LINKING MEDICAL RECORDS AND ASSESSMENT INSTRUMENTS TO THE ICF: ASSESSMENT OF FUNCTIONING AND OUTCOME OF REHABILITATION AFTER TRAUMATIC BRAIN INJURY – PRESENTATION OF A CASE

PRETVORBA MEDICINSKIH ZAPISOV IN OCENJEVALNIH LESTVIC V MKF: OCENJEVANJE FUNKCIONIRANJA IN IZIDA REHABILITACIJE PO NEZGODNI MOŽGANSKI POŠKODBI – PRIKAZ PRIMERA

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Abstract

Introduction:
Traumatic brain injury (TBI) is one of the most serious medical conditions. Rehabilitation after TBI is usually a long-term and challenging process. A number of tools exist in order to assess the functional state of a patient before and after the rehabilitation. Possible benefits of the ICF as a conceptual model and ICF-based tools in TBI rehabilitation are currently under discussion.

Goal:
The study tested the possibility of linking the existing medical records of patients after the TBI to the ICF and explored the possible benefits of creating double ICF-based functional profiles of such patients (at admission and at discharge) in order to evaluate the outcome of rehabilitation.

Method:
Medical records of a patient, admitted to the Institute for Rehabilitation, Republic of Slovenia, in 2008 (admission and discharge forms, reports from physiotherapist,

Prispelo: 18. 9. 2009
Sprejeto: 15. 10. 2009

Izvleček

Izhodišča:
Nezgodna možganska poškodba (NMP) je eno najresnejših zdravstvenih stanj. Rehabilitacija po NMP je navadno dolgotrajen in zahteven proces. Za oceno funkcijskega stanja pacienta pred in po rehabilitaciji obstajajo številna orodja. Možne dobrobiti uporabe Mednarodne klasifikacije funkcioniranja (MKF) kot pojmovnega modela in orodij na podlagi MKF v rehabilitaciji po NMP so trenutno predmet strokovnih razprav.

Namen:
Preizkusili smo možnost pretvorbe obstoječih medicinskih zapisov pacientov po NMP v MKF in raziskali možne koristi izdelave dvojnega funkcijskega profila (ob sprejemu in odpustu) na podlagi MKF pri takih pacientih za oceno izida rehabilitacije.

Metode:
Medicinske zapise pacientov, sprejetih na URI Soča v letu 2008 (sprejemne in odpustne liste, poročila fizioterapevtov, delovnih terapevtov, logopedov in psihologov, ter ocene na lestvici FIM) smo pretvorili v MKF. Za vnos podatkov smo uporabili poseben obrazec o primeru na

occupational therapist, speech therapist and psychologist, and FIM) were linked to the ICF. Special ICF-based case report form was used to enter the data. Information about functioning at admission and at discharge was entered separately.

Results:
The majority of functional problems of a patient at the level of Body Functions were found in the domains of mental functions and movement-related functions. Within the list of Activities and Participation, the patient experienced more difficulties in acquiring skills, communication and activities, related to mobility and self-care. Little information was found in the medical records about the activities related to daily life and the relevant environmental factors.

Conclusions:
Translation of the information about functioning into the ICF provides a well-structured functional profile of a patient in a clear and language-independent format. Of special importance is the capacity of the ICF to describe the environmental factors relevant for recovery and functioning, as well as the neutrality of the obtained profile.

Key words:
ICF, traumatic brain injury, linking rules

podlagi MKF. Podatke o sprejemu in odpustu smo pretvorili ločeno.

Rezultati:
Večina funkcijskih težav pacientov na ravni telesnih funkcij (razdelek b) je sodila na področji duševnih funkcij (b1) in funkcij, povezanih z gibanjem (b7). V okviru dejavnosti in sodelovanja (razdelek d) so imeli pacienti največ težav pri učenju in uporabi znanja (d1), sporazumevanju (d3), gibanju (d4) in skrbi zase (d5). Medicinski zapisi so vsebovali malo podatkov o dnevnih dejavnostih in pomembnih okoljskih dejavnikih.

Zaključki:
Pretvorba podatkov o funkcioniranju v MKF vodi do strukturiranega funkcijskega profila pacienta v jasni obliki, neodvisni od jezika. Posebnega pomena sta zmožnost MKF, da opiše dejavnike okolja, pomembne za funkcioniranje in okrevanje, in nevtralnost izdelanega profila.

Ključne besede:
MKF, nezgodne možganske poškodbe, pretvorbena pravila

INTRDUCTION

Traumatic brain injury (TBI) is one of the most serious medical conditions and is often associated with significant physical, cognitive and psychological consequences for the individual. Rehabilitation after TBI is usually a long-term – and in some cases a never-concluded – process, which is effective when an interdisciplinary approach is used. Nowadays, a considerable number of assessment instruments exist in order to assess patients after TBI. ICF as a conceptual model and ICF-based tools as practical instruments may contribute to a more holistic description of functioning of persons after TBI at the beginning of rehabilitation, as well as to assess the outcome of rehabilitation after its completion. The current data indicates that ICF can be useful in classifying the currently used assessment scales in acquired brain injury (1). It also allows a standardised and comprehensive analysis of health and health-related consequences, fully applicable to the acquired brain injury rehabilitation. Particularly in the area of neurorehabilitation, it may contribute to the evaluation of deficits and identification of treatment goals and targets for intervention (2). A special added value of the ICF is its capacity to describe and categorise the environmental factors relevant for rehabilitation. Ultimately, an ICF Core Set for TBI is being developed (3).

AIM

The study aimed at testing the possibility of linking the existing medical records of patients after the TBI to the ICF and to explore the possible benefits of creating double ICF-based functional profiles of such patients (at the admission and at the discharge) in order to evaluate the outcome of rehabilitation.

METHOD

A special ICF case report form was designed in order to enter the data about functioning of a patient in collaboration with the ICF Research Branch, WHO FIC Collaborating Centre, Institute for Health and Rehabilitation Sciences, Ludwig-Maximilian University, Munich. Medical records of a patient after TBI caused by a traffic accident that took place in April, 2008, who was admitted to our Institute for Rehabilitation in July, 2008, were linked to the ICF. The patient was male, 31 years old at the time of admission, and his Glasgow Coma Scale score after the accident was 6. He was admitted to our Institute after the acute treatment with 8 different diagnoses, all of them corresponding to the ICD section "S" ("Injury, poisoning and certain other conse-

quences of external causes"). Information about functioning at admission and discharge was entered separately. Medical records comprised the admission and discharge form and the reports from physiotherapist, occupational therapist, speech therapist and psychologist.

The medical records, which were mostly in text format, were linked to the ICF using the so-called linking rules. The process was divided into the following stages:

- identification of the meaning unit – a short phrase or sentence that describes one concrete aspect of functioning;
- linking of the meaning unit to the ICF code; and
- selection of the appropriate qualifier.

An example of the linking process is shown in Table 1. Additionally, the Functional Independence Measure (FIM), which had been previously linked to the ICF by a group of experts at the level of code in the current study (4, 5, 6), was linked to the level of qualifier. The correspondence of the FIM scores to the ICF qualifiers is presented in Table 1. For practical purposes, it was assumed that the higher level of dependence by FIM, the higher the level of the problem.

Table 1: *Identification of a meaning unit and linking it to the ICF code and qualifier.*

Source	Report from psychologist
Meaning unit	..."marked decrease in attention"...
Correspondent ICF Code	b140 Attention functions
Correspondent qualifier	3 (serious problem – "marked")

Table 2: *Correspondence of FIM scores to the ICF qualifiers.*

FIM score	ICF qualifier
1	4
2	3
3	3
4	2
5	1
6	1
7	0

RESULTS

Medical records and FIM were successfully linked to the ICF. An ICF-based functional profile of a patient was obtained, which is presented in Table 3. The profile describes functioning of the patient at the admission and at the discharge. The majority of functional problems of a patient at the level of "body functions" were found in the domains of mental functions and movement-related functions. Within the list of "activities and participation", the patient experienced more difficulties with acquiring skills, communication and activities, related to mobility and self-care.

Table 3: *ICF-based functional profile of the patient (Cap=capacity, Per=performance).*

Code	Description	Admission		Discharge	
		ICF qualifier	FIM score	ICF qualifier	FIM score
b1	MENTAL FUNCTIONS				
b110	**Consciousness functions** General mental functions of the state of awareness and alertness, including the clarity and continuity of the wakeful state.	0		0	
b114	**Orientation functions** General mental functions of knowing and ascertaining one's relation to self, to others, to time and to one's surroundings.	3	3	1	5
b140	**Attention functions** Specific mental functions of focusing on an external stimulus or internal experience for the required period of time.	3		3	
b144	**Memory functions** Specific mental functions of registering and storing information and retrieving it as needed.	3	3	1	5
b156	**Perceptual functions** Specific mental functions of recognizing and interpreting sensory stimuli.	0		0	
b167	**Mental functions of language** Specific mental functions of recognizing and using signs, symbols and other components of a language.	3	3	1	5
b2	SENSORY FUNCTIONS AND PAIN				
b230	**Hearing functions** Sensory functions relating to sensing the presence of sounds and discriminating the location, pitch, loudness and quality of sounds.	8		8	

Code	Description	Admission		Discharge	
		ICF qualifier	FIM score	ICF qualifier	FIM score
b5	FUNCTIONS OF THE DIGESTIVE, METABOLIC AND ENDOCRINE SYSTEMS				
b510	**Ingestion functions** Functions related to taking in and manipulating solids or liquids through the mouth into the body.	1	5	0	7
b525	**Defecation functions** Functions of elimination of wastes and undigested food as faeces and related functions.	0	7	0	7
b6	GENITOURINARY AND REPRODUCTIVE FUNCTIONS				
b620	**Urination functions** Functions of discharge of urine from the urinary bladder.	0	7	0	7
b7	NEUROMUSCULOSKELETAL AND MOVEMENT RELATED FUNCTIONS				
b710	**Mobility of joint functions** Functions of the range and ease of movement of a joint.	1		1	
b730	**Muscle power functions** Functions related to the force generated by the contraction of a muscle or muscle groups.	8		8	
b750	**Motor reflex functions** Functions of involuntary contraction of muscles automatically induced by specific stimuli.	2		1	
s	BODY STRUCTURES				
s2	THE EYE, EAR AND RELATED STRUCTURES	8		8	
s610	Structure of urinary system	8		8	
s750	Structure of lower extremity	8		8	
s550	Structure of pancreas	8		8	
s420	Structure of immune system	8		8	
d	ACTIVITIES AND PARTICIPATION				
d155	**Acquiring skills** Developing basic and complex competencies in integrated sets of actions or tasks so as to initiate and follow through with the acquisition of a skill, such as manipulating tools or playing games like chess.	Cap 3	3	Cap 1	5
d166	**Reading** Performing activities involved in the comprehension and interpretation of written language (e.g. books, instructions or newspapers in text or Braille), for the purpose of obtaining general knowledge or specific information.	Cap 0 Per 0		Cap 0 Per 0	
d175	**Solving problems** Finding solutions to questions or situations by identifying and analysing issues, developing options and solutions, evaluating potential effects of solutions, and executing a chosen solution, such as in resolving a dispute between two people.	Cap 3	3	Cap 1	5
d3	COMMUNICATION				
d310	**Communicating with – receiving – spoken messages** Comprehending literal and implied meanings of messages in spoken language, such as understanding that a statement asserts a fact or is an idiomatic expression.	Cap 3	3	Cap 1	5
d350	**Conversation** Starting, sustaining and ending an interchange of thoughts and ideas, carried out by means of spoken, written, sign or other forms of language, with one or more people one knows or who are strangers, in formal or casual settings.	Cap 1 Per 1		Cap 1 Per 1	
d4	MOBILITY				
d410	**Changing basic body position** Getting into and out of a body position and moving from one location to another, such as getting up out of a chair to lie down on a bed, and getting into and out of positions of kneeling or squatting.	Cap 1 Per 1	6	Cap 1 Per 1	6
d420	**Transferring oneself** Moving from one surface to another, such as sliding along a bench or moving from a bed to a chair, without changing body position.	Cap 1 Per 1	6	Cap 1 Per 1	6

Code	Description	Admission		Discharge	
		ICF qualifier	FIM score	ICF qualifier	FIM score
d4	MOBILITY				
d440	**Fine hand use** Performing the coordinated actions of handling objects, picking up, manipulating and releasing them using one's hand, fingers and thumb, such as required to lift coins off a table or turn a dial or knob.	Cap 1 Per 1	5	Cap 0 Per 0	7
d450	**Walking** Moving along a surface on foot, step by step, so that one foot is always on the ground, such as when strolling, sauntering, walking forwards, backwards, or sideways.	Cap 3 Per 2		Cap 1 Per 1	
d455	**Moving around** Moving the whole body from one place to another by means other than walking, such as climbing over a rock or running down a stree, skippin, scapering, jumping, somersaulting or running around obstacles.	Cap 1 Per 1	5	Cap 1 Per 1	6
d460	**Moving around in different locations** Walking and moving around in various places and situations, such as walking between rooms in a house, within a building, or down the street of a town.	Cap 1 Per 1	5	Cap 1 Per 1	6
d465	**Moving around using equipment** Moving the whole body from place to place, on any surface or space, by using specific devices designed to facilitate moving or create other ways of moving around, such as with skates, skis, or scuba equipment, or moving down the street in a wheelchair or a walker.	Cap 9		Cap 0	
d5	SELF-CARE				
d510	**Washing oneself** Washing and drying one's whole body, or body parts, using water and appropriate cleaning and drying materials or methods, such as bathing, showering, washing hands and feet, face and hair, and drying with a towel.	Cap 1 Per 1	6	Cap 1 Per 1	6
d520	**Caring for body parts** Looking afer those parts of the body, such as skin, face, teeth, scalp, nails and genitals, that require more than washing and drying.	Cap 1 Per 1	6	Cap 1 Per 1	6
d530	**Toileting** Planning and carrying out the elimination of human waste (menstruation, urination and defecation), and cleaning oneself afterwards.	Cap 1 Per 1	6	Cap 1 Per 1	6
d540	**Dressing** Carrying out the coordinated actions and tasks of putting on and taking off clothes and footwear in sequence and in keeping with climatic and social conditions, such as by putting on, adjusting and removing shirts, skirts, blouses, pants, undergarments, saris, kimono, tights, hats, gloves, coats, shoes, boots, sandals and slippers.	Cap 1 Per 1	6	Cap 1 Per 1	6
d550	**Eating** Carrying out the coordinated tasks and actions of eating food that has been served, bringing it to the mouth and consuming it in culturally acceptable ways, cutting or breaking food into pieces, opening bottles and cans, using eating implements, having meals, feasting or dining.	Cap 1 Per 1	5	Cap 0 Per 0	7
d560	**Drinking** Taking hold of a drink, bringing it to the mouth, and consuming the drink in culturally acceptable ways, mixing, stirring and pouring liquids for drinking, opening bottles and cans, drinking through a straw or drinking running water such as from a tap or a spring; feeding from the breast.	Cap 1 Per 1	5	Cap 0 Per 0	7
d7	INTERPERSONAL INTERACTIONS AND RELATIONSHIPS	Cap 3 Per 3	3	Cap 1 Per 1	5
e1	PRODUCTS AND TECHNOLOGY				
e120	**Products and technology for personal indoor and outdoor mobility and transportation** Equipment, products and technologies used by people in activities of moving inside and outside buildings, including those adapted or specially designed, located in, on or near the person using them.	9		+3	

Code	Description	Admission		Discharge	
		ICF qualifier	FIM score	ICF qualifier	FIM score
e3	SUPPORT AND RELATIONSHIPS				
e310	**Immediate family** Individuals related by birth, marriage or other relationship recognized by the culture as immediate family, such as spouses, partners, parents, siblings, children, foster parents, adoptive parents and grandparents.	+8		+8	
e355	**Health professionals** All service providers working within the context of the health system, such as doctors, nurses, physiotherapists, occupational therapists, speech therapists, audiologists, orthotist-prosthetists, medical social workers.	+8		+8	
e5	SERVICES, SYSTEMS AND POLICIES				
e580	**Health services, systems and policies** Services, systems and policies for preventing and treating health problems, providing medical rehabilitation and promoting a healthy lifestyle.	+8		+8	

DISCUSSION

In this particular study, ICF did not provide any additional information about functioning of a patient, as all the information was taken from the existing medical records. Nevertheless, ICF structures this large amount of information and provides a clear, easy and holistic view of all the different aspects of functioning reflected in different reports and documents.

The study also demonstrated the weak points of the medical documentation. Almost no information was found in the medical records regarding activities, related to the daily life (chapter 6 – domestic life, which includes preparing meals, caring for household objects, doing housework etc.), interpersonal interactions and relationships, major life areas (which include education, work and employment, and economic life) and community, social and civic life (which includes recreation and leisure, religion and spirituality).

Little information was also found concerning the relevant environmental factors. Those that were identified correspond to "products and technology for daily use" and "support and relationships". Health professionals and "health services, systems and policies" were also found to be the facilitating environmental factors. Rehabilitation had a positive influence mostly on functions of language and memory and activities that are related to mobility and self-care. Some of these are difficult to assess in a rehabilitation hospital, since the patient has to stay at home for some time in order to comprehend the extent of problems with these activities. The impact of the environment is also difficult to assess before the patient has been living at home for a while. Before finishing the rehabilitation, patients usually go home for a weekend to face the reality. After such visits, clinicians should describe the problems that the patients had at home better and be able to suggest feasible solutions. The later should also be written in the medical records.

Many areas could not be assessed specifically. The qualifier "8" (standing for "not specified") was used due to the fact that particular aspects of functioning are not described sufficiently enough to determine the scale of the problem or the role of an environmental factor. In these areas, it was also not possible to demonstrate any improvement. Clinicians will have to find appropriate outcome measures for assessing these categories.

Another advantage of the ICF lies in its easy and language-independent format that is especially important in the united Europe and the globalised world of today. Being neutral, ICF also underlines the strong sides of an individual that are important for rehabilitation and further functioning. However, little information was found in relation with the environmental factors.

CONCLUSIONS

In a patient after traumatic brain injury, ICF structures the information about functioning in a clear, easy and holistic way. The study revealed that some aspects of functioning are currently not sufficiently described in the medical records. In the future, ICF could help professionals to draw more attention to the important aspects of functioning and the environmental factors relevant for functioning.

ACKNOWLEDGMENTS

We are grateful to Michaela Coenen and Heinrich Gall, ICF Research Branch, WHO FIC Collaborating Centre, Institute for Health and Rehabilitation Sciences, Ludwig-Maximilian University, Munich, for their help in elaboration of the case report form and creation of the database.

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