S. L., Eng, J. J., Miller, W. C., & Sakakibara, B. M. (2011). An evidence-based review of aging of the body systems following spinal cord injury. *Spinal Cord*, 49(6), 684–701. <https://doi.org/10.1038/sc.2010.178>
- Hughes, R., Swedlund, N., Petersen, N., & Nosek, M. (2001). Depression and Women with Spinal Cord Injury. *Topics in Spinal Cord Injury Rehabilitation*, 7(1), 16–24. <https://doi.org/10.1310/HPKX-D0PV-MNFV-N349>
- ICF. (2001). *Międzynarodowa Klasyfikacja Funkcjonowania, Niepełnosprawności i Zdrowia*. Genewa: Światowa Organizacja Zdrowia.
- Institute of Medicine. (1991). Prevention of secondary conditions. In A. M. Pope & A. R. Tarlov (Eds.), *Disability in America: Toward a National Agenda for Prevention* (pp. 214–241). Washington, D.C.: National Academy Press, <https://doi.org/10.17226/1579>.
- Institute of Medicine. (2007). Secondary conditions and aging with disability. In M. J. Field & A. M. Jette (Eds.), *The Future of Disability in America* (pp. 136–161). Washington, D.C.: National Academy Press.
- Ipsen, C. (2016). Health, Secondary Conditions, and Employment Outcomes for Adults with Disabilities: *Journal of Disability Policy Studies*, 17(2), 77–87. (Sage CA: Los Angeles, CA). <https://doi.org/10.1177/10442073060170020401>
- Jazayeri, S. B., Beygi, S., Shokraneh, F., Hagen, E. M., & Rahimi-Movaghar, V. (2015). Incidence of traumatic spinal cord injury worldwide: A systematic review. *European Spine Journal*, 24(5), 905–918. <https://doi.org/10.1007/s00586-014-3424-6>
- Jensen, M. P., Molton, I. R., Groah, S. L., Campbell, M. L., Charlifue, S., Chiodo, A., ... Tate, D. (2012). Secondary health conditions in individuals aging with SCI: Terminology, concepts and analytic approaches. *Spinal Cord*, 50(5), 373–378. <https://doi.org/10.1038/sc.2011.150>
- Joseph, C., & Nilsson Wikmar, L. (2016). Prevalence of secondary medical complications and risk factors for pressure ulcers after traumatic spinal cord injury during acute care in South Africa. *Spinal Cord*, 54(7), 535–539. <https://doi.org/10.1038/sc.2015.189>
- Kalpakjian, C. Z., McCullumsmith, C. B., Fann, J. R., Richards, J. S., Stoelb, B. L., Heinemann, A. W., & Bombardier, C. H. (2014). Post-traumatic growth following spinal cord injury. *The Journal of Spinal Cord Medicine*, 37(2), 218–225. <https://doi.org/10.1179/2045772313Y.0000000169>
- Kalpakjian, C. Z., Scelza, W. M., Forchheimer, M. B., & Toussaint, L. L. (2007). Preliminary Reliability and Validity of a Spinal Cord Injury Secondary Conditions Scale. *The Journal of Spinal Cord Medicine*, 30(2), 131–139.
- Kemp, B. (2006). Depression as a Secondary Condition in People with Disabilities. In M. J. Field, A. M. Jette, & L. Martin (Eds.), *Workshop on Disability in America: A New Look* (pp. 234–250). Washington, D.C.: Institute of Medicine, The National Academies Press. <https://doi.org/10.17226/11579>

- Kennedy, P., Kilvert, A., & Hasson, L. (2016). A 21-year longitudinal analysis of impact, coping, and appraisals following spinal cord injury. *Rehabilitation Psychology, 61*(1), 92–101. <https://doi.org/10.1037/rep0000066>
- Kinne, S. (2008). Distribution of secondary medical problems, impairments, and participation limitations among adults with disabilities and their relationship to health and other outcomes. *Disability and Health Journal, 1*(1), 42–50. <https://doi.org/10.1016/j.dhjo.2007.11.006>
- Kinne, S., Patrick, D. L., & Doyle, D. L. (2004). Prevalence of Secondary Conditions Among People With Disabilities. *American Journal of Public Health, 94*(3), 443–445. <https://doi.org/10.2105/ajph.94.3.443>
- Koritsas, S., & Iacono, T. (2009). Limitations in life participation and independence due to secondary conditions. *American Journal on Intellectual and Developmental Disabilities, 114*(6), 437–448. <https://doi.org/10.1352/1944-7588-114.6.437>
- Krause, J. S., & Broderick, L. (2004). Patterns of recurrent pressure ulcers after spinal cord injury: Identification of risk and protective factors 5 or more years after onset. *Archives of Physical Medicine and Rehabilitation, 85*(8), 1257–1264. <https://doi.org/10.1016/j.apmr.2003.08.108>
- Krause, J. S., & Saunders, L. L. (2011). Health, Secondary Conditions, and Life Expectancy after Spinal Cord Injury. *Archives of Physical Medicine and Rehabilitation, 92*(11), 1770–1775. <https://doi.org/10.1016/j.apmr.2011.05.024>
- Krause, J. S., Saunders, L. L., DiPiro, N. D., & Reed, K. S. (2013). Theoretical Risk and Prevention Model for Secondary Health Conditions and Mortality After SCI: 15 Years of Research. *Topics in Spinal Cord Injury Rehabilitation, 19*(1), 15–24. <https://doi.org/10.1310/sci1901-15>
- Kunz, S., Joseph, S., Geyh, S., & Peter, C. (2017). Posttraumatic growth and adjustment to spinal cord injury: Moderated by posttraumatic depreciation? *Psychological Trauma: Theory, Research, Practice and Policy, 9*(4), 434–444. <https://doi.org/10.1037/tra0000164>
- Kunz, S., Joseph, S., Geyh, S., & Peter, C. (2019). Perceived posttraumatic growth and depreciation after spinal cord injury: Actual or illusory? *Health Psychology, 38*(1), 53–62. <https://doi.org/10.1037/hea0000676>
- Larsson Lund, M., Nordlund, A., Bernspång, B., & Lexell, J. (2007). Perceived participation and problems in participation are determinants of life satisfaction in people with spinal cord injury. *Disability and Rehabilitation, 29*(18), 1417–1422. <https://doi.org/10.1080/09638280601029068>
- Larsson Lund, M., Nordlund, A., Nygård, L., Lexell, J., & Bernspång, B. (2005). Perceptions of participation and predictors of perceived problems with participation in persons with spinal cord injury. *Journal of Rehabilitation Medicine, 37*(1), 3–8. <https://doi.org/10.1080/16501970410031246>
- Livneh, H., & Martz, E. (2014). Coping strategies and resources as predictors of psychosocial adaptation among people with spinal cord injury. *Rehabilitation Psychology, 59*(3), 329–339. <https://doi.org/10.1037/a0036733>
- Livneh, H., & Martz, E. (2016). Psychosocial Adaptation to Disability Within the Context of Positive Psychology: Philosophical Aspects and Historical Roots. *Journal of Occupational Rehabilitation, 26*(1), 13–19. <https://doi.org/10.1007/s10926-015-9601-6>
- Livneh, H., McMahon, B. T., & Rumrill Jr., P. D. (2019). The Duality of Human Experience: Perspectives From Psychosocial Adaptation to Chronic Illness and Disability—Historical Views and Theoretical Models. *Rehabilitation Counseling Bulletin, 62*(2), 67–77. (Sage CA: Los Angeles, CA). <https://doi.org/10.1177/0034355218800790>
- Lollar, D. J. (2001). Public health trends in disability: Past, present, and future. In G. L. Albrecht, K. D. Seelman, & M. Bury (Eds.), *Handbook of Disability Studies* (pp. 754–771). Thousand Oaks, CA: SAGE Publications, Inc.
- Magasi, S. R., Heinemann, A. W., Whiteneck, G. G., & Quality of Life/Participation Committee. (2008). Participation following traumatic spinal cord injury: An evidence-based review for research. *The Journal of Spinal Cord Medicine, 31*(2), 145–156. <https://doi.org/10.1080/10790268.2008.11760705>
- Marge, M. (1988). Health promotion for persons with disabilities: Moving beyond rehabilitation. *American Journal of Health Promotion: AJHP, 2*(4), 29–44. <https://doi.org/10.4278/0890-1171-2.4.29>
- Marge, M. (2008). Secondary conditions revisited: Examining the expansion of the original concept and definition. *Disability and Health Journal, 1*(2), 67–70. <https://doi.org/10.1016/j.dhjo.2008.02.002>

- Marti, A., Boes, S., Lay, V., Reuben Escorpizo, P. T., & Trezzini, B. (2016). The association between chronological age, age at injury and employment: Is there a mediating effect of secondary health conditions? *Spinal Cord*, *54*(3), 239–244. <https://doi.org/10.1038/sc.2015.159>
- Marti, A., Reinhardt, J. D., Graf, S., Escorpizo, R., & Post, M. W. M. (2012). To work or not to work: Labour market participation of people with spinal cord injury living in Switzerland. *Spinal Cord*, *50*(7), 521–526. <https://doi.org/10.1038/sc.2011.181>
- Martz, E., & Livneh, H. (2016). Psychosocial Adaptation to Disability Within the Context of Positive Psychology: Findings from the Literature. *Journal of Occupational Rehabilitation*, *26*(1), 4–12. <https://doi.org/10.1007/s10926-015-9598-x>
- Martz, E., Livneh, H., Priebe, M., Wuermser, L. A., & Ottomanelli, L. (2005). Predictors of psychosocial adaptation among people with spinal cord injury or disorder. *Archives of Physical Medicine and Rehabilitation*, *86*(6), 1182–1192. <https://doi.org/10.1016/j.apmr.2004.11.036>
- Martz, E., Livneh, H., Southwick, S. M., & Pietrzak, R. H. (2018). Posttraumatic growth moderates the effect of posttraumatic stress on quality of life in U.S. military veterans with life-threatening illness or injury. *Journal of Psychosomatic Research*, *109*, 1–8. <https://doi.org/10.1016/j.jpsychores.2018.03.004>
- Mashola, M. K., & Mothabeng, D. J. (2019). Associations between health behaviour, secondary health conditions and quality of life in people with spinal cord injury. *African Journal of Disability*, *8*. <https://doi.org/10.4102/ajod.v8i0.463>
- May, L., Day, R., & Warren, S. (2006). Evaluation of patient education in spinal cord injury rehabilitation: Knowledge, problem-solving and perceived importance. *Disability and Rehabilitation*, *28*(7), 405–413. <https://doi.org/10.1080/09638280500192439>
- McColl, M. A., Gupta, S., Smith, K., & McColl, A. (2017). Promoting Long-Term Health among People with Spinal Cord Injury: What's New? *International Journal of Environmental Research and Public Health*, *14*(12). <https://doi.org/10.3390/ijerph14121520>
- Meade, M. A., Forchheimer, M. B., Krause, J. S., & Charlifue, S. (2011). The influence of secondary conditions on job acquisition and retention in adults with spinal cord injury. *Archives of Physical Medicine and Rehabilitation*, *92*(3), 425–432. <https://doi.org/10.1016/j.apmr.2010.10.041>
- Middleton, J. W., Lim, K., Taylor, L., Soden, R., & Rutkowski, S. (2004). Patterns of morbidity and rehospitalisation following spinal cord injury. *Spinal Cord*, *42*(6), 359–367. <https://doi.org/10.1038/sj.sc.3101601>
- Molton, I. R., & Jensen, M. P. (2010). Aging and disability: Biopsychosocial perspectives. *Physical Medicine and Rehabilitation Clinics of North America*, *21*(2), 253–265. <https://doi.org/10.1016/j.pmr.2009.12.012>
- New, P. W. (2016). Secondary conditions in a community sample of people with spinal cord damage. *The Journal of Spinal Cord Medicine*, *39*(6), 665–670. <https://doi.org/10.1080/10790268.2016.1138600>
- Noreau, L., Proulx, P., Gagnon, L., Drolet, M., & Laramée, M. T. (2000). Secondary impairments after spinal cord injury: A population-based study. *American Journal of Physical Medicine & Rehabilitation*, *79*(6), 526–535. <https://doi.org/10.1097/00002060-200011000-00009>
- Nosek, M. A., Hughes, R. B., Petersen, N. J., Taylor, H. B., Robinson-Whelen, S., Byrne, M., & Morgan, R. (2006). Secondary conditions in a community-based sample of women with physical disabilities over a 1-year period. *Archives of Physical Medicine and Rehabilitation*, *87*(3), 320–327. <https://doi.org/10.1016/j.apmr.2005.11.003>
- Nosek, M. A., Robinson-Whelen, S., Hughes, R. B., Petersen, N. J., Taylor, H. B., Byrne, M. M., & Morgan, R. (2008). Overweight and obesity in women with physical disabilities: Associations with demographic and disability characteristics and secondary conditions. *Disability and Health Journal*, *1*(2), 89–98. <https://doi.org/10.1016/j.dhjo.2008.01.003>
- Paker, N., Soy, D., Kesiktas, N., Nur Bardak, A., Erbil, M., Ersoy, S., & Yılmaz, H. (2006). Reasons for rehospitalization in patients with spinal cord injury: 5 years' experience. *International Journal of Rehabilitation Research*, *29*(1), 71–76. <https://doi.org/10.1097/01.mrr.0000185953.87304.2a>

- Peter, C., Müller, R., Post, M. W. M., van Leeuwen, C. M. C., Werner, C. S., Geyh, S., & Swiss Spinal Cord Injury Cohort Study Group. (2015). Depression in spinal cord injury: Assessing the role of psychological resources. *Rehabilitation Psychology, 60*(1), 67–80. <https://doi.org/10.1037/rep0000021>
- Peterson, M. D., Kamdar, N., Chiodo, A., & Tate, D. G. (2020). Psychological Morbidity and Chronic Disease Among Adults with Traumatic Spinal Cord Injuries: A Longitudinal Cohort Study of Privately Insured Beneficiaries. *Mayo Clinic Proceedings, 95*(5), 920–928. <https://doi.org/10.1016/j.mayocp.2019.11.029>
- Piatt, J. A., Van Puymbroeck, M., Zahl, M., Rosenbluth, J. P., & Wells, M. S. (2016). Examining How the Perception of Health Can Impact Participation and Autonomy Among Adults with Spinal Cord Injury. *Topics in Spinal Cord Injury Rehabilitation, 22*(3), 165–172. <https://doi.org/10.1310/sci2203-165>
- Pilusa, S., Myezwa, H., & Potterton, J. (2019). Prevention care for secondary health conditions among people living with spinal cord injuries: Research protocol. *BMC Research Notes, 12*(1), 179. <https://doi.org/10.1186/s13104-019-4202-7>
- Post, M. W. M., Brinkhof, M. W. G., von Elm, E., Boldt, C., Brach, M., Fekete, C., ... SwiSCI study group. (2011). Design of the Swiss Spinal Cord Injury Cohort Study. *American Journal of Physical Medicine & Rehabilitation, 90*(11 Suppl 2), 5–16. <https://doi.org/10.1097/PHM.0b013e318230fd41>
- Post, M. W. M., & van Leeuwen, C. M. C. (2012). Psychosocial issues in spinal cord injury: A review. *Spinal Cord, 50*(5), 382–389. <https://doi.org/10.1038/sc.2011.182>
- Potter, P. J., Wolfe, D. L., Burkell, J. A., & Hayes, K. C. (2004). Challenges in Educating Individuals with SCI to Reduce Secondary Conditions. *Topics in Spinal Cord Injury Rehabilitation, 10*(1), 30–40. <https://doi.org/10.1310/WP5P-CNHM-NC6T-DL7P>
- Psarra, E., & Kleftras, G. (2013). Adaptation to Physical Disabilities: The Role of Meaning in Life and Depression. *The European Journal of Counselling Psychology, 2*(1), 79–99. <https://doi.org/10.5964/ejcop.v2i1.7>
- Ravesloot, C., Seekins, T., & Walsh, J. (1997). A structural analysis of secondary conditions experienced by people with physical disabilities. *Rehabilitation Psychology, 42*(1), 3–16. <https://doi.org/10.1037/0090-5550.42.1.3>
- Ravesloot, C., Seekins, T., & White, G. (2005). Living Well with a Disability Health Promotion Intervention: Improved Health Status for Consumers and Lower Costs for Health Care Policymakers. *Rehabilitation Psychology, 50*(3), 239–245. <https://doi.org/10.1037/0090-5550.50.3.239>
- Richardson, A., Samaranyaka, A., Sullivan, M., & Derrett, S. (2019). Secondary health conditions and disability among people with spinal cord injury: A prospective cohort study. *The Journal of Spinal Cord Medicine, 1*–10. <https://doi.org/10.1080/10790268.2019.1581392>
- Rimmer, J. H., Chen, M.-D., & Hsieh, K. (2011). A conceptual model for identifying, preventing, and managing secondary conditions in people with disabilities. *Physical Therapy, 91*(12), 1728–1739. <https://doi.org/10.2522/ptj.20100410>
- Rimmer, J., Wang, E., Eisenberg, Y., & Vasudevan, V. (2010). Longitudinal perspective of secondary conditions and community accessibility in a predominantly African American group of women with mobility disability. *Disability and Health Journal, 3*(2), e6. <https://doi.org/10.1016/j.dhjo.2009.08.085>
- Rivers, C. S., Fallah, N., Noonan, V. K., Whitehurst, D. G., Schwartz, C. E., Finkelstein, J. A., ... RHSCIR Network. (2018). Health Conditions: Effect on Function, Health-Related Quality of Life, and Life Satisfaction After Traumatic Spinal Cord Injury. A Prospective Observational Registry Cohort Study. *Archives of Physical Medicine and Rehabilitation, 99*(3), 443–451. <https://doi.org/10.1016/j.apmr.2017.06.012>
- Seekins, T., Clay, J., & Ravesloot, C. (1994). A Descriptive Study of Secondary Conditions Reported by a Population of Adults with Physical Disabilities Served by Three Independent Living Centers in a Rural State. *The Journal of Rehabilitation, 60*(2), 47–51.
- Simpson, L. A., Eng, J. J., Hsieh, J. T. C., & Wolfe and the Spinal Cord Injury Rehabilitation Evidence (SCIRE) Research Team, D. L. (2012). The Health and Life Priorities of Individuals with Spinal Cord Injury: A Systematic Review. *Journal of Neurotrauma, 29*(8), 1548–1555. <https://doi.org/10.1089/neu.2011.2226>

- Suttiwong, J., Vongsirinavarat, M., & Hiengkaew, V. (2018). Predictors of Community Participation Among Individuals with First Stroke: A Thailand Study. *Annals of Rehabilitation Medicine*, 42(5), 660–669. <https://doi.org/10.5535/arm.2018.42.5.660>
- Suzuki, R., Krahn, G. L., McCarthy, M. J., & Adams, E. J. (2007). Understanding Health Outcomes: Physical Secondary Conditions in People with Spinal Cord Injury. *Rehabilitation Psychology*, 52(3), 338–350. <https://doi.org/10.1037/0090-5550.52.3.338>
- Sweet, S. N., Noreau, L., Leblond, J., & Dumont, F. S. (2014). Understanding Quality of Life in Adults with Spinal Cord Injury Via SCI-Related Needs and Secondary Complications. *Topics in Spinal Cord Injury Rehabilitation*, 20(4), 321–328. <https://doi.org/10.1310/sci2004-321>
- Tederko, P., Krasuski, T., Krasuski, M., Długołęcka, A., & Tarnačka, B. (2017). Determinants of health knowledge and health perceptions from the perspective of health-related education of patients with spinal cord injury: A systematic review. *International Journal of Rehabilitation Research*, 40(2), 97–106. <https://doi.org/10.1097/MRR.0000000000000215>
- Turk, M. A. (2006). Secondary conditions and disability. In M. J. Field, A. M. Jette, & L. Martin (Eds.), *Workshop on Disability in America: A New Look* (pp. 185–193). Washington, D.C.: Institute of Medicine, The National Academies Press. <https://doi.org/10.17226/11579>
- van Loo, M. A., Post, M. W. M., Bloemen, J. H. A., & van Asbeck, F. W. A. (2010). Care needs of persons with long-term spinal cord injury living at home in the Netherlands. *Spinal Cord*, 48(5), 423–428. <https://doi.org/10.1038/sc.2009.142>
- Vogeli, C., Shields, A. E., Lee, T. A., Gibson, T. B., Marder, W. D., Weiss, K. B., & Blumenthal, D. (2007). Multiple Chronic Conditions: Prevalence, Health Consequences, and Implications for Quality, Care Management, and Costs. *Journal of General Internal Medicine*, 22(Suppl 3), 391–395. <https://doi.org/10.1007/s11606-007-0322-1>
- White, G. W., Gutierrez, R. T., & Seekins, T. (1996). Preventing and Managing Secondary Conditions: A Proposed Role for Independent Living Centers. *The Journal of Rehabilitation*, 62(3), 14–20.
- Whiteneck, G. G., Charlifue, S. W., Frankel, H. L., Fraser, M. H., Gardner, B. P., Gerhart, K. A., ... Short, D. J. (1992). Mortality, morbidity, and psychosocial outcomes of persons spinal cord injured more than 20 years ago. *Paraplegia*, 30(9), 617–630. <https://doi.org/10.1038/sc.1992.124>
- Wilber, N., Mitra, M., Walker, D. K., Allen, D., Meyers, A. R., & Tupper, P. (2002). Disability as a public health issue: Findings and reflections from the Massachusetts survey of secondary conditions. *The Milbank Quarterly*, 80(2), 393–421. <https://doi.org/10.1111/1468-0009.00009>
- Yasuda, S., Wehman, P., Targett, P., Cifu, D. X., & West, M. (2002). Return to work after spinal cord injury: A review of recent research. *NeuroRehabilitation*, 17(3), 177–186.