Swiss Paraplegic Research

Swiss Paraplegic Centre

ICF Case Studies

Translating Interventions into Real-life Gains – a Rehab-Cycle Approach

SCI in Older Persons

Case Study 05

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Content

SCI in Older Persons

Preface

Functioning is a central dimension in persons experiencing or likely to experience disability. Accordingly, concepts, classifications and measurements of functioning and health are key to clinical practice, research and teaching. Within this context, the approval of the **International Classification of Functioning, Disability and Health (ICF)** by the World Health Assembly in May 2001 is considered a landmark event.

To illustrate the use of the ICF in rehabilitation practice **Swiss Paraplegic Research (SPF)** together with **Swiss Paraplegic Centre (SPZ)**, one of Europe's leading (acute and rehabilitation) centres for paraplegia and spinal cord injury (SCI), performed a series of case studies. Conducting ICF-based case studies was one approach to address SPF's aim to contribute to optimal functioning, social integration, health and quality of life for persons with SCI through clinical and community-oriented research. The ICF-based case studies project began in October 2006.

In this project, persons of different age groups and gender and who are living with SCI of varying etiology and levels of severity, were accompanied during their rehabilitation at SPZ. The rehabilitation process is then described using the Rehab-Cycle® and the corresponding ICF-based documentation tools. Since persons with SCI are faced with a number of physical, psychological and social challenges, the case studies aimed to cover a broad spectrum of these challenges. With this in mind, each case study highlighted a specific theme of SCI rehabilitation.

A booklet is published for each case study conducted. To better understand the case studies described in these booklets, find below some basic information about SCI, the ICF, ICF Core Sets, the Rehab-Cycle® and the ICF-based documentation tools.

Spinal Cord Injury (SCI)

Spinal cord injury (SCI) is an injury of the spinal cord that results in a temporary or permanent change in motor, sensory, or autonomic functions of the injured person's body. The spinal cord is divided into four sections which can be further subdivided into individual segments:

– 8 cervical segments (C1 to C8)
– 12 thoracic segments (T1 to T12)
– 5 lumbar segments (L1 to L5)
– 5 sacral segments (S1 to S5)

The damage of the spinal cord is called lesion. Important functions such as mobility (motor functions) or sensation (sensory functions) fail below the lesion. To help determine future rehabilitation and recovery needs, the extent of a SCI in terms of sensory and motor functions is described using the American Spinal Injury Association (ASIA) impairment scale.

International Classification of Functioning, Disability and Health (ICF)

The ICF is a classification of the **World Health Organization (WHO)** based on the integrative bio-psycho-social model of functioning, disability and health. Functioning and disability reflect the human experience related to the body functions, body structures, and activities and participation. It is viewed in terms of its dynamic interaction with a health condition, personal and environmental factors.

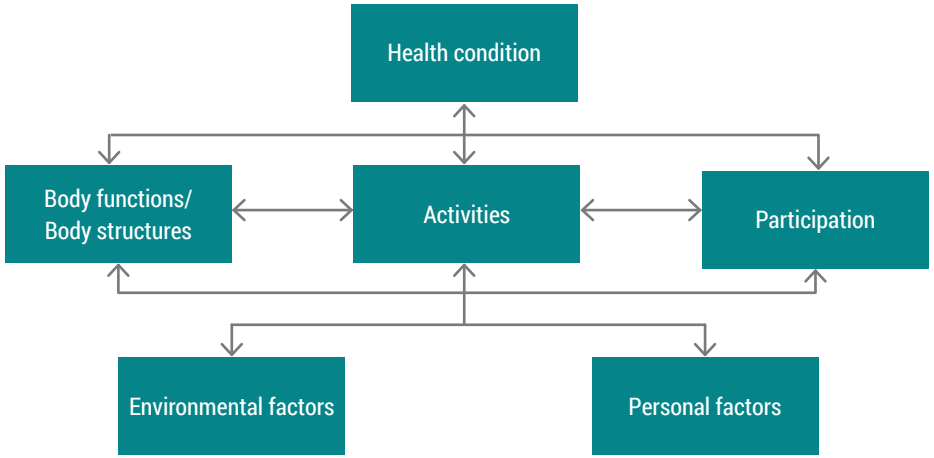

Figure 1: *Bio-psycho-social model of functioning, disability and health*

The ICF classification corresponds to the components of the model. Within each component, there is an exhaustive list of categories that serve as the units of the classification. ICF categories are denoted by unique alphanumeric codes and are hierarchically organized in chapter, second, third and fourth levels. When going from the chapter level to the fourth level, the category's definition becomes more detailed.

The classification also comprises so-called ICF qualifiers, which quantify the extent of a problem experienced by a person in a specific ICF category. Since environmental factors can also be facilitators, the ICF qualifier for facilitators are indicated with a plus sign.

Generic Scale of ICF Qualifiers	
0	NO problem (none, absent, negligible,...) 0-4%
1	MILD problem (slight, low,...) 5-24%
2	MODERATE problem (medium, fair,...) 25-49%
3	SEVERE problem (high, extreme,...) 50-95%
4	COMPLETE problem (total,...) 96-100%
8	not specified (used when there is insufficient information to quantify the extent of the problem)
9	not applicable (used to indicate when a category does not apply to a particular person)

ICF Core Sets

To facilitate the use of the ICF in clinical practice, it is essential to have ICF-based tools that could be integrated into the existing processes. The first step toward providing ICF-based tools for clinical practice was the development of ICF Core Sets. ICF Core Sets are shortlists of ICF categories that are considered to be most relevant for describing persons with a specific health condition or in a particular setting. In a rehabilitation setting an ICF Core Set can help guide the rehabilitation management process. ICF Core Sets have been developed for several health conditions e.g. for spinal cord injury, health condition groups e.g. for neurological conditions and for various settings. ICF Core Sets can serve as a basis when using the **ICF-based documentation tools** that follow the **Rehab-Cycle®**.

Rehab-Cycle® and corresponding ICF-based documentation tools

The Rehab-Cycle® is one approach that reflects the structured processes inherent in multidisciplinary rehabilitation management. The Rehab-Cycle® consists of an assessment phase, assignment phase, intervention phase and evaluation phase. An ICF-based documentation tool has been developed to guide each of the Rehab-Cycle® phases: the ICF Assessment Sheet, the ICF Categorical Profile, ICF Intervention Table and ICF Evaluation Display. These tools can help a multidisciplinary rehabilitation team to better understand the role of functioning within the rehabilitation process and to more comprehensively describe a person's functioning - hence support ICF-based rehabilitation management.

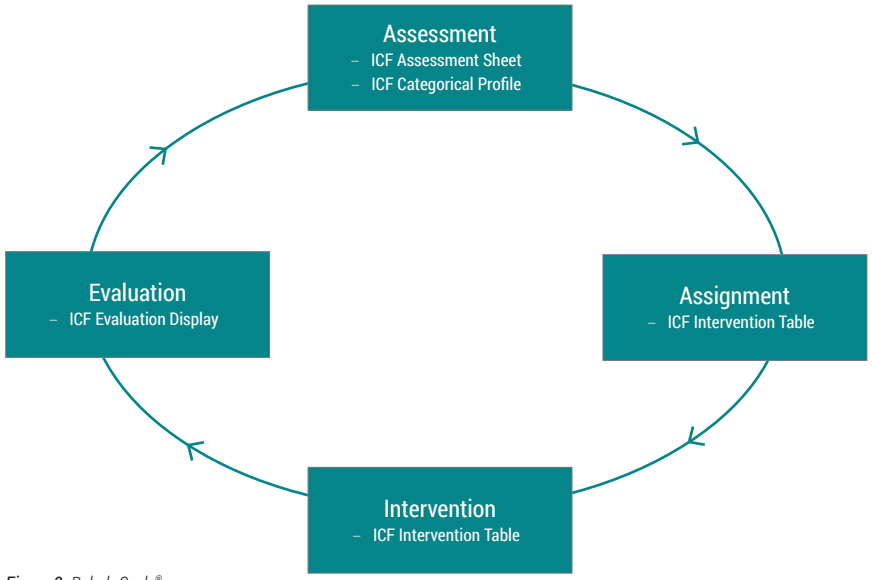

Figure 2: *Rehab-Cycle®*

You can find more detailed information about SCI, the ICF, ICF Core Sets, the Rehab-Cycle® and the ICF-based documentation tools on the website www.icf-casestudies.org.

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General Introduction

More and more spinal cord injuries (SCI) are occuring in older persons. With the effectiveness of SCI interventions, the increased utilization of preventative care and specialized treatment centres and people living longer in general, the life expectancy of persons with SCI has increased dramatically over the past decades.

An estimated 7-20% of those living with SCI are 60 years or older, and these rates have been increasing steadily over the past 20 years.[1, 2, 3, 4, 5] Estimates in the United States indicate a five-fold increase in the incidence of SCI in the elderly over the past 30 years.[6] Thus, understanding the lived experience of older persons with SCI – specific issues and needs – is very important for optimizing care.

SCI in Older Persons

Aging is both an unavoidable fact of life and a complex process. Aging is intertwined with a spectrum of medical, social, environmental, physical and psychological processes, as well as other factors such as genetics, adaptation to stress, ethnicity and economic resources. Sorting out what might be considered the "normal" processes of aging and effects related to SCI is therefore very difficult. However, it can be assumed that the interaction between SCI and increasing age has an additive effect on health problems of older persons with SCI.[4, 7]

"...the interaction between SCI and increasing age has an additive effect on health problems..."

Until recently, no longitudinal studies on SCI and aging had been undertaken. However since the 1990s, studies have explored correlations between complications and comorbidities, SCI and age.[1, 7, 8] The group of older persons with SCI can be differentiated in two distinct populations – those whose SCI occured at an older age (over age 60), known as 'late onset', and those whose SCI occurred many years ago and is now over 60 years of age, known as 'early onset'.[9]

Box 1 | Etiology of Late Onset SCI

In general, the cause of late onset SCI differs markedly from early onset SCI. Historically, SCI that occurs due to a traumatic event or 'traumatic SCI' were more common in younger persons and 'non-traumatic SCIs' in older persons. However the incidence of traumatic SCI has been increasing in older persons, primarily reflecting the higher incidence of falls among the elderly. It is important to note that recent studies have shown a general increase in non-traumatic SCI as well.[5, 6] One study in Italy of 284 persons with SCI showed that the late onset group tend to have non-traumatic and incomplete SCIs, of which a high proportion resulting from degenerative disease.[10]

Given aging patterns in the general population, it is expected that the number of those with both early and late onset injuries will continue to increase.[11]

Older persons with SCI differ from younger persons in fundamental ways. Most notably, older patients have more associated medical problems, and are more likely to develop secondary medical complications related to the SCI itself. This can, in turn, have a major impact on rehabilitation results, and may lead in the worst cases to a cycle of further complications.[9, 10, 11]

Studies have demonstrated that older persons with SCI have a greater risk of diabetes, heart disease, obesity and arthritis, poorer outcomes with respect to walking and more difficulties with bladder and bowel independence.[11] Additionally, older persons with SCI are more likely to develop complications such as pneumonia, pulmonary emboli, renal stones and gastrointestinal hemorrhage.[12] Being aware of such complications are important for the recovery process of persons with SCI. In addition to the nature of injury, a person's general health status also has an impact on the person's functioning outcomes. For example, aspiration pneumonia resulting from the poor state of health of a person with SCI can initiate a cycle of declining health, that can correspondingly lead to a poor prognosis and poor functioning outcome.[13]

Another difference between older persons with SCI and younger persons with SCI include work participation status. In general, persons with late onset SCIs tend not to be working, and often report greater problems in independence measures than those with early onset SCI.[9]

Functioning Outcomes in Older Persons with SCI

Given the higher rate of complications among older persons with SCI, what outcomes can be anticipated during rehabilitation?

One large study of over 6,000 persons with SCI showed a correlation between age and a decrease in functional independence, overall life satisfaction, and perceived physical health, especially in the areas of physical independence, mobility, occupational functioning and social integration.[9] Given these less than positive outcomes, there is a significant chance that older persons with SCI will be transferred to other hospitals rather than home or rehospitalized after some time in the community.[10] In addition, a person's age is a particularly strong predictor of whether he is discharged to his own home, a nursing home or another care facility.[14]

"...a person's age is a particularly strong predictor of whether he is discharged to his own home, a nursing home or another care facility."

SCI has been associated with an acceleration of the aging process due to lower physiological reserves and increasing requirements of functional body systems. Considering this the prevention and treatment of comorbidities and SCI-related complications experienced by older persons with SCI require special attention on the part of the rehabilitation team.[4] To enable the delivery of appropriate services, the rehabilitation approach may need to be specially tailored for the **unique rehabilitation needs of older persons with SCI**, taking into account the person's functioning status, comorbidities and existing complications – all of which could facilitate or challenge the rehabilitation process.[10]

As we will see in this case study of Mr. Meier, a 78-year old man with SCI, memory loss and dementia can significantly impede rehabilitation efforts. This case study aims to illustrate how **age-related factors impact upon rehabilitation,** and the role that comorbidities and age can play in achieving optimal functioning outcomes.

Mr. Meier's Story

"I felt relatively healthy before the aneurysm and the spinal cord injury. I didn't have any sense of a problem that would require an operation, so I was quite surprised when it came up. There was no discomfort; I wasn't disabled. I did get a little tired while working. Of course, I thought this was just my age."

Mr. Meier

By many measures Mr. Meier, 78 years old, was **successful in his life**. After 25 productive years as the chief executive officer (CEO) of his own auto parts firm, he went into retirement. He was married only once and is still married, and is an involved grandparent of two grandchildren from two daughters.

Retirement did not mean that Mr. Meier would slow down. And he certainly was not going to stop "working". Since retiring, he had been focused on managing and maintaining a number of properties that he owns throughout Switzerland. Not surprisingly, Mr. Meier lived comfortably and in relative wealth together with his wife in a one-family chalet. He had always lived his life enthusiastically, and since stepping down as CEO, sailing, gardening and socialising have comprised his recreational time.

At his age, Mr. Meier never anticipated having to live with a spinal cord injury (SCI). And despite his age and **living with diverse health conditions** at the time of onset of the SCI, physical fitness, mental clarity and independence were the norm for him. His life after SCI was drastically different, taking him on a five-month rehabilitation journey with challenges that he had not previously experienced.

Comorbidity and SCI

Mr. Meier's medical history extended back quite a number of years, covering a range of health problems, some of which had implications for his recovery after the SCI and subsequent rehabilitation.

"...previous aneurysms, heart disease and thromboembolytic incidents placed him at even greater risk for SCI-associated thromboses."

In 1998, he had suffered from thoracic and abdominal aortic aneurysms that were successfully treated. Mr. Meier's medical history also included ischaemic coronory heart disease and repeated thromboembolic incidents (1942, 1963 and 1998), renal cysts, cox arthrosis (leading to a hip joint prosthesis in 1998) and wrist and shoulder arthrosis. Despite his extensive history of illness, Mr. Meier considered himself quite fit for his age – that is, before his SCI.

Although none of these health conditions resulted in a permanent disability at the time of their onset, all of these conditions had the potential for negatively impacting Mr. Meier's recovery from SCI. For example, previous aortic aneurysms (see box 2), heart disease and thromboembolytic incidents placed him at even greater risk for SCI-associated thromboses. Moreover, heart disease could impact his tolerance for exercise, that in turn could limit rehabilitation interventions.

Box 2 | Aortic Aneurysm Surgery and SCI

An aneurysm occurs when there is a localized dilation (or widening) of an artery. Such a widening can lead to a weakening or rupture of a vessel wall. Most aneurysms occur in the aorta. The aorta is the primary vessel that distributes blood from the heart to the rest of the body. While smaller aneurysms may be treated medically, some larger or more aggressive aortic aneurysms may require a surgical intervention to repair the damaged tissue. This procedure involves replacing the damaged portion of the vessel with a synthetic tube.[15, 16, 17]

SCI can be one of the most serious consequences following the surgical repair after an aortic aneurysm. Its onset can also be one of the most difficult to predict. The life-saving procedure carries with it the devastating risk of paraplegia. With older age, post-operative SCI has been associated with poorer outcomes due to secondary complications. The reasons for SCI stem from factors associated with the surgical procedure itself that involves the clamping of the aorta and the disruption of blood flow to the spinal cord. Although techniques have been devised to minimize the risk, SCI still occurs in 3-18 % (estimate) of the cases.[18]

Based upon the the risks, benefits and treatment options available, health care professionals together with the person who experienced the aortic aneurysm will need to make an informed decision about the most appropriate intervention.

In 2007, Mr. Meier underwent his second surgical repair following an aortic aneurysm. Though the procedure likely saved his life, he was now confronted with paraplegia as a result of the intervention. His primary diagnosis was classified as ASIA B, sub T4 (indicating that sensory but no motor function existed below the injury level). *See information about the ASIA impairment scale on page 4.*

Following the onset of SCI, a number of **secondary complications** arose in the early post-acute rehabilitation phase. A direct result of the SCI included autonomic dysregulation that caused an impairment of Mr. Meier's circulation and bladder, bowel and sexual functions. One week after the procedure, Mr. Meier was further diagnosed with respiratory global insufficiency, and a tracheostomy tube was put in place to allow for mechanical ventilation as well as a tube to facilitate feeding (known as a PEG tube that passes directly into the stomach).

"Whether and to what degree the complications that arose were related to Mr. Meier's age is impossible to discern."

Whether and to what degree the complications that arose were related to Mr. Meier's age is impossible to discern. However, being elderly clearly put him at risk for many of the conditions previously mentioned in addition to the aneurysm itself.

These complications that showed up within 10 days after surgery were managed with medical interventions. Mr. Meier was subsequently admitted to a a rehabilitation centre specialized in SCI. At admission, his spinal cord independence measure (SCIM) score was low at 9 out of 100 points.

Box 3 | The Spinal Cord Independence Measure[19]

The spinal cord independence measure, or SCIM, is a disability scale commonly utilized to perform functional assessments of persons with paraplegia or tetraplegia. It was developed to provide health care professionals with a valid and reliable measure that specifically addresses the ability of persons with SCI to perform basic activities of daily living independently. The measure has been determined to be sensitive at detecting changes in functioning of persons with a spinal cord lesion. The following areas of functioning are evaluated to determine a SCIM score that goes from 0 to a maximum of 100 points:

- **Self-Care** (0-20 points): Assesses independence in feeding, bathing, dressing and grooming
- **Respiration and sphincter management** (0-40 points): Assesses independence in respiration, bladder and bowel sphincter management and use of the toilet.
- **Mobility** (0-40 points): Assesses independence in mobility in bed, pressure sore prevention, transfers from bed to wheelchair and wheelchair to toilet or bathtub, indoor mobility, outdoor mobility, mobility for moderate distances, stair management and transfer from the wheelchair to a car and from the ground to a wheelchair.

The higher the score the more independent a person is. The SCIM score can be useful for a multidisciplinary team to assess everyday performance over time.

In Mr. Meier's case, his SCIM score was low but stable just prior to the start of his rehabilitation. This reflected his significant degree of dependancy four weeks following the SCI. His respiration continued to be artificially assisted with mechanical ventilation, and feeding was only possible through his PEG tube.

Medical management and rehabilitation proceeded steadily over the course of four months. During this time, his respiration improved and he was eventually able to breathe without the help of a respirator. Unfortunately the tracheostomy tube resulted in decreased sensitivity of Mr. Meier's pharynx and larynx, that in turn later led to aspiration pneumonia. Luckily, the pneumonia was successfully treated. However, Mr. Meier continued to suffer from aspiration problems due to difficulties in swallowing (known as dysphagia).

Mr. Meier's discharge from the rehabilitation centre had been planned for five months after admission. When his feeding tube was removed, he and the rehabilitation team agreed that he would remain one month longer before being discharged. During this one-month period, the rehabilitation team initiated a Rehab-Cycle® in order to prepare Mr. Meier for discharge.

Assessment

The Rehab-Cycle® of Mr. Meier began in July 2007 with an assessment of functioning from both a health professional perspective as well as Mr. Meier's own perceptions and experiences.

This assessment was based on the description of ICF components (body functions and structures, activities and participation, environmental and personal factors). It helped **identify what he and his rehabilitation team saw** as outstanding needs and individualized problems – some of which were age-related.

Table 1 shows the **ICF Assessment Sheet** that was used to document, in Mr. Meier's own words, his experience of functioning in the component of activities and participation, as well as the results from the clinical assessment conducted by the rehabilitation team using ICF terminology. The environmental and personal factors reflected the combination of information received from Mr. Meier as well as the observations of the rehabilitation team. *See "Table 1: ICF Assessment Sheet" on page 26 at the end of this booklet.*

> *"At the moment, I don't have any discomfort … I just can't walk. Worst of all, I still can't go to the bathroom on my own. Being in this condition makes me utterly helpless...The rehabilitation team keeps telling me that I've been a model student and patient, but I just don't see this at all...My mood is extremely unstable at the moment. It's difficult for me to even talk about it. Sometimes I just start crying! This is terrible for a grown man. I've never cried before in my life, never had this problem! I used to feel like a normal man."*
>
> *Mr. Meier*

For Mr. Meier there was a variety of age-related physical, psychological as well as personal factors that impacted the progression of his disease and the pace of recovery. Therefore, it was important to take stock of these issues at the start of this Rehab-Cycle®.

Beyond the **age-related factors**, consequences of the extensive period during which his condition was serious and he was restricted to bed included low tolerance for exercise and reduced muscle power functions in the upper extremity. These body function issues resulted in a problem in another body function i.e. inadequate supportive functions of his arms. These body function impairments became critical factors in his rehabilitation. Combined with disease-related issues, they also placed significant limitations on Mr. Meier's activities.

Cognitively, Mr. Meier was having **trouble with his memory**; he himself recognized that the act of recalling certain words became challenging for him. Psychologically he continued to have intense **mood swings**, often leading him to cry for no reason (as perceived by Mr. Meier).

"Being in this condition makes me utterly helpless."

Other issues were more or less independent of age – **positive environmental factors** included Mr. Meier's financial assets and property, and positive personal factors included his feeling of accomplishment and the perception that he has led a good life. He also felt no need to make lots of plans for the future.

With regard to Mr. Meier's body functions and structures, he felt no pain and experienced some sensation in his legs. Urinary and defecation functions were completely impaired; this, in turn, led to complete dependency on bladder and bowel management. **Being dependent on others**, especially for toileting, was particularly **difficult for Mr. Meier**. Moreover, the loss of muscle power functions in the lower half of the body and increasing spasticity in the legs made it difficult for him to transfer from bed to wheelchair and back as well as change his body position from a lying to a sitting position. He also suffered from itchy skin, probably due to medication.

With regard to activities and participation, Mr. Meier experienced many of the same common complaints as others with incomplete paraplegia i.e. an inability to walk, wash and care for himself and a need for assistance in getting dressed. Regarding mobility, the rehabilitation team felt that Mr. Meier's wheelchair (an environmental factor) was less than optimal and additional assistive devices would be necessary to achieve optimal functioning. After his tracheostomy tube was removed, he was able to eat without significant limitation and his digestion functioned normally.

"Having to stay at the rehabilitation centre prevented him from participating in life at home and from managing his property."

Based upon the assessment results Mr. Meier and his rehabilitation team mutually agreed upon a set of goals. These goals were documented on the ICF Categorical Profile.

Goal-setting/Determination of Intervention Targets

Based on the assessment results an **ICF Categorical Profile** of Mr. Meier's functioning status was created. An ICF Categorical Profile is a visual display of ICF categories that reflect these assessment results as well as the goals i.e. global goal, service-program goal and three cycle goals, that Mr. Meier and his rehabilitation team mutually agreed upon.

See "Table 2: ICF Categorical Profile" on page 28 at the end of this booklet.

As a **global goal** they decided to strive for adequate general functioning in daily life. Correspondingly they defined optimal independence in daily living as Mr. Meier's **service-program goal**.

To help achieve these broader goals, three **cycle goals** were set: improvement of mobility (including independent transferring and changing of body positions), improvement of self-care (including independent dressing) and general health status (including prevention of further secondary complications like pressure ulcers, respiratory infection or impairments in mobility of joint functions).

Once the goals were defined, corresponding **intervention targets** were determined. Intervention targets were those ICF categories that corresponded to specific goals and were addressed with interventions in the Rehab-Cycle®. If an ICF category did not correspond to a set goal e.g. b1302 Appetite, it was not considered an intervention target and thus not addressed during the assignment and intervention phases of the Rehab-Cycle®.

Assignment and Intervention

Mr. Meier's rehabilitation team included his physician, a nurse, physical therapist, occupational therapist and social worker. Each team member was assigned to corresponding intervention targets that had been determined during the assessment phase.

His physician, for instance, was responsible for cardiovascular, elimination and muscle tone functions; medication was the primary intervention provided by the physician. While the nurse supported Mr. Meier in nearly all activities of self-care, the physical therapist provided interventions to improve muscle power functions, mobility of joint functions and to strengthen supportive functions of the arms such as muscle strength training of the upper extremity, specific "prop-up" training and passive movement of the lower extremity joints.

The assignment of rehabilitation team members to respective intervention targets and the interventions themselves are are listed in more detail on table 3, the **ICF Intervention Table**. Mr. Meier's ICF Intervention Table also shows the results of the first assessment as a starting point and the value, as indicated by the ICF qualifier, he and his rehabilitation team intended to achieve after completing the interventions. *See "Table 3: ICF Intervention Table" on page 30 at the end of this booklet.*

As the intervention phase proceeded, all did not go as planned. Three weeks into the intervention phase, the rehabilitation team was encouraged with some of the results but less pleased with others.

There had been a moderate turn for the better in Mr. Meier's condition, with slight but significant improvements in many of the intervention targets including respiration and circulatory functioning as well as with mobility. However, certain self-care activities did not seem to be improving, and time was running out.

Just before the end of the Rehab-Cycle®, a critical change occurred that threatened the entire process – the rehabilitation team discovered that Mr. Meier's consciousness had altered such that he was no longer oriented to time and place. This was a sudden and wholly **unanticipated event** with no explanation. The team members were confounded as they helplessly watched Mr. Meier's physical condition deteriorate along with his mental state. Although it was suspected that his state had cardiovascular and/or neurological etiologies, electrocardiographs and CT scans were inconclusive. After seven days, Mr. Meier's **dementia-like symptoms** subsided. Nevertheless, no clear diagnosis had been made.

"...Mr. Meier's consciousness had altered such that he was no longer oriented to time and place...After seven days, Mr. Meier's dementia-like symptoms subsided."

Mr. Meier showed slow but steady improvements in his mental state. He became more conscious to his surroundings and situation. He began to exercise again and his rehabilitation interventions were carefully resumed at a lower level of intensity than before. At the conclusion of the intervention phase, an evaluation of Mr. Meier's functioning status was conducted to see the improvements in the intervention targets or lack thereof.

Evaluation

"I didn't achieve as much as I wanted to. I still can't walk!"

Mr. Meier at the end of his Rehab-Cycle®

Despite the complications that arose, Mr. Meier was able to make progress in his Rehab-Cycle®, achieving two of his three cycle goals: mobility and general health status. This was clearly seen during the evaluation phase.

At the evaluation, the physical therapist found that Mr. Meier's mobility had improved. For example, the power in isolated muscles and muscle groups increased, and Mr. Meier's mobility was better when using equipment/assistive devices. His general health status also showed improvement due to better cardiovascular and excretory functioning.

The **ICF Evaluation Display** gives a detailed overview of goals, intervention targets, as well as assessment and evaluation results for comparison. *See "Table 4: ICF Evaluation Display" on page 32 at the end of this booklet.*

As seen on the ICF Evaluation Table, Mr. Meier's cycle goal for self-care was unfortunately not reached. This was primarily due to a lack of improvement in a number of specific intervention targets, namely caring for the skin, toileting and dressing.

For the improvements that did occur, the spinal cord independence measure (SCIM) score increased from 9 to 38 out of 100 possible points, with the largest gains in independent respiration and the ability to turn and sit up in bed. *See "Table 5: Spinal Cord Independence Measure (SCIM)" on page 34 at the end of this booklet.*

The SCIM results for Mr. Meier in self-care did demonstrate some improvement – in eating and holding a cup, soaping with adaptive devices, and putting on and taking off these devices independently. Unfortunately these accomplishments fell short of what had been hoped for by the team and Mr. Meier himself.

The self-care activities that did not show the expected improvement were all the activities that required coordination of multiple tasks. For Mr. Meier multi-tasking was probably difficult given his impaired memory functions that was observed during the intervention phase when dementia-like symptoms unexpectedly appeared. This, in turn, limited the extent of improvement in self-care activities.

With consideration of Mr. Meier's age and general health condition, there was some improvement in his functional outcomes. Still his existing heart disease, his reduced exercise tolerance and the limitations on physical activity all had an effect on his rehabilitative training and was expected to impact on Mr. Meier's future functioning.

At the evaluation, he had not been able to recall and execute the required steps to complete certain tasks, such as transferring himself into a car or from his bed to a wheelchair. Due to reduced memory functions Mr. Meier will most likely require assistance in the future and will have to learn different strategies e.g. memorizing steps of the task to more effectively perform certain coordinated complex activities.

"Given his mental and physical health condition, I don't anticipate an improvement in his functional outcome."

Mr. Meier's physical therapist at the end of the Rehab-Cycle®

Discussion

Spinal cord injury (SCI) has a devastating and traumatic impact on all those it affects. An older person with SCI can present unique challenges within a rehabilitation setting. These persons bring a variety of age-related problems as well as resources that can greatly influence the rehabilitation process. Mr. Meier's case is a good illustration of rehabilitation in older persons with SCI.

Age-related Risks and Complications

Increasing age is associated with a higher risk of aortic aneurysm. In Mr. Meier's case, it is clear that the corrective surgery required for this condition carries with it the unfortunate higher risk of SCI.[18] It resulted in a non-traumatic and incomplete SCI, the type of SCI that is more prevalent among older persons.[10]

"Rehabilitation providers must be attuned to the fact that older persons are confronted more frequently by complications, both mental and physical, during the rehabilitative process."

As SCI survivors of older age recover, there are numerous factors that can affect the rehabilitation process and outcomes. Mr. Meier reflects the higher incidence of complications during hospitalization in persons over 50 years of age.[9, 10] In his case, comorbidities, limited tolerance for physical activity, age-related personal factors and psychological factors all had a significant effect on Mr. Meier's general health and rehabilitation.

In the assessment phase of Mr. Meier's Rehab-Cycle® it was observed that some factors that are common among persons with SCI were independent of age, while others could be considered age-related. Age-related factors included comorbidities that resulted in impaired cardiovascular and respiratory functions as well as a weak musculoskeletal system. Such limitations and complications have the potential for creating a negative feedback cycle, that in turn, can lead to poorer outcomes. In Mr. Meier's case, his physical limitations adversely impacted the physical training and exercises that were part for his rehabilitation program. This slowed his progress and perhaps even contributed to the less than optimal outcome after intervention. This, in turn, resulted in weakening Mr. Meier's general health.

His general health was further harmed by an unexpected and sudden downturn of his mental state, specifically the appearance of dementia-like symptoms, late in the Rehab-Cycle®. It is unclear whether Mr. Meier's dementia-like symptoms were related to his advanced age or something else. In any case, rehabilitation providers must be attuned to the fact that older persons are more frequently confronted by mental and physical complications during the rehabilitative process.

Facilitating Factors and Challenges

In addition to age-related factors that can pose barriers to rehabilitation outcomes, there are other factors that can have a facilitating effect. Such age-related factors could be social or economic in nature or reflect personal characteristics and geographic aspects. In Mr. Meier's case, he was already retired and due to many years of working and running his own business, he had accumulated significant monetary capital that safeguarded him from any financial worries. This is contrary to what many younger persons with SCI experience. Since older persons are generally no longer in the workforce,[5, 9] they ar no longer dependent on employment for their livelihood.

The presence of a spouse can also have a significant impact on the lived experience of an older person with SCI. Spousal support has been associated with less depression, greater life satisfaction, psychological well-being and better perceived quality of life among persons with SCI.[20] One question remains: If the spouse him or herself is elderly, is the spouse capable of caring for the partner with SCI or does the spouse require care him or herself? Fortunately in Mr. Meier's case, he had a wife and family that were willing and able to support him. Both of these factors were of great benefit to Mr. Meier during the course of his recovery.

"The presence of a spouse can also have a significant impact..."

Furthermore, an older person's view of life may differ from those of a younger person living with SCI; this different life perspective may have an impact on the person's psychological status. For example, Mr. Meier felt strongly that he had already lived a long and successful life. Overall, he felt he had a "good life". This view of life offered him a degree of comfort and strength. While this was a facilitating personal factor of Mr. Meier, and perhaps of many older persons, it did not pre-empt other psychological challenges. Feeling helpless or "being lost", along with having feelings of diminished masculinity were issues that plagued Mr. Meier throughout his rehabilitation. While such feelings may not be specifically age-related, powerlessness and dependency among older men who have always maintained traditional gender roles may be prevalent.

Another mental issue that Mr. Meier had to deal with during his rehabilitation was worsening memory. Mr. Meier's difficulty in remembering the individual steps necessary for successful transferring or for performing other multi-step tasks forced him to be dependent on others. In this case, the memory limitations Mr. Meier expererienced could largely be considered age-related.

"Feeling helpless or 'being lost', along with having feelings of diminished masculinity were issues that plagued Mr. Meier throughout his rehabilitation."

Case Study 05 | SCI in Older Persons | Discussion

Older and elderly persons with SCI can present a special set of factors, both facilitative and challenging, that impact the rehabilitation process. Within the Rehab-Cycle®, many of the factors can be assessed at the beginning and constructively used to inform the rehabilitation process with the hope of achieving better outcomes.

Awareness of comorbidities and the risk of complications associated with older persons is the first step toward prevention and management. In addition, facilitating aspects of the person's character, social network and environment should be taken into consideration, since these can facilitate the rehabilitation process and prepare the person for returning home or, if needed, to a nursing home or another appropriate health care facility.

For older persons with SCI, the Rehab-Cycle®'s holistic approach to rehabilitation can support the person's and the rehabilitation team's decision-making along the way, allowing for the best possible recovery and outcomes.

Annex

Table 1: ICF Assessment Sheet

ICF Assessment Sheet

Body Functions & Structures

Patient Perspective

- Sometimes I can't remember words
- My mood has changed very much
- I have to cry sometimes without knowing why
- I can eat without limitation
- I can sense my legs somehow
- I have no pain
- I have some mucus in my lungs
- My digestion is working
- I can sense my full bowel
- My legs are paralyzed
- I have a lot of spasticity
- My skin itches when I am sweating

Health Professional Perspective

- Proprioceptive functions below T4 – reduced
- Touch functions below T4 – reduced
- Heart functions – impaired
- Blood vessel functions – at risk
- Respiratory functions – at risk
- Airways congested with mucus
- Exercise tolerance functions
- Fecal incontinence
- Urinary incontinence
- Mobility of joint functions – at risk
- Muscle power functions in upper extremity – reduced
- Muscle power functions below T4 – none
- At times high spasticity (Flex/Add)
- Involuntary movement reaction functions
- Supportive functions of the arms – insufficient
- Structure of the wrist joint – impaired
- Structure of areas of skin

Activities & Participation

Patient Perspective

- I can transfer from and to bed by myself
- I can't put my legs on the bed
- I can transfer into the car
- I can't walk
- I can move around with the wheelchair
- I can sit on a horse for therapy
- I need help in washing myself
- I need help in caring for my body
- I can't go to the toilet by myself
- I need help to dress
- I can't organize things at home
- I started playing table tennis for the first time in my life
- I used to go sailing, take walks and garden
- I can't do what I want
- I have less independence; I am a helpless creature

Health Professional Perspective

- Changing basic body positions – severely limited
- Transferring – Partially limited
- Maintaining a sitting position – limited
- Washing oneself – Partially limited
- Caring for body parts – completely limited
- Bladder management – completely limited
- Bowel management – completely limited
- Dressing – partially limited
- Looking after one's health – insufficient
- Plays table tennis

Environmental Factors

- Wheelchair is not perfect
- Assistive devices
- I already rented a wheelchair adapted flat
- Steps and ramps are disabling
- Doors are too narrow and disabling
- Hot weather is a burden
- The landscape is beautiful
- Family supports him
- Has 'the best wife'
- Wife can drive the car
- Being in this rehabilitation centre is the best thing that has happened to him
- Care is perfect
- Rehabilitation team members are always friendly, in a good mood and happy
- Financial assets
- Three houses he owns are not wheelchair-adapted

Personal Factors

- 79 year old male
- Married, living together with wife in Swiss chalet
- 2 children, two grandchildren
- One dog
- Owner of three houses
- Feels lost somehow
- Started and finished a lot things in his life
- Stated that he has had a good life
- Sees that being 79 years old one does not make plans for the future

Table 2: ICF Categorical Profile

ICF Categorical Profile

Assessment

Global Goal: General functioning in daily life					■	■	■					
Service-Program-Goal: Independence in daily living					■	■	■	■	■			
Cycle goal 1: Mobility					■	■	■					
Cycle goal 2: Self-Care					■	■	■	■				
Cycle goal 3: General health status					■	■						

ICF categories		ICF Qualifier									Goal Relation	Goal Value
						problem						
						0	1	2	3	4		
b1302	Appetite					■					-	-
b144	Memory functions					■	■				-	-
b152	Emotional functions					■	■	■			-	-
b260	Proprioceptive functions					■	■	■	■		-	-
b265	Touch function					■	■	■	■		-	-
b280	Pain					■					-	-
b410	Heart functions					■	■	■			3	2
b415	Blood vessel functions					■	■				3	1
b420	Blood pressure functions					■	■				1	0
b440	Respiratory functions					■	■	■			3	1
b450	Additional respiratory functions					■	■				3	1
b455	Exercise tolerance functions					■	■	■			1	1
b5105	Swallowing					■	■				-	-
b525	Defecation functions					■	■	■	■	■	3	4
b610	Urinary excretory functions					■	■	■			3	2
b620	Urination functions					■	■	■	■	■	3	4
b640	Sexual functions					■	■	■	■	■	-	-
b710	Mobility of joint functions					■					1	0
b7300	Power of isolated muscles and muscle groups					■	■	■			1	1
b7303	Power of muscles in lower half of the body					■	■	■	■	■	-	-
b735	Muscle tone functions					■	■	■	■		1	1
b755	Involuntary movement reaction functions					■	■	■			1	1
b7603	Supportive functions of the arms					■	■	■			1	1
b840	Sensations related to the skin					■	■	■			-	-
s73011	Wrist joints					■	■	■			-	-
s810	Structures of areas of the skin					■	■				3	0
d230	Carrying out daily routine					■	■	■	■	■	-	-
d410	Changing basic body positions					■	■	■	■		1	1
d4153	Maintaining a sitting position					■	■	■			1	1
d4200	Transferring oneself while sitting					■	■	■			1	1
d450	Walking					■	■	■	■	■	-	-
d465	Moving around using equipment					■	■	■			1	1
d510	Washing oneself					■	■	■	■		2	2
d5200	Caring for skin					■	■	■	■	■	2	3
d530	Toileting					■	■	■	■	■	2	3
d540	Dressing					■	■	■	■		2	2
d570	Looking after one's health					■	■				2	0
d6505	Taking care of plants, indoors and outdoors					■	■	■	■	■	-	-
d760	Family relationship					■					-	-
d920	Recreation and leisure					■	■	■			-	-
		facilitator					barrier					
		4+	3+	2+	1+	0	1	2	3	4		
e1101	Drugs		■	■	■	■					3	4+
e1151	Assistive products...for personal use in daily living			■	■	■					1	4+
e1201	Assistive products...for personal mobility			■	■	■					1	4+
e150	Design, construction of buildings for public use					■	■	■			-	-
e155	Design, construction...of buildings for private use					■					-	-
e160	Products and technology of land development					■	■	■			-	-
e1650	Financial assets	■	■	■	■	■					-	-
e210	Physical geography			■	■	■					-	-
e225	Climate					■	■	■			-	-
e310	Immediate family	■	■	■	■	■					-	-
e350	Domesticated animals				■	■					-	-
e355	Health professionals	■	■	■	■	■					-	-
e450	Individual attitude of health professionals	■	■	■	■	■					-	-
e555	Associations and organizations	■	■	■	■	■					-	-
e5800	Health services					■					SP	4+
pf	Role behavior					■	■	■			-	-

Table 3: ICF Intervention Table

ICF Intervention Table											
	Intervention target		Intervention	Doc	Nurse	PT	OT	SW	First value	Goal value	Final value
Body function/structure	b410	Heart functions	Medication	x					2	2	2
	b415	Blood vessel functions	Compression hosiery	x	x				1	1	1
	b420	Blood pressure functions	Medication, Compression hosiery	x	x				1	0	0
			Standing table			x					
	b440	Respiratory functions	Inhalation		x				2	1	0
	b450	Additional respiratory functions	Cough training			x			1	1	1
	b455	Exercise tolerance functions	Endurance training with ergometer			x			2	1	3
	b525	Defecation functions	Medication	x					4	4	3
			Digital elimination		x						
	b610	Urinary excretory functions	Medication	x					2	2	2
	b620	Urination functions	Medication	x					4	4	4
			Catheterization		x						
	b710	Mobility of joint functions	Passive movement		x	x			0	0	0
	b7300	Power of isolated muscle groups	Muscle power training with equipment			x			2	1	1
	b735	Muscle tone functions	Medication	x					3	1	1
			Hippotherapy			x					
	b755	Involuntary movement reaction functions	Body balance training			x			2	1	1
	b7603	Supportive functions of the arms	Prop-up training, Training with equipment			x			2	1	1
	s810	Structure of areas of the skin	Daily inspections		x				1	0	0
Activities/Participation	d410	Changing basic body positions	Repetitive training			x	x		3	1	2
	d4153	Maintaining a sitting position	Table tennis, Hippotherapy			x			2	1	1
	d4200	Transferring oneself while sitting	Repetitive transfer training			x	x		2	1	1
	d465	Moving around using equipment	Instruction for wheelchair use			x	x		2	1	1
	d510	Washing oneself	Support		x				3	2	2
	d5200	Caring for skin	Support, Instructions		x				4	3	4
	d530	Toileting	Support		x				4	3	4
	d540	Dressing	Support, Instructions		x				3	2	3
	d570	Looking after one's health	Instruction, Counseling		x	x	x		1	0	1
Environmental factors	e1151	Assistive products... for personal use in daily living	Choice and organization of assistive devices		x		x		2 (+)	4 (+)	4 (+)
	e1201	Assistive products... for personal mobility	Choice of manual wheelchair, Counseling for electric wheelchair				x		2 (+)	4 (+)	4 (+)
	e5800	Health services	Organization of care after discharge					x	0	4 (+)	4 (+)

Table 3: ICF Intervention Table; Doc = Physician; PT = Physical Therapist; OT = Occupational Therapist; SW = Social Worker. The first value refers to the rating at the initial assessment, the goal value refers to the rating that should be achieved after the intervention, and the final value refers to the actual rating at the second assessment or evaluation. ICF qualifiers were used to determine theses ratings (0 = no problem to 4 = complete problem) in the intervention targets. For the intervention targets representing the environmental factors, the plus sign next to value indicates a facilitator. Note that e1101 Drugs is not listed, since this represents the intervention with medication itself.

Table 4: ICF Evaluation Display

ICF Evaluation Display																						
Assessment																						
Global Goal: General functions in daily living											1					Not evaluated yet					-
Service-Program-Goal: Independence in daily living											1										+
Cycle goal 1: Mobility											1										+
Cycle goal 2: Self-Care											2										-
Cycle goal 3: General health status											1										+

ICF categories		ICF Qualifier									Goal relation	Goal value	ICF Qualifier										Goal achievement
						problem											problem						
						0	1	2	3	4							0	1	2	3	4		
b410	Heart functions										3	2											+
b415	Blood vessel functions										3	1											+
b420	Blood pressure functions										1	0											+
b440	Respiratory functions										3	1											+
b450	Additional respiratory functions										3	1											+
b455	Exercise tolerance functions										1	1											-
b525	Defecation functions										3	4											+
b610	Urinary excretory functions										3	2											+
b620	Urination functions										3	4											+
b710	Mobility of joint functions										1	0											+
b7300	Power of isolated muscle groups										1	1											+
b735	Muscle tone functions										1	1											+
b755	Involuntary movement reaction functions										1	1											+
b7603	Supportive functions of the arms										1	1											+
s810	Structure of areas of the skin										3	0											+
d410	Changing basic body positions										1	1											-
d4153	Maintaining a sitting position										1	1											+
d4200	Transferring oneself while sitting										1	1											+
d465	Moving around using equipment										1	1											+
d510	Washing oneself										2	2											+
d5200	Caring for skin										2	3											-
d530	Toileting										2	3											-
d540	Dressing										2	2											-
d570	Looking after one's health										2	0											-

		Caring for skin					barrier						facilitator					barrier				
		4+	3+	2+	1+	0	1	2	3	4			4+	3+	2+	1+	0	1	2	3	4	
e1101	Drugs										3	4+										+
e1151	Assistive products...for personal use in daily living										1	4+										+
e1201	Assistive products...for personal mobility										1	4+										+
e5800	Health services										SP	4+										+

Table 4: ICF Evaluation Display; ICF Qualifier: rate the extent of problems (0 = no problem to 4 = complete problem) in the components of body functions (b), body structures (s), activities and participation (d) and the extent of positive (+) or negative impact of environmental (e) and personal factors (pf); Goal Relation: 1, 2, 3 refers to Cycle goal 1, 2, 3 and SP refers to Service-Program goal; Goal value refers to the ICF qualifier to achieve after an intervention; Goal achievement: + means achieved, - means not achieved.

Table 5: Spinal Cord Independence Measure (SCIM)

Spinal Cord Independence Measure (SCIM)					
		April 2007		September 2007	
Self-Care	Feeding	0	Needs parental, gastrostomy or fully assisted oral feeding	3	Eats cut food with one adaptive device, holds cup
	Bathing	1	Soaps only small part of the body with or without adaptive devices	3	Soaps with adaptive devices; needs a little assistance to reach distant parts of body
	Dressing	1	Dresses upper body partially (e.g. without buttoning) in special position (e.g. back support)	2	Independent in dressing and undressing upper body. Needs much assistance for lower body
	Grooming	2	Performs some tasks using adaptive devices; needs help to put on/ take off devices	3	Performs some tasks using adaptive devices; puts on/ off devices independently
	Sub-score	4		11	
Respiration and sphincter management	Respiration	2	Requires tracheal tube and partially assisted ventilation	10	Breathes independently without any devices
	Sphincter management-bladder	0	Indwelling catheter	0	Indwelling catheter
	Sphincter management-bowel	0	Irregularity, improper timing or very low frequency of bowel movements (less than once in three days)	5	Regular bowel movements, with proper timing, but with assistance (e.g. for applying suppository)
	Use of toilet	0	Requires total assistance	0	Requires total assistance
	Sub-score	2		15	
Mobility in room and toilet	Motion in bed and sore prevention	0	Requires total assistance	4	Turns in bed and sits up without assistance
	Transfers: bed-wheelchair	0	Requires total assistance	1	Needs partial assistance and/or supervision
	Transfers: wheelchair-toilet-tub	0	Requires total assistance	1	Needs partial assistance and/or supervision, or adaptive device (e.g. grab bars)
	Sub-score	0		6	
Mobility indoors and outdoors	Mobility indoors	1	Needs electric wheelchair or partial assistance to operate manual wheelchair	2	Moves independently in manual wheelchair
	Mobility for moderate distances	1	Needs electric wheelchair or partial assistance to operate manual wheelchair	2	Moves independently in manual wheelchair
	Mobility outdoors	1	Needs electric wheelchair or partial assistance to operate manual wheelchair	1	Needs electric wheelchair or partial assistance to operate manual wheelchair
	Stair management	0	Unable to climb or descend stairs	0	Unable to climb or descend stairs
	Transfers: wheelchair-car	0	Requires total assistance	1	Needs partial assistance and/or supervision, or adaptive device
	Sub-score	3		6	
Total score		9		38	

Table 5: Spinal Cord Independence Measure (SCIM) overview for Mr. Meier

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Questions

Q1. **What are the differences in the etiology of spinal cord injury (SCI) in older and younger persons?** *(Refer to page 9 for the answer.)*

Q2. **Name typical comorbidities in older persons with SCI**. *(Refer to page 9 for the answer.)*

Q3. **What is the relationship between aortic aneurysm surgery and SCI?** *(Refer to page 12 for the answer.)*

Q4. **What areas of functioning are evaluated to determine a spinal cord independence measure (SCIM) score?** *(Refer to page 13 for the answer.)*

Q5. **In Mr. Meier's case, what age-related factors impacted on his rehabilitation process?** *(Refer to page 21 for the answer.)*

ICF Case Studies Website
www.icf-casestudies.org

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ICF Research Branch

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