Functional evaluation of rehabilitation outcome – a pilot project on implementation of the Inpatient Functional Assessment (ICF) in selected spas

Authors' Contribution:
A Study Design
B Data Collection
C Statistical Analysis
D Manuscript Preparation
E Funds Collection

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Abstract

Background & Study Aim: According to World Health Organisation (WHO) recommendations, the effectiveness of rehabilitation measures should be evaluated comprehensively. The International Classification of Functioning, Disability and Health (ICF) allows to make a bio-psycho-social functional assessment. ICF, being part of WHO international classifications, is an international standard for describing and assessing health and disability. This article is a presentation of a pilot application of this classification in the assessment of rehabilitation progress based on the model of information collection designed by the authors. The aim of the study was knowledge about the time-consuming nature of entering the required data related to the assessment of the effectiveness of rehabilitation intervention.

Material & Methods: Patients of two publicly funded inpatient rehabilitation centres participated in the study. On the basis of ICF-compliant criteria for assessing the progress and effectiveness of rehabilitation, the patient's condition was assessed twice: upon his/her admission to hospital and upon his/her discharge after the rehabilitation stay. The rehabilitation stay financed from public funds by the national payer (the National Health Fund – NFZ) lasts 21 days during which each patient undergoes at least 5 physiotherapy procedures specified by a doctor. A total of 174 patients were examined.

Results: Assessment of results of rehabilitation progress in individual patients shows that vast majority of respondents (76%) demonstrated health improvement. The average questionnaire entry time was 3 minutes and 51 seconds.

Conclusions: Results of the pilot project indicate that the proposed solution would meet assumptions of a universal measure of rehabilitation progress based on the ICF model. The average time required for entering data into the questionnaire is shorter than the usual period of time needed to conduct a physiotherapy interview with a patient. Therefore, we recommend this method and tool as meeting the diagnostic criteria for use not only in rehabilitation, but also in therapy and prevention.

Keywords: combat sports • effectiveness • innovative agonology • physiotherapy

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Conflict of interest: Authors have declared that no competing interest exists

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Combat sport – *noun* a sport in which one person fights another, e.g. wrestling, boxing and the martial arts [53].

Martial arts – *plural noun* any of various systems of combat and self-defence, e.g., judo or karate, developed especially in Japan and Korea and now usually practised as a sport [53].

Recreation – *noun* an activity that a person takes part in for pleasure or relaxation rather than as work [53].

Mental toughness – is *a measure of individual resilience and confidence that may predict success in* sport, education, and the workplace [54].

INNOAGON – acronym 'innovative agonology' [45].

Innovative agonology – is an applied science dedicated to promotion, prevention and therapy related to all dimensions of health and regarding the optimization of activities that increase the ability to survive from micro to macro scales [49, p. 274].

INTRODUCTION

According to guidelines of the World Health Organization (WHO), the effectiveness of rehabilitation interventions should be evaluated comprehensively. Both the physical and psychological spheres of the patient should be assessed. Positive results in regaining physical functionality, achieved by a health-care facility providing rehabilitation services, must be correlated with improvement (or maintenance) of mental and social functions. Assessment of bio-psycho-social functionality can be made by the International Classification of Functioning, Disability and Health (ICF). It proposes a multifaceted approach taking into account the structures and functions of the body and, above all, focuses on the individual's activity and participation in a particular environment and avoids assessing the patient considering only the medical aspect.

Rehabilitation measures are supposed to optimize the functionality capacity of people affected by various functional limitations and/or disabilities. Functional assessment is therefore the starting point of the patient-centre rehabilitation process, and comparative assessment of rehabilitation interventions is based on an analysis of differences between the change in the patient's functioning before and after implementation of a particular rehabilitation intervention [1-4]. The International Classification of Functioning, Disability and Health (ICF) is a reference system of medical information that can improve the comparative assessment of changes in patient functioning after implementation of particular rehabilitation interventions [5]. ICF, being a part of WHO international classifications, is a standard for describing and assessing health and disability. This classification was adopted in 2001 by the World Health Assembly (resolution WHA 54.21) and is a revised version of the previous ICIDH system (International Classification of

Impairments, Disabilities and Handicaps) from the year 1980 [6]. ICF serves as a platform for collecting data on practical human functioning in the environment and limitations of these functions. Health in this classification is perceived not only as a clinical dimension but also as a health-related condition [7-9]. The ICF classification has two main components. The first, *human body functions and structures*, refers to physiological functions and anatomical parts. A loss or deviation, from what Evidence Based Medicine identifies as normal body functions or structures, is defined by the classification as an impairment [10]. The second component, i.e. *activity and participation*, is identified as the ability to perform a task or activity and the ability to engage in life situations. Deficits in these areas are defined by ICF as limitations. The two qualifiers for the "activity and participation" component are the performance qualifier and the ability qualifier. Both qualifiers can be applied to the patient's use and non-use of assistive devices or the use or non-use of assistance provided by other person (according to the ICF scales) [11]. The mentioned components are interrelated and they interact with the health status and personal and environmental factors. Environmental factors should be analysed from the perspective of the involved person. The ICF framework thus reflects a bio-psycho-social approach to represent health and disability in various components [12-17].

In a study called "Rehabilitation 2030", WHO highlighted the status of ICF as "an internationally standardized language and data coding system which enables to make multi-level comparisons" and pointed out the usefulness of the classification in improving health information systems [18]. Some of the ICF categories and those of the ICD-10 classification (International Statistical Classification of Diseases and Health Problems – the European system of nosological

diagnosis currently in use in Poland) are similar, particularly in terms of the nomenclature used for the patient's subjective and objective evaluation. However, purposes of these two classifications are different. ICD-10 classifies symptoms in order to document morbidity and use of medical services (cause-effect or etiological categories). ICF, on the other hand, identifies symptoms as a component of human body function. According to the ICF framework, disability is a complex concept that integrates impairments, activity and participation limitations with personal and environmental factors. The ICF Classification focuses more on the interaction of the condition with the individual's functioning, rather than on the aetiology or disease [19-21]. Previous experience of using ICF in assessment of the effectiveness of medical interventions, particularly rehabilitation interventions, confirms benefits of the classification framework and discourages from following the traditional biomedical approach as it simplifies disability and regards it as a defined clinical condition [22, 23]. Using ICF as a common language to describe clinical outcomes at different time points and achieved by different professionals facilitates establishment of a common reporting system, which allows to avoid ambiguities and eliminate inconsistencies arising from sectoral descriptions made by different members of the treatment team [24-26]. Adoption of such reporting system can be extremely useful in monitoring the patient, between his/her admission to and discharge from hospital, taking into account both therapeutic progress and failures. This minimises the reporting effort and enables to meet all legal requirements for traceability. The use of the ICF platform in estimating the effectiveness of rehabilitation also imposes a new quality on diagnostic and therapeutic teams. In a way, it enforces collaboration of multidisciplinary groups, starting with lab technicians and finishing with physicians, physiotherapists, psychologists and psychotherapists [27-29]. In a broader perspective, the ICF classification enables to provide standardised and objective diagnosis and medical jurisdiction, as well as take breakthrough decisions regarding the selection of rehabilitation therapies/procedures through creation of assessment aggregates or multi-criteria evaluation. Consequently, this also contributes to qualitative changes in healthcare, including the patient service formula. At the level of a treatment facility or rehabilitation program, ICF allows to aggregate information on patient functioning, which in turn helps to monitor clinical outcomes and improve planning of medical services. At the level of population-based measures, aggregated clinical information on patient functioning provides information for decision-makers responsible for planning health services, including rehabilitation, which helps to monitor the impact of the implemented services [30, 18, 21, 31].

This article is a presentation of a pilot application of this classification in the assessment of rehabilitation progress based on the model of information collection designed by the authors. The aim of the study was knowledge about the time-consuming nature of entering the required data related to the assessment of the effectiveness of rehabilitation intervention [32, 33, 7, 18, 8].

MATERIAL AND METHODS

Participants
Patients of two publicly funded inpatient rehabilitation centres participated in the study. The pilot project included patients receiving rehabilitation services (during a rehabilitation stay) in the following medical facilities: American Heart of Poland S.A. Uzdrowisko Ustroń, 1 Sanatoryjna Street, 43-450 Ustroń; Uzdrowisko Krynica-Zdrój – Independent Public Healthcare Centre, Spa Sanatorium of the Ministry of Internal Affairs and Administration in Krynica-Zdrój, Poland.

The patients were informed about the principles of the pilot study and gave their consent to participate in it.

The Bioethics Committee of the National Medical Institute of the Ministry of Foreign Affairs and Administration (Poland) approved of the study.

Study design
On the basis of ICF-compliant criteria for assessing the progress and effectiveness of rehabilitation (Attachment 1), the patient's condition was assessed twice: upon admission to hospital; upon the patient's discharge after the rehabilitation stay. The rehabilitation stay financed from public funds by the national payer (the National Health Fund – NFZ) lasts 21 days, during which each patient undergoes at least 5 rehabilitation procedures, specified by a specialist in medical rehabilitation, orthopaedics and traumatology.

Documenting empirical data and statistical analysis

The information obtained from the questionnaire was appropriately coded in an MS Excel spreadsheet, which allowed a quantitative interpretation and indexical evaluation of the received rehabilitation. For each patient, the level of subjectively assessed health condition was determined. This allowed to compare the health status on the first and last day of the rehabilitation stay. During the interview, the patient had an opportunity to rank his/her functioning on a scale. The score was appropriately calculated for values in the range <0; 1>; the answers were given the following values: 0 if the respondent was unable to function within a particular range and 1 if the respondent demonstrated full functionality; options between the values of 0 and 1, assessing the level of functioning have been differentiated to reflect the patient's independence in performing activities (the value of 0.2 was awarded if the respondent needed to be helped by another person; the value of 0.5 was awarded if the respondent needed more time or technical support).

In order to analyse the effectiveness of the proposed analytical tool for data extraction, we use the record of the time when the raw data were entered into the online questionnaire.

The arithmetic mean was then used to aggregate the result to a comparable value in the interval <0; 1> for each measured patient. The results obtained in the next step were compared between the initial and final measurements.

$$R_r = \frac{R_{m_2}}{R_{m_1}},$$

where:

R_r – rehabilitation result ratio,
R_m – rehabilitation result measurement, initial period 1, final period 2.
$R_r = 1$ – for no change in the patient's health status, $R_r > 1$ – for improvement in the patient's health status, $R_r < 1$ – for worsening of the patient's health status.

The estimation of the results is based on the frequency (N) and proportion index (%) of observed phenomena.

RESULTS

For 174 patients included in the study, $R_m = 0.886$ was achieved at the first or initial measurement. During the second or final measurement, $R_m = 0.930$, which proves a positive average rehabilitation progress score of $R_r = 1.05$. In the surveyed group of patients, in the majority (147 patients), the rehabilitation score R_r was between 0.75 and 1. During the second measurement, 170 patients scored the same range of values. This indicates an improvement in the patients' health overall status. Detailed results also confirm the above regularities, recorded at the overall level.

Assessment of the outcome of rehabilitation progress, at the level of an individual patient (Figure 1), reveals that the vast majority of patients (more than 76%) demonstrated an improvement in their health status. One in five patients did not report changes in their rehabilitation progress. Of the total number of 35 patients, 23 achieved the maximum functional level $R_m = 1$ in both measurements. Deterioration in the assessment of the health status was reported for only 6 (4%) patients (which accounted for 4%).

The average questionnaire entry time in both measurements (first/second) was 3 minutes and 51 seconds. In fact, most data are entered in less than 3 minutes – the percentage of patients in this time group was 74.35%. This may indicate that operating the system (after the personnel have got familiar with its operation) would not be a significant additional burden for the medical personnel when examining patients, e.g., in rehabilitation centres (Figure 2).

DISCUSSION

Health outcomes are typically measured to assess the effectiveness of a particular rehabilitation (or treatment-related) intervention or the extent to which programs or services were beneficial for participants (including satisfaction with services and the impact of a particular intervention on the quality of life [34, 35]). This assessment is necessary and driven by increased demands for accountability of the society with regards to the use of health care resources, the need to focus on evidence-based practices and emerging availability of
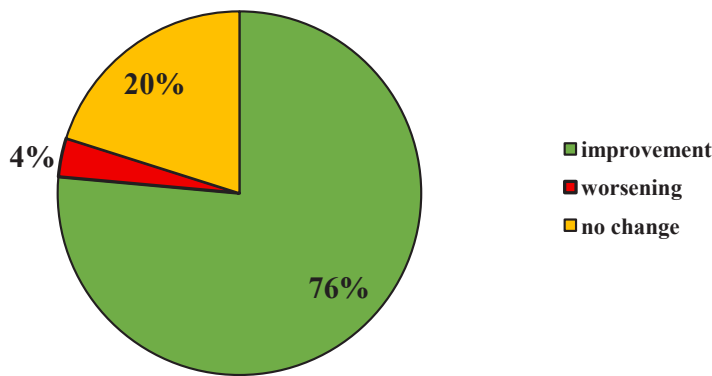
Figure 1. Answers regarding rehabilitation interventions (improvement-no change – deterioration) for patients of the pilot study.
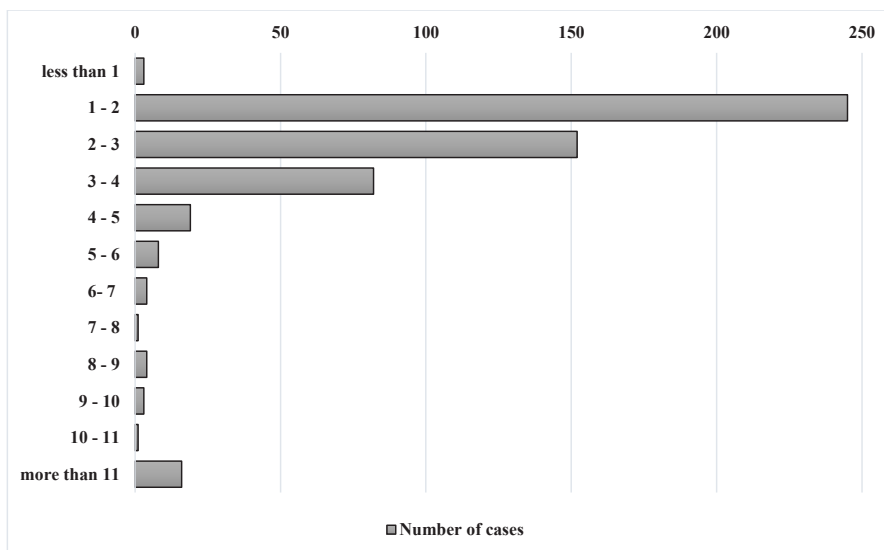

Figure 2. Time of entering data into the questionnaire in the pilot study (the length of the class interval equals 1 minute, but the actual ending of the interval is the 59th second of the next minute).

more sophisticated methodologies used in monitoring the effectiveness of therapies [36]. Busch and Sederer [37] claim it is highly important to adopt specific criteria to evaluate therapy outcomes especially if the therapy is financed from public funds and supported by empirical analyses.

During the pilot project, 174 patients were assessed twice in the two treatment centres that agreed to participate free of charge. The first assessment was made upon the patient's admission to a 21-day rehabilitation stay. The average score on the first day was 0.886. The patient was assessed for the second time on the last day of the rehabilitation stay; at this measurement point, the average value was 0.930. The difference in the mean values obtained for 76% of patients during the first and the second measurements indicates a positive effect of a particular rehabilitation intervention.

Healthcare management organisations encourage rehabilitation and health care providers to incorporate methods of assessing patient outcomes that clearly demonstrate benefits of the health care service.

Result of the evaluation (revealing to what extent particular rehabilitation interventions appeared to be beneficial to patients) were a motivation to develop an online tool, based on the ICF platform, which could easily enable to collect data on patient health. A system of forms, containing depersonalized information on a therapy (rehabilitation) of patients, was created. The forms are secured and accessible via the Internet. Patients who stay all the time in a treatment facility and are managed there can be identified with the use of a system of keys (indexes).

The proposed evaluation system model continuously checks whether the entered data meet the standard of the fields given in the form, which reduces the time needed to enter the information. In the pilot project, the average time to enter one data record into the application was less than four minutes (3:51). The collected depersonalized data are then exported to an MS Excel spreadsheet for further processing and analysis. It is also possible to quickly import raw data into other analytical applications (as required). In a pilot solution, an MS Excel overlay assessing rehabilitation progress was proposed, which allows to automatically perform subjective and qualitative quantification of the patient's assessment in particular ICF domains. The tool summarily calculates the obtained data and quantifies them to a single synthetic measure, contained in a comparable range of values <0; 1>. The proposed approach allows comparison of the patient's health status assessment at two time points (at the beginning of and after the rehabilitation period) and verification of the rehabilitation outcome for three outcomes (improvement /worsening/no change). The interpreted outcome of rehabilitation takes into account individual as well as external conditions of the patient, without having to transform it into a category parameter for analyses, such as Cost-Consequences Analysis [38], which are often considered in economic evaluation. The proposed tool provides functional flexibility of measurement. Weights of different parameters of the given answers were determined. In the proposed model, the authors considered adopting different values for the weighting of a given parameter (e.g. uniform distribution) but this did not affect the result of the main measurement (it was revealed that with different weighting values (e.g. fixed weights) for each response option, the tool showed differences in classification for only 2 patients).

The solutions proposed and tested in the pilot model can be successfully adopted as methods for verifying the effectiveness of interventions in applied rehabilitation services (assessment of intervention results).

This work is not directly related to the healthful exercises associated with the practice of hand-to-hand combat. However, a recent publication on Latvian taekwondo athletes provided empirical data that in some ways corresponds with presented pilot study. Authors applied an innovative outdoor recreation activity program (walking in nature) on mental toughness components of taekwondo athletes during the competition period. However, the positive effects led them to a prudent conclusion: "The study has several limitations, such as having no control group and a small sample size (…) we suggest that future studies should be conducted on larger samples, preferably selected by random sampling and involving other age groups" [39, p. 119].

We thoughtfully used the phrase "health exercises identified with hand-to-hand combat practice" [40-42] for two reasons. Firstly, we share the view of prominent combat sports experts (both scholars and practitioners) who emphasize that the generic name "martial arts" supplemented with the word 'mixed' has become a camouflage for neo-gladiatorship [43-45]. Secondly, the successful promotion in the global scientific space of a new applied science (INNOAGON [46-51]) based on the unique theories of agonology (authored exclusively by Polish scholars and initiated in 1938 by Tadeusz Kotarbinski), opens new perspectives for the exploration of the phenomena that make up the enhancement of all dimensions of health and survival in a complementary way – from micro to macro scales [52].

CONCLUSIONS

The outcome of the pilot study indicates that the proposed solution would meet requirements of a universal measure of rehabilitation progress based on the ICF model. The average estimated time of entering data into the forms (3:51 min) is shorter than the standard time of making a physiotherapy interview with a patient. Therefore, we recommend this method and tool as meeting the diagnostic criteria for use not only in rehabilitation, but also in therapy and prevention.

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