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ICF Case Studies

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

# Goal-Setting

Case Study 01



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# 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.

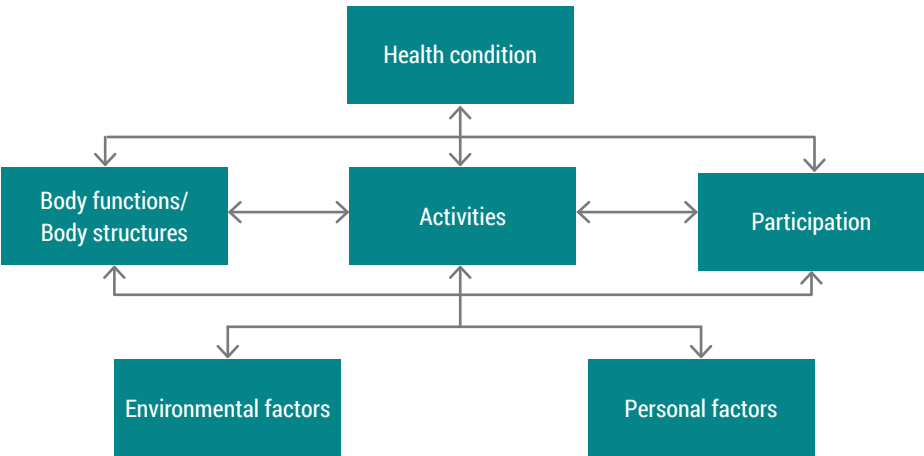


Figure 1: Bio-psycho-social model of functioning, disability and health

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.

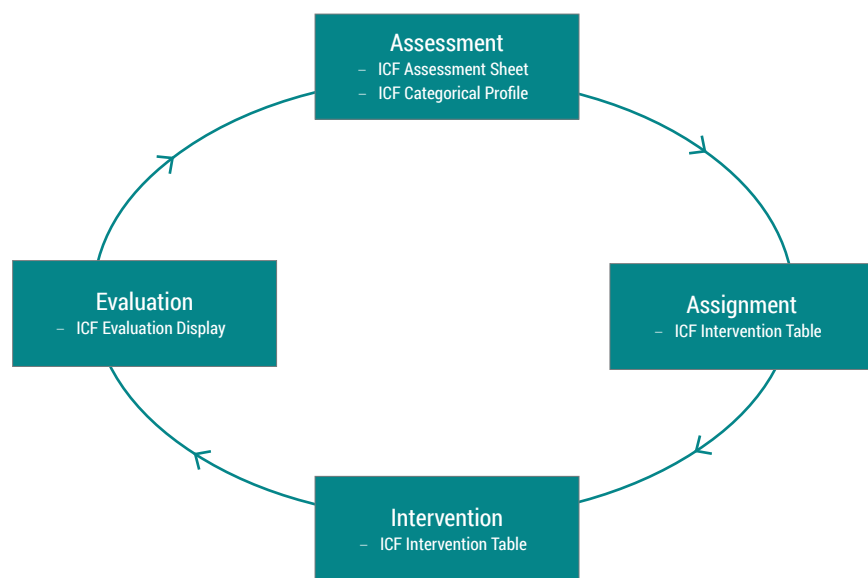


Figure 2: Rehab-Cycle®

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](http://www.icf-casestudies.org).

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## General Introduction



**Tetraplegia** is a serious condition resulting from a **spinal cord injury (SCI)** that leads to complete or incomplete paralysis of all four limbs.<sup>1,2</sup> Persons with tetraplegia face a range of physical and psychological challenges. Even an incomplete loss of arm and hand function has an immense impact on an individual's ability to carry out everyday activities.

In the rehabilitation of persons with tetraplegia, personality, motivation and outlook on life can play a big role in goal-setting and in achieving the desired rehabilitation outcomes.<sup>3</sup>

SCI is an injury to the spinal cord that results in a temporary or permanent change in motor, sensory, or autonomic functions of the injured person's body.<sup>1,2</sup> 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.<sup>4,5</sup> This scale indicates how much sensation a person feels after light touch and a pin prick at multiple points on the body, and tests key motions on both sides of the body. Table 1 illustrates the ASIA impairment scale grading of a person with tetraplegia with

ASIA B sub C5/C6 and loss of muscle function and sensitivity. See *"Table 1: ASIA impairment scale"* on page 22 at the end of this booklet. ASIA B means that the SCI is incomplete; the person has some sensations but with impaired motor functions below the lesion of cervical 5 and 6. In the ASIA impairment scale, 0 indicates total paralysis (in red), 1 indicates palpable or visible contraction and 2 indicates active movement. To learn more about SCI and ASIA go to [www.icf-casestudies.org](http://www.icf-casestudies.org)

The person must overcome significant obstacles to interact with his or her environment and is often

dependent upon others to accomplish everyday activities. Learning to cope with this situation is a complex process that affects a person's quality of life.<sup>6</sup> How a person deals with a condition such as tetraplegia may play a significant role in the true benefits of even proven surgical and medical interventions. For instance, one accepted pro-

cedure, upper extremity surgery (see Box 1), has been shown to greatly improve the functioning of the hand and arm in persons with tetraplegia resulting in improvements in activities of daily living, increased independence and better quality of life.<sup>7,8,9</sup>

### Box 1 | Upper Extremity Surgery Used for the Improvement of Functioning in Tetraplegia

Upper extremity surgery is a proven surgical technique that has shown improvement in the hand and arm functioning of persons with tetraplegia. The procedure, as described by Moberg,<sup>7</sup> consists of two approaches:

1. The restoration of elbow extension is achieved through the deltoid-to-triceps transfer. The totally paralyzed or weak triceps is restored utilizing the posterior deltoid, which is separately innervated.
2. The restoration of hand grip is achieved in four steps:
  - c) The construction, if needed, of a wrist extensor using the brachioradialis;
  - d) The increase of the mechanical advantage of the weak flexor system through the release of the flexor pollicis longus tendon;
  - e) Stabilization of the distal thumb joint with a Kirschner wire;
  - f) Tenodesis of the flexor pollicis longus tendon.

The goal of upper extremity surgery is to allow a "tripod pinch" as well as a degree of voluntary motion of the fingers. In a study of 57 patients and 97 reconstructions Mohammed et al.<sup>10</sup> reported that 70% had good or excellent subjective results.

However, surgery and its associated post-operative management alone may not guarantee positive results. To maximize the benefit of the surgery, the rehabilitative process following surgery should take into account the person's perspective.<sup>11,12,13</sup> In fact, a focus on "person-centred service" is increasingly emphasized in the field of rehabilitation management.<sup>14</sup>

The following case study aims to illustrate the potential as well as the challenges of translating the benefits of upper limb surgery into positive, meaningful outcomes for a person with tetraplegia.

The rehabilitative process includes the person's individual perspective.



## Peter's Story



Peter was a 20-year-old plasterer at the time of his car accident in 2001. He is diagnosed with tetraplegia (sub C6, as a consequence of vertebral fracture of C5) ASIA B.

*"The thing that bothers me most about my situation is depending on others so much. I cannot stand having to wait until the nurse arrives in the morning to get me out of bed. The days that I wake up early are terrible. My inanimate body forces me to lie there! – These are the moments in which you realize most how much you are at the mercy of others. I do not like to be dressed and washed. You feel almost like a baby. During the day it is OK. I can handle almost everything I want to do. Something else that bothers me is having to organize ahead of time when I go to bed or to having to ask one of my friends for help... But that's nothing compared to not being able to decide when I want to get up. I hope that something can still be fixed to change this."*

*Peter five years following the accident.*

In 2004, Peter and his medical team decided that upper extremity surgery for his left arm and hand (he is left-handed) would improve his arm-hand function, lower his dependence and lead to improvements in his quality of life. This procedure

was performed successfully, and following a period of rehabilitation without complications, Peter's ability to do many day-to-day activities improved and his independence increased.

*"These are the moments in which you realize most how much you are at the mercy of others."*

*"It definitely made some things much easier, like eating and drinking. But also other things I enjoy, like driving to meet friends. I could more easily transfer myself in and out of the car; and also playing video games. These things were really much easier after this surgery, much less difficult. Although it's not like I need less help. The nurses still have to come and do all the things I can't do by myself. Certain things have just become a little less hard for me to do... and because of this, I started enjoying life more. And when you're stuck in a wheelchair, these small improvements make a big difference... I would even be able to work in a call centre if I wanted to. But you know, I'm not so excited about that. I'd rather just meet friends and play games ... so we'll see..."*

Peter

*"...certain things have just become a little less hard for me to do... and because of this, I started enjoying life more."*

With much improvement in his left arm-hand function, Peter made the decision to have another operation on his right arm and hand. He wanted to become more independent, particularly in self-care, by improving his ability to use his hand and arm while transferring. In December 2006, he went for upper extremity surgery for his right arm. This procedure was again completed successfully

and was followed with standardized, post-operative medical management by his rehabilitation team. This program meant that he was fitted with a wrist brace and arm cast, and began physical and occupational therapy exercises. See "Table 2: Treatment scheme after upper extremity surgery" on page 24 at the end of this booklet.

*"He was fitted with a wrist brace and arm cast and began physical and occupational therapy."*

Additionally, due to restrictions imposed by his surgeon, Peter was not allowed to use his hand and arm, forcing him to use an electric wheelchair. Over the subsequent three weeks, no obvious problems arose, and Peter was able to easily accomplish the physical exercises prescribed for him.

However after three weeks, a change in Peter's behaviour was noticed – Peter became increasingly rebellious and difficult. He began to miss

therapy sessions without explanation, dismissing his responsibilities as a patient without concern. He began to drink and smoke more often with other patients late at night, with the consequence that he was tired during the day. He also disregarded rehabilitation centre rules. In contrast to this defiant behaviour, Peter made inquiries into the possibility of going home and visit with friends over the weekend. These mixed signals caught the attention of the rehabilitation team.

*"Four weeks following the surgery, we met to discuss Peter's evolution. We immediately focused on his behaviour and the challenges it presented to his rehabilitation. We all agreed that Peter's wish for weekend leaves were unrealistic... He could not drive and most importantly, a weekend leave would possibly compromise the advances already made in the rehabilitative process."*

*A rehabilitation team member*

*"A change in Peter's behaviour was noticed – Peter became increasingly rebellious and difficult."*

*"In addition, given his behaviour, all of us were concerned that he would not continue with his treatment plan at home without supervision...All of us agreed that a shift in Peter's behaviour would be necessary for the best rehabilitative outcomes. We also realized that we should also learn more about how Peter sees the situation. His change in behaviour had to have an explanation...The psychologist pointed out that we had eventually underestimated how important common goal-setting is, even in a case in which routine surgery is performed. Agreement on targets between Peter and us might result in increased intrinsic motivation and his own sense of responsibility toward the rehabilitation program."*

*A rehabilitation team member*

*"... a weekend leave would possibly compromise the advances already made in the rehabilitative process."*

## Assessment



The team decided to close the initial rehabilitation cycle (or Rehab-Cycle®) that focused on hand recovery using a standardized treatment scheme (see *"Table 2: Treatment scheme after upper extremity surgery"* on page 24 at the end of this booklet) and open a new **Rehab-Cycle®** that intended to address both Peter's current physical situation and behaviour.

### The Team's Assessment

Peter's rehabilitation team worked closely with a psychologist to carry out an assessment of Peter's current functioning status. The inclusion of a psychologist in the team helped ensure that Peter's behaviour was taken into account in the assessment. Table 3 – the **ICF Assessment Sheet** – provides an overview of the assessment results

from the **perspective of the health professional** i.e. Peter's rehabilitation team as well as from Peter's own perspective. Peter's perspective, as shown on the table as **"Patient Perspective"**, is reflected in statements he made in discussions with him during the assessment. See *"Table 3: ICF Assessment Sheet"* on page 26 at the end of this booklet.

*"I had to use this electric wheelchair, which I couldn't really get the hang of."*

Considering Peter's perspective was important, since it illuminated aspects of his experience living with spinal cord injury (SCI) that could facilitate his rehabilitation. For example, Peter's specific needs and complaints about body functions i.e. pain, muscle weakness, lack of sleep, etc. reflected those of many persons with tetraplegia. These

body function issues were not exceptionally difficult to address, and many were well-met. This was illustrated by the fact that Peter easily performed his physical therapy activities. The procedure performed on his arm and hand posed no complications for him. Peter's perspective on activities and participation, however, were not as simple.



*"You know, after this surgery, everything just seemed more difficult. I had to use this electric wheelchair, which I couldn't really get the hang of. And I even needed more help because I couldn't use my hand. It was all really frustrating...And I felt like I was in prison. I just wanted to go home on the weekends to get away – play around a little, meet my friends, feed my cat. I really wanted more freedom. In the hospital, I found it hanging out with my new friends in the ward, but that wasn't exactly the same as at home."*

Peter

In short, Peter found it difficult being in the rehabilitation centre. His interest in the rehabilitation program was continually decreasing, and he was

often frustrated, bored and less than challenged. He found himself becoming idle.

*"I felt a bit resentful and I think I kind of took it out on the nurses and doctors... And I felt like I was in prison. I just wanted to go home on the weekends to get away..."*

From the health professional's perspective, Peter had the typical impairments and limitations of a person with tetraplegia C6, ASIA B. However, the psychologist made note of a number of personal factors that had a significant impact on his

functioning. These included a passive lifestyle, poor compliance, and the absence of a sense of responsibility and purpose. To address these factors, specific intervention targets were identified.

## Goal-setting and Determination of Intervention Targets



Based on the assessment of Peter's functioning status, as documented on the ICF Assessment Sheet, a profile of Peter's functioning, or **ICF Categorical Profile**, was created using the standardized language of the International Classification of Functioning, Disability and Health (ICF). The ICF Categorical Profile for Peter visually depicts his functioning status at the time of the assessment using ICF qualifiers, and shows long and short-term goals that the rehabilitation team, with consideration of Peter's perspective, has identified. It was believed that clear and meaningful common goals would help to increase Peter's intrinsic motivation and foster his feeling of responsibility toward the program.

For example, to address Peter's passive lifestyle, poor compliance, and the absence of a sense of responsibility and purpose, 'carrying out daily routine' was identified as one of the cycle goals. This required that Peter participate in all treatment sessions.

With Peter's input, a 6-month **global goal** was set to reduce ambulatory care to once a day. The **service-program goal** that allowed Peter to fulfill

his wish to go home on weekends was of some concern, since there was a possibility that it might compromise the potential positive outcomes of the surgery. Regardless, it was accepted with the premise that the **cycle goals** set, that is, the 'stepping stones' toward achieving the service-program goal, involved Peter and that he accepted "ownership" for these goals and shared the responsibility for his rehabilitative program.

*“...the cycle goals set...involved Peter and that he accepted "ownership" for these goals and shared responsibility for his rehabilitative program.”*

The cycle goals included:

- **Transferring oneself:** Independent transfer to his wheelchair and car within 2 weeks
- **Hand and arm use:** Drinking with right arm
- **Carrying out a daily routine:** Participating in all treatment sessions

### Determination of Intervention Targets

Once the cycle goals were established, the rehabilitation team identified which intervention targets were related to the cycle goal i.e. selected ICF categories that should be targeted for intervention. The team took into account those intervention targets that were most relevant to the cycle goal and that were modifiable. For example, b28014 Pain in upper limb, b7401 Endurance of muscle groups, b7603 Supportive functions of the arms, d410 Changing basic body positions, and d4200 Transferring oneself while sitting were all selected as intervention targets for cycle goal 1 –

independent transferring while sitting i.e. Peter's ability to transfer himself to his wheelchair and car. See *“Table 4: ICF Categorical Profile” on page 28 at the end of this booklet.*

Improvement in these ICF categories or intervention targets were expected to lead to cycle goal achievement. The identification of the shared goals and corresponding intervention targets served as the central source of information for planning the interventions in the second Rehab-Cycle® of Peter's rehabilitation program.

## Assignment and Intervention

The information shown in the ICF Categorical Profile created for Peter was instrumental in completing the **ICF Intervention Table**, an ICF-based tool that provides a comprehensive overview of Peter's intervention targets, the interventions themselves and the corresponding rehabilitation team members who is (are) assigned to address each intervention target.

For example, the psychologist was assigned the responsibility for addressing Peter's compliance with interventions, and his sense of responsibility and purpose. See *“Table 5: ICF Intervention Table” on page 30 at the end of this booklet.*

The intervention the psychologist decided to implement included a realistic behavioural plan with attainable goals that incorporated progressive levels of difficulty from Peter's point of view. At the end of each week, both Peter and the psychologist evaluated the extent to which the goals had been reached. Since these three intervention targets i.e. compliance, sense of responsibility

and purpose were of particular importance as well as the cornerstone of all the other goals outlined in Peter's rehabilitation program, the rehabilitation team hoped that addressing these specifically would also contribute to the success in the other goals.

It is important to note that based on Peter's development following surgery and his subsequent behavioural change, it was difficult to decide on the goal value that should be attained following intervention. Some members of the rehabilitation team decided to make a prediction and adapt it during the intervention period if necessary.

*“The intervention... included a realistic behavioural plan with attainable goals that incorporated progressive levels of difficulty from Peter's point of view.”*

## Evaluation

Just two weeks before completing the Rehab-Cycle® Peter asked to be discharged, and he was released against the recommendations of his rehabilitation team. Unfortunately, he was unable to be dissuaded, and a final evaluation was performed just before he left the clinic – significantly earlier than originally intended.

*“Peter asked to be discharged, and he was released against the recommendations of his rehabilitation team.”*

This evaluation compared the results of the first assessment with the results of final assessment of the intervention targets identified. A visualization of this final evaluation is shown in the **ICF Evaluation Display** created for Peter. See “Table 6: ICF Evaluation Display” on page 32 at the end of this booklet.

Peter’s ICF Evaluation Display indicates that most of the goals set were achieved. Although there was some improvement in all of the intervention targets, the desired values were not reached in a

number of intervention targets such as changing body position, the ability to transfer himself, as well as in the critical intervention targets grouped under personal factors, thus not achieving the goal set for these intervention targets. Consequently, the cycle goals of ‘independent transferring while sitting’ and ‘carrying out daily routine’ were not achieved. It is believed that this was a result of his early departure from the program and that had he remained in the program more intervention targets and goals would have been met.

*“Although there was some improvement in all of the intervention targets, the desired values were not reached in a number of intervention targets.”*

## Discussion



As illustrated in Peter’s case, the translation of the results of a surgical intervention such as upper extremity surgery into positive, meaningful outcomes for a patient can present a significant challenge.

### Multi-faceted Factors Impacting Functioning

Real-life outcomes are dependent not only upon the success of medical intervention, but also on the subsequent rehabilitative interventions and the person himself. While it is well-documented that upper extremity surgery is effective for increasing functionality,<sup>8,15,16</sup> surgery and the treatment scheme alone may not guarantee

positive results, as was evident three weeks into Peter’s medical management. Outcomes are also affected by the person’s level of participation and acceptance of responsibility in the rehabilitation process, as well as the healthcare professional-patient interaction. Peter’s case illustrates this well.

### Shared Goal-setting

Moving away from the initial Rehab-Cycle® that solely focused on hand recovery to a new Rehab-Cycle® that additionally addressed factors beyond medical management was beneficial. In this new Rehab-Cycle®, shared goal-setting proved to be essential.

The introduction of common and meaningful goals can lead to increased motivation in

patients.<sup>13,17,18</sup> In Peter’s case, an absence of common, mutually-accepted goals, beyond those set for the post-surgery treatment scheme, impacted his overall motivation within the rehabilitation program. Thus, proper individualized goal-setting undertaken through shared decision-making is critical.<sup>12,19</sup>

*“...an absence of common, mutually-agreed goals, beyond those set for the post-surgery treatment scheme, impacted his overall motivation...”*

Goals have been shown to achieve positive results in self-care tasks, and also function well as a concrete measure with respect to rehabilitation.<sup>20,21</sup> Important for **goal attainment** is the consideration of both the health professional and the patient perspectives.<sup>17</sup> This was clearly illustrated in Peter's case.

Peter, his physician and the psychologist on the rehabilitation team together decided on the most appropriate and achievable goals to strive for in the new Rehab-Cycle®: cycle goal 1 'independent transferring while sitting' reflected Peter's wish,

while cycle goal 3 'carrying out a daily routine' reflected the rehabilitation team's perspective. Cycle goal 2 'hand and arm use', or specifically improved grab functions, was one goal that required more discussion. Although the patient and health professional perspectives can seem to be incongruent at times, the process of reconciling this incongruency itself could benefit the goal-setting process. This was exemplified by the process of setting Peter's service-program goal; despite concerns from the rehabilitation team, the team together with Peter agreed on the service-program goal of 'going home on weekends'.

*“When both perspectives are understood, common goals can be defined.”*

Peter's defiant and non-constructive behaviour offered the rehabilitation team an opportunity to better define goals that would lead to real and positive rehabilitation outcomes. Once clear and **common goals** were set, Peter showed continual improvement in both compliance and functioning.

Although he prematurely discharged himself from the rehabilitation centre two weeks before the end of the program and did not meet the goals in all intervention targets, the **concrete and realistic goals** established helped contribute to significant progress in Peter's rehabilitation.

## Annex

- Table 1: ASIA impairment scale
- Table 2: Treatment scheme after upper extremity surgery
- Table 3: ICF Assessment Sheet
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- Questions

Table 1: ASIA impairment scale

ASIA Impairment Scale											
Motor function				Light touch				Pin prick			
	R	L		R	L			R	L		
C2				2	2		C2	2	2		
C3				2	2		C3	2	2		
C4				2	2		C4	2	2		
C5	5	4	Elbow flexors	2	2		C5	2	2		
C6	5	4	Wrist extensors	2	2		C6	2	2		
C7	0	0	Elbow extensors	1	1		C7	1	1		
C8	0	0	Finger flexors	1	1		C8	1	1		
T1	0	0	Finger abductors	1	1		T1	1	1		
T2				1	1		T2	1	1		
T3				1	1		T3	0	0		
T4				1	1		T4	0	0		
T5				1	1		T5	0	0		
T6				1	1		T6	0	0		
T7				1	1		T7	0	0		
T8				1	1		T8	0	0		
T9				1	1		T9	0	0		
T10				1	1		T10	0	0		
T11				1	1		T11	0	0		
T12				1	1		T12	0	0		
L1				0	0		L1	0	0		
L2	0	0	Hip flexors	0	0		L2	0	0		
L3	0	0	Knee extensors	0	0		L3	0	0		
L4	0	0	Ankle dorsiflexors	0	0		L4	0	0		
L5	0	0	Long toe extensors	0	0		L5	0	0		
S1	0	0	Ankle plantar flexors	0	0		S1	0	0		
S2				0	0		S2	0	0		
S3				0	0		S3	0	0		
S4-5				1	1		S4-5	0	0		
Sum	10	8		25	25		Sum	14	14	+	28
				= 50							

ASIA Impairment Scale											
A	Complete: No motor or sensory functions as preserved in the sacral S4-S5										
B	Incomplete: Sensory but no motor function is preserved below the neurological level and includes the sacral segments S4-S5										
C	Incomplete: Motor function is preserved below the neurological level, and more than half of key muscles below the neurological level have a muscle grade less than 3										
D	Incomplete: Motor function is preserved below the neurological level, and at least half of key muscles below the neurological level have a muscle grade of 3 or more.										
E	Normal: Motor and sensory functions are normal										

Table 1: ASIA impairment scale grading of a person with tetraplegia with ASIA B sub C5/C6 and loss of muscle function and sensitivity. Touch functions are graded with 0 = absent, 1 = impaired to 2 = normal. Motor functions are graded from 0 = total paralysis to 5 = active movement with full range of motion, against gravity and provides a level of resistance.

Table 2: Treatment scheme after upper extremity surgery

Treatment scheme after upper textremity surgery							
	Pre-surgery	Post-surgery	2 weeks post-surgery	3 weeks post-surgery	4 weeks post-surgery	6 weeks post-surgery	8 weeks post-surgery
Wheelchair use/ Positioning	Adaptation of electrical wheelchair with positioning of arm in 60° abduction and 60° horizontal adduction	<u>Positioning of arm</u> : Dorsal position: 60° abduction, Side position: arm above trunk				Moving around using manual wheelchair allowed	
Braces		Adaption of Scotchcast brace for wrist joint in 0° and positioning of thumb in 20° adduction			Adaption of thumb protection brace	Removal of brace	
		Fitted with circular, removable upper arm cast.	Fitted with movement cast for elbow flexion up to 30°	Removal of cast			
Exercises	Muscle status of upper extremity	<u>Wrist</u> : Isometric exercises of wrist extensors			Daily exercises without brace for key grip, Intensity of exercise only until thumb-forefinger contact, no resistance. Exercises only with light objects like sheets, paper, etc.	Increasing exercises for key-grip with increasing resistance and weights	Increasing exercises with heavier and larger objects for key-grip
		<u>Shoulder joint</u> : Passive movement of arm in 90° abduction, 60° flexion and free extension, horizontal adduction		<u>Shoulder joint</u> : No active elevation, Assistive exercises allowed		<u>Shoulder joint</u> : No limitation in range of motion	
		<u>Elbow joint</u> : No movement		<u>Elbow joint</u> : Flexion up to 30° with weekly increases of 30°, active extension in the beginning without resistance, later with increasing resistance		<u>Elbow joint</u> : Increasing resistance for extension	
Activities of daily living						Start with exercising activities of daily living	Increase of active self-help-training. Transferring allowed



Table 3: ICF Assessment Sheet

ICF Assessment Sheet		
Patient Perspective	Body Functions & Structures	Activities & Participation
	<ul style="list-style-type: none"><li>- Sometimes I can't sleep because of my snoring neighbor</li><li>- I have pain in my lower belly</li><li>- I have pain in the right upper arm</li><li>- My sensitivity is not like it used to be before the injury</li><li>- Currently I am gaining weight</li><li>- My body temperature increases due to heat</li><li>- I have muscles that are weak</li><li>- My muscles exhaust faster</li><li>- I have a risk for pressure sores (especially on my back)</li></ul>	<ul style="list-style-type: none"><li>- I need support in transferring from bed to wheelchair</li><li>- Currently I can't transfer into the car by myself</li><li>- I hope to improve putting objects down with my hands</li><li>- I can't pick up things</li><li>- At the moment I can do less with my right arm</li><li>- Driving long distances with the wheelchair is exhausting</li><li>- I need support in dressing</li><li>- I need support in washing myself</li><li>- I can't drive the car by myself</li><li>- No sporting activity</li><li>- I want to spend time with my friends</li><li>- I would like to go home for the weekend</li><li>- Playing computer games</li><li>- I would like to drive a motorbike</li><li>- Maybe I will work in the summer</li><li>- I want more independence</li></ul>
Health Professional Perspective	<ul style="list-style-type: none"><li>- Sleeping is impaired</li><li>- Touch functions impaired related to diagnosis</li><li>- No proprioceptive functions related to diagnosis</li><li>- Fecal continence completely impaired</li><li>- Urinary continence completely impaired</li><li>- Mobility of joints of right upper extremity reduced by surgery</li><li>- Muscle power functions of upper extremity reduced</li><li>- Muscle spasticity existing but without influence on functioning</li><li>- Endurance of muscles of upper extremity</li><li>- Reflex functions impaired as related to diagnosis</li><li>- Prop up functions of arms reduced, e.g. not allowed</li><li>- Scars are healed</li><li>- Structure of the skin - at risk</li></ul>	<ul style="list-style-type: none"><li>- Completely limited in changing body positions</li><li>- Completely limited in transferring from seat to seat</li><li>- Grab functions reduced</li><li>- Use of hand and arm reduced</li><li>- Moving the manual wheelchair not allowed</li><li>- Completely limited in washing body parts</li><li>- Partially limited in caring for body parts</li><li>- Completely limited in toileting</li><li>- Completely limited in dressing</li><li>- Partially limited in eating</li><li>- Partially limited in drinking</li><li>- Carrying out daily routine limited</li></ul>
Environmental Factors		
	<ul style="list-style-type: none"><li>- Assistive devices for daily living</li><li>- Manual/Electrical wheelchair</li><li>- Adapted car</li><li>- Wheelchair adapted flat</li><li>- Disability payment, Social welfare</li><li>- Ambulant care 2x/daily</li><li>- My family is important to me</li><li>- My friends are important to me</li><li>- My cat is important to me</li><li>- Fellow human beings are mainly friendly</li><li>- Care in rehabilitation is good</li></ul>	
Personal Factors		
		<ul style="list-style-type: none"><li>- 25 year old male</li><li>- Single, living on his own</li><li>- Plasterer, unemployed</li><li>- Poor sense of purpose</li><li>- I have adapted to the loss of functioning</li><li>- Being patient is difficult</li><li>- Passive lifestyle</li><li>- Poor compliance</li><li>- Poor sense of responsibility</li></ul>

Table 4: ICF Categorical Profile

ICF Categorical Profile													
Assessment													
Global Goal: Ambulatory care only once daily													
Service-Program-Goal: Going home on weekends													
Cycle goal 1: Independent transferring while sitting													
Cycle goal 2: Hand and arm use: Drinking													
Cycle goal 3: Carrying out daily routine (Treatments)													
ICF categories													
ICF Qualifier													
problem													
	0	1	2	3	4								
b134													
b28012													
b28014													
b7101													
b7301													
b7401													
b7603													
b820													
s810													
d410													
d4200													
d440													
d445													
d510													
d520													
d530													
d540													
d550													
d560													
facilitator													
	4+	3+	2+	1+	0	1	2	3	4				
pf													
pf													
pf													

**Table 4: ICF Categorical Profile; 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; SP refers to Service-Program Goal; G refers to the Global Goal; Goal value refers to the ICF qualifier to achieve after an intervention.**

Table 5: ICF Intervention Table

ICF Intervention Table												
	Intervention target		Intervention		Doc	Nurse	PT	OT	Psych	First value	Goal value	Final value
Body function/-structure	s810	Structure of the skin	Daily monitoring			X				0	0	0
	b134	Sleep functions	Daily monitoring			X				2	0	1
	b28012	Pain in the lower belly	Medication		X					2	1	1
	b28014	Pain in the right upper limb	Medication		X					3	0	0
	b7101	Mobility of several joints	Active/passive exercises according to treatment scheme				X	X		2	0	0
			Adapting brace for limiting range of motion					X				
	b7300	Power of isolated muscles (M. triceps brachii)	Active/passive exercises based on treatment scheme, Manual and machine muscle power training 6 weeks post-surgery				X			3	2	2
	b7401	Endurance of muscle groups	Repetitive exercises, Endurance training with arm ergometer 6 weeks post-surgery				X			3	1	1
	b7603	Supportive functions of the arms	Repetitive prop-up training 6 weeks post-surgery Muscle power training with machine 6 weeks post-surgery				X			3	1	2
	b820	Repair functions of the skin	Daily wound control		X					0	0	0
Activities / Participation	d230	Carrying out daily routine	Behavioural approach						X	3	1	1
	d410	Changing basic body position	Support, assistance		X	X				4	0	2
	d4200	Transferring oneself while sitting	Support, assistance Functional training, Prop-up training 6 weeks post-surgery		X		X			4	0	2
	d440	Fine hand use	Functional games				X			4	2	2
	d445	Hand and arm use	Functional games					X		3	2	2
	d510	Washing oneself	Support, assistance		X					4	3	3
	d520	Caring for body parts	Support, assistance		X					3	3	3
	d530	Toileting	Support				X			4	4	4
	d540	Dressing	Support, assistance		X					4	3	4
	d550	Eating	Assistance		X					3	2	2
Personal factors	d560	Drinking	Assistance		X					3	1	1
	pf	Compliance										
	pf	Sense of responsibility							X	3 (-)	0	1 (-)
	pf	Sense of purpose										

**Table 5:** ICF Intervention Table; Doc = Physician; PT = Physical Therapist; Psych = Psychologist. 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 these ratings (0 = no problem to 4 = complete problem) in the intervention targets. For the interventions targets representing the personal factors (pf) of compliance, sense of responsibility and purpose, the minus sign next to value indicates a barrier.

Table 6: ICF Evaluation Display

ICF Evaluation Display																					
					Assesment					Evaluation											
Global Goal: Ambulatory care only once daily															2		not evaluated yet				
Service-Program-Goal: Going home on weekends															2		not evaluated yet				
Cycle goal 1: Independent transferring while sitting															1						
Cycle goal 2: Hand and arm use: Drinking															1		+				
Cycle goal 3: Carrying out daily routine (Treatments)															1		-				
ICF categories					ICF Qualifier					Goal Relation	Goal Value	ICF Qualifier					Goal achievement				
b134	Sleep functions										SP	1					+				
b28012	Pain in stomach and abdomen										SP	1					+				
b28014	Pain in upper limb										1,2	0					+				
b7101	Mobility of several joints										2	0					+				
b7301	Power of muscles of one limb										2	2					+				
b7401	Endurance of muscle groups										1,2	1					+				
b7603	Supportive functions of the arms										1	2					+				
b820	Repair functions of the skin										SP	0					+				
s810	Structure of areas of the skin										SP	0					+				
d410	Changing basic body positions										1	1					-				
d4200	Transferring oneself while sitting										1	1					-				
d440	Fine hand use										2	1					+				
d445	Hand and arm use										2	2					+				
d510	Washing oneself										SP	3					+				
d520	Caring for body parts										SP	3					+				
d530	Toileting										SP	3					+				
d540	Dressing										SP	3					-				
d550	Eating										SP	2					+				
d560	Drinking										SP	1					+				
		facilitator				barrier				facilitator				barrier							
		4+	3+	2+	1+	0	1	2	3	4			4+	3+	2+	1+	0	1	2	3	4
pf	Compliance										3	0									-
pf	Sense of responsibility										3	0									-
pf	Sense of purpose										3	0									-

Table 6: 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; SP refers to Service-Program goal; G refers to Global goal; Goal value refers to the ICF qualifier to achieve after an intervention; Goal achievement: + means achieved, - means not achieved.

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## Questions

- Q1. **How does ASIA classify spinal cord injuries (SCI)?** Explain what SCI with ASIA score of B C5/C6 mean. *(Refer to page 8 for the answer.)*
- Q2. **What is performed in the Moberg Surgery?** *(Refer to page 9 for the answer.)*
- Q3. **What are the three distinct goals types that can be set in the Rehab-Cycle®?** Describe them using Peter's case as an example. *(Refer to page 15 for the answer.)*
- Q4. **In Peter's case, what intervention targets were identified to address cycle goal 1?** *(Refer to page 28 for the answer.)*
- Q5. **Why is shared goal-setting using the ICF as framework important for rehabilitation planning?** *(Refer to page 19 for the answer.)*





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