

MEASURING OUTCOMES IN ACUTE NEUROREHABILITATION IN GENERAL HOSPITAL SETTING – OUR EXPERIENCE

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ABSTRACT

In General Hospital setting, where varieties of patients are included in neurorehabilitation process, set of multidisciplinary functional tests were established, as a routine in daily work. Tests were done by physiotherapists and occupational therapists who were members of rehabilitation team. Our aim was to select the tests which can be used as a routine and are applicable for different neurological impairments in daily work. Tests were applied to inpatients admitted to the Medical, Trauma, Neurology and Neurosurgery wards in the Rashid Hospital, DOHMS, Dubai. Fifty inpatients with different neurological impairments admitted to totally 8 wards, were tested in the beginning of rehabilitation process and on discharge from the hospital. Nine tests were used as standardized tests for measuring motor, cognitive, focal impairment, ADL activities and disability: Motricity Index, Trunk Control Test, Standing Balance score, Functional Ambulation Categories test, Mini Mental State Examination, Canadian Neurological Scale, Action Research Arm test, Bartel Index and Functional Independent Measurements. FIM, Motricity Index and Trunk Control Test were applicable for all tested patients, with required adaptation for different neurological conditions within the same score. Other tests were not applicable for all patients as routine, but there were very useful for certain number of patients as a measurement of functional improvement. It is very important to have proper setup of tests, which are simple, reliable and valid for measuring impairment, disability and handicap and which can be used as standardized part of assessment protocol. Also, they must be applicable for different neurological impairments to monitor treatment progress. Combination of tests performed by different professionals and comprehensive approach of all team members is very important for measuring outcomes in rehabilitation and evaluating patient's impairment and disability. Proper hospital setup, optimal number of staff, good communication and team work are leading to better outcome in neurorehabilitation process.

INTRODUCTION

To measure the effectiveness of clinical interventions and to develop general – purpose database, set of different tests were established. The tests were applied by Physiotherapists and Occupational therapists as Rehabilitation team members. Rehabilitation is intensive and costly intervention, and that's why evaluation of its therapeutic effectiveness is very important. Physical Medicine & Rehabilitation team members treat inpatients admitted to different wards in General Hospital, such as Trauma, Internal Medicine, Neurology, Neurosurgery etc. They were a part of multidisciplinary teams in charged of comprehensive care of admitted patients. Each of medical professionals usually develop own preferred measurements, but it is good to have unique set of tests which can be done fast, are sensitive enough and reliable to monitor progress in the treatment (1). Physical Medicine & Rehabilitation field is not only concern about the organs system function, but also about "function" of a person in real life, after being discharged from the hospital. The aim of rehabilitation is to improve various aspects of patient's life, such as disability, handicap or quality of life, so all these categories should be included in patient's assessment. (2, 3, 4) Previously functional measurements were focused on impairment (measuring functions in term of organ systems, such as muscle strength, sensations, range of motions, balance etc.), but lately measurements are going beyond impairment by assessing disability of individuals and activities they perform in daily life. (5) World Health Organization (WHO) develops International Classification of Impairment, Disabilities and Handicaps (ICIDH) which was later revised as International Classification of Functioning, Disability and Health (ICF) where taxonomy for understanding of functioning at the biologic, individual and interpersonal (social) levels was established. By definition, disability is any restriction or a lack of ability to perform an activity – at the level of person while handicap is limitation at the level of person in the environment (mostly social). In CSF classification disability is replaced by term "activity" and handicap is replaced by "participation restriction" defined as problems an individual may experience in life situations (5, 6). Rehabilitation has long aim to improve the function of patients, so it is very important to start thinking about functional problems and quality of life from the very beginning of disease or injury, during the stage of early neurorehabilitation (7, 8, 9). Literature reviews of measurements in rehabilitation have noted that the Rehabilitation field needs more formal studies of the reliability and validity of measurements (7). In General Hospital setting measurements for early

rehabilitation database should be easy to use - simple, quick and economic, valid – to achieve the intended purpose (to be appropriate, meaningful and useful), reliable – to have good correlation between observed and true scores or how closely two obtained results related to each other and sensitive – to detect expecting changes easily. (7) Our aim was to choose the simple, reliable and valid tests for measuring impairment, disability and handicap. These tests can be used as standardized and should be applicable for different neurological impairments..

MATERIAL AND METHODS

PARTICIPANTS

Fifty patients with neurological deficit and symptoms of upper motor neuron weakness were assessed. All patients were inpatients in Rashid Hospital, Dubai, recruited from Neurosurgery, Neurology, Trauma and Medical wards. Subjects were referred for Physiotherapy and Occupational Therapy treatment from different specialist team depending on primary cause of hospitalization. Primary team was in daily contacts with physiotherapists, and where it was required occupational therapy was also performed. Physical Medicine and Rehabilitation (PM&R) team (Physiatrist, Physiotherapist and Occupational Therapist) on their daily meetings were planning the program of rehabilitation and discussed type of treatment, requirements and functional improvement. All patients were treated once daily in the ward during hospitalization. Treatment time depended on needs and conditions of each patient. The patients were tested before and on discharge from the hospital, and if hospitalization was longer - more measurements were recommended. Decision about discharging the patients were made by primary specialists' team and very often PM&R team was not informed about it.

MEASURES

For each patient physiotherapists used to do four tests and occupational therapist 5 tests which are designed to give us information about full functional status of patient. Motor impairment was assessed by physiotherapists using Motricity Index and Trunk Control Test. Balance and Mobility was assessed by Standing Balance Score and Functional Ambulation Categories Test. Cognitive impairment was measured by occupational therapist using Mini Mental State Examination (MMSE) and for cognition and motor response Canadian Neurological Scale (CNS) was used. Arm function was assessed by Action Research Arm test (ARA), Activity of Daily Living (ADL) with Barthel ADL index test; and disability was measured

with Functional Independent Measurements (FIM). (7) Special form was designed to record patient's general data, medical diagnoses, level of disability and score values.

TESTS

Motricity Index (MI): Primarily designed for measurements of motor functions after stroke where it showed good validity and reliability (7, 9, 10), it can also be used to test patients with upper motor neuron weakness. The measurements are simple and of practical prognostic importance. Six limb movements are tested - pinch grip, elbow flexion, shoulder abduction, ankle dorsiflexion, knee extension and hip flexion. Specific grading is derived from the Medical Research Council (MRC) grades with maximum score 100 for each limb score and side score.

Trunk Control Test (TCT): Mostly tested together with Motricity Index as a motor impairment measurement (7, 10). Four movements/functions are tested: rolling to strong and to weak side, sitting up from lying position and balance in sitting position. Max score for each function is 25 and maximum total score is 100.

Standing Balance score (SBS): Used for measuring bilateral static standing performance and postural stability while subject stand with their eyes open (7, 11). Grading: 0 - 4.

Functional Ambulation Categories Test (FACT): Giving details on the physical support needed by patients who are walking. It is simple to use and sensitive to change during the transition from being immobile to walking. All support needed for patients are given by person(s), not by any aid, so this test is much more useful in active rehabilitation rather than as measure of active disability. (7, 11) Grading: 0-5

Mini Mental State Examination (MMSE): Used for measuring cognitive impairment (7, 12). The test includes memory, attention, language etc. with maximum score of 30. Score of 24 distinguishing normal from abnormal. It is best to study the actual response of each question, not the total score.

Canadian Neurological Scale (CNS): Designed mainly for stroke patients can be useful also for other upper motor neuron deficits. It is measuring consciousness, speech, and strength. (7, 13) Because impairments of these modalities are basic for evaluation of any stroke patient, performing CNS will provide full information about severity of the initial neurological deficit. Maximum score is 11.5. Long term outcome can be also predicted by using CNS score considering patient's age. (14)

Action Research Arm test (ARAT): Used for measuring arm function. (15) Contains 4 subtests for testing grasp, grip, pinch and gross movements with maximum score 57. Some equipment is required (7).

Barthel ADL index: Includes ten most common areas within ADL scales and specifically covers continence of bowel and bladder. It is simple to use, but has limited sensitivity especially to small differences. Maximum score – 100 (2, 7, 16, 17, 18).

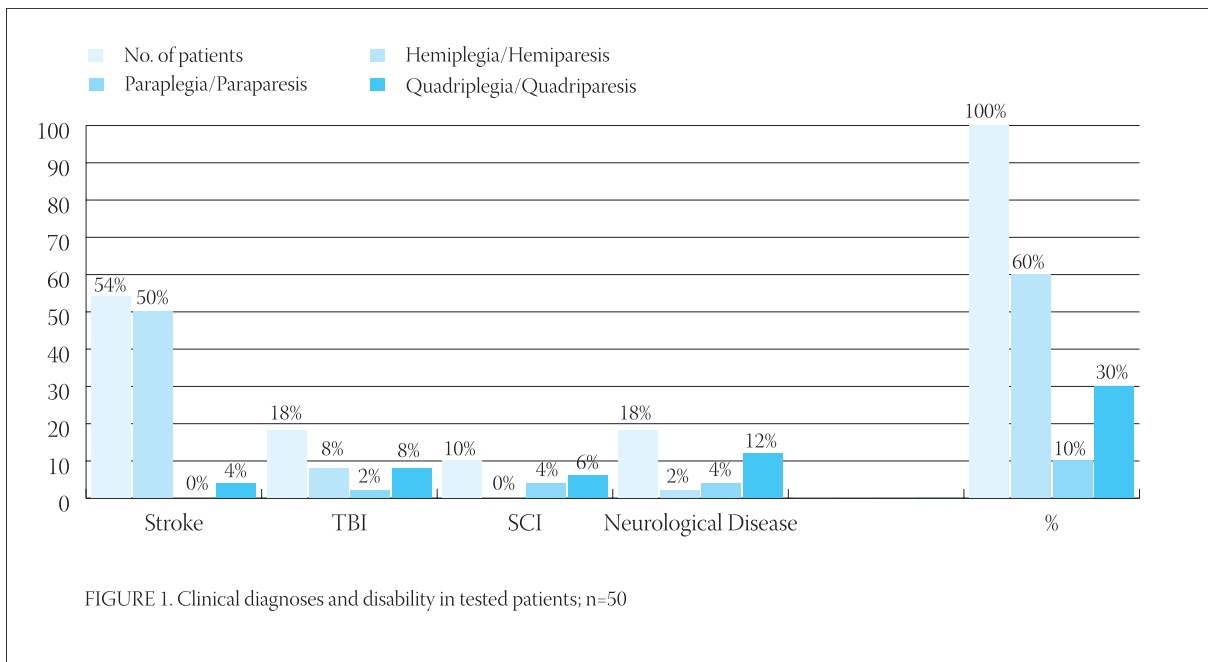
Functional Independent Measurements (FIM): Used for measuring disability. FIM can detect meaningful changes in level of function during rehabilitation, so it is very useful for inpatients rehabilitation assessments. (2, 7) FIM is designed to evaluate patient's abilities in self-care, sphincter control, mobility, locomotion, communications and social cognition. Score range is from 1 to 7 for each item, with Motor subtotal score (13 items) and Cognitive score (5 items). Maximal total score is 127. (2, 7, 16, 17, 18, 19, 20)

RESULTS

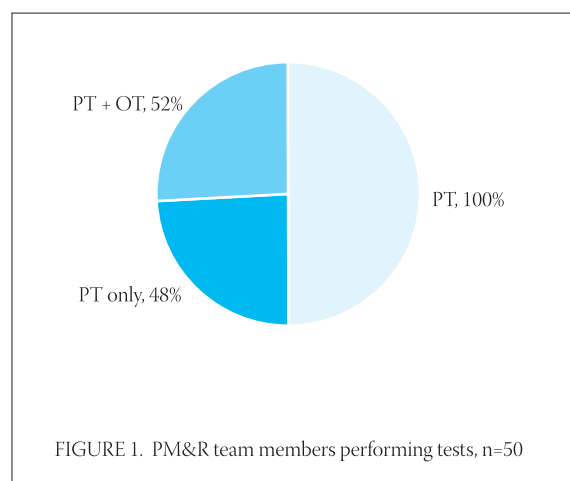
A total of 50 patients with different neurological impairments were tested in 8 wards in the Rashid Hospital, Dubai, in the beginning of rehabilitation process and on the discharge. Tests and retests were done by 5 physiotherapists and 2 occupational therapists worked in the wards. 38 (76%) of subjects were male and 12 (24%) female. Mean age of tested patients was 48, with minimal age of 19 and maximal of 90 years. Total length of rehabilitation treatment in the hospital for all 50 patients was 1527 days, means average length of treatment was 34 days per patient (from minimal 3 days to maximal 163 days).

DATA ANALYSIS

All 50 patients had symptoms of affected upper motor neuron with different clinical pictures and different causes of disability. Out of total number of patients 54% suffered a stroke (with presented hemiplegia/hemiparesis in 50% and quadriplegia/quadruparesis in 4% of patients), 18% traumatic brain injury (TBI) (8% hemiplegia/hemiparesis, 2% paraplegia/paraparesis and 8% quadriplegia/quadruparesis), 10% spinal cord injury (SCI) (4% paraplegia/paraparesis and 6% quadriplegia/quadruparesis) and the rest of 18% of patients presented the symptoms of some neurological disease with a signs of hemiparesis/hemiplegia in 2%, paraplegia/paraparesis in 4% and quadruparesis/quadruplegia in 12% of patients (Figure 1.) Majority of tested patients diagnosed as a stroke developed hemiparesis or hemiplegia. During hospitalization all patients underwent ones daily treatment in the ward. Treatment type (physiotherapy or occupational therapy) and treatment time depended on needs and conditions of each patient. The patients are tested before treatment and on discharge from the hospital or even more - if



hospitalization was longer. All patients were referred by primary medical team to physiotherapist who then informed other members of PM&R team. All 50 patients (100%) were seen by physiotherapist, 52% (26 patients) were seen by both - physiotherapist and occupational therapists and 48% (24 patients) only by physiotherapists (Figure 2.). Physiotherapists used 4 tests for measuring motor impairment, mobility and balance of the patients: Motricity Index, Trunk Control test, Standing Balance test and Functional Ambulation Categories. Motricity index for measuring of motor impairment, was applicable for all 50 patients. Only one test was done to 28% of patients, two tests to 44% and three and more tests to 28% of tested patients. Trunk control test was applicable to 68% of patients with one testing for 12%, two testing for 34% and three and more testing for 22% of patients. Standing Balance test and Functional Ambulation Categories were applicable to 44% of tested patients where 10% of patients performed one test, 24% two tests and 10% three and more tests. (Figure 3). Occupational therapists performed tests for measuring cognitive impairment, activities of daily living and disability for inpatients. Mini Mental State was applicable for 30% of all tested patients - 14% of patients were tested only one time, 12% two times and 4% three and more times. Canadian Neurological Scale was done to 40% of all patients - 16% one time, 16% two times and 8% three and more times. Arm Research Test was applicable for 34% of patients - 16% one time, 12% two times and 6% three times. ADL activities were tested with Barthel Index for 26% of all patients - 12% once, 12% twice and only 1% three times. FIM measured disability for 42% of patients - 12% once, 22% twice



and 8% three times. Only 52% of total number of tested patients were referred for Occupational Therapy treatment. Mini Mental State Examination was applicable to 58% of patients seen by OT, Canadian Neurological Scale to 77%, Action Research Arm Test to 65%, FIM to 81% and Barthel to only 50% of OT patients (Figure 4.). Our aim was to do at least two tests – on admission and discharge, and if patient has longer hospitalization – even more. Majority of patients, as proposed, were tested two times – Motricity index 44%, TCT 34%, SBT 24%, FAC 24%, MMS 12%, CNS 16%, ARA 12%, FIM 22%, Barthel 12%. Motricity Index was tested three or more times for 28%, TCT for 22%, SBT 10%, FAC 10%, MMS 4%, CNS 8%, ARAT 6%, FIM 8% and Barthel for 2% of patients. A number of patients were tested only one time – MI 28%, TCT 12%, SBT 10%, FAC 10%, MMS 14%, CNS 16%, ARAT 16%, FIM 12% and Barthel 12%. (Figure 5.)

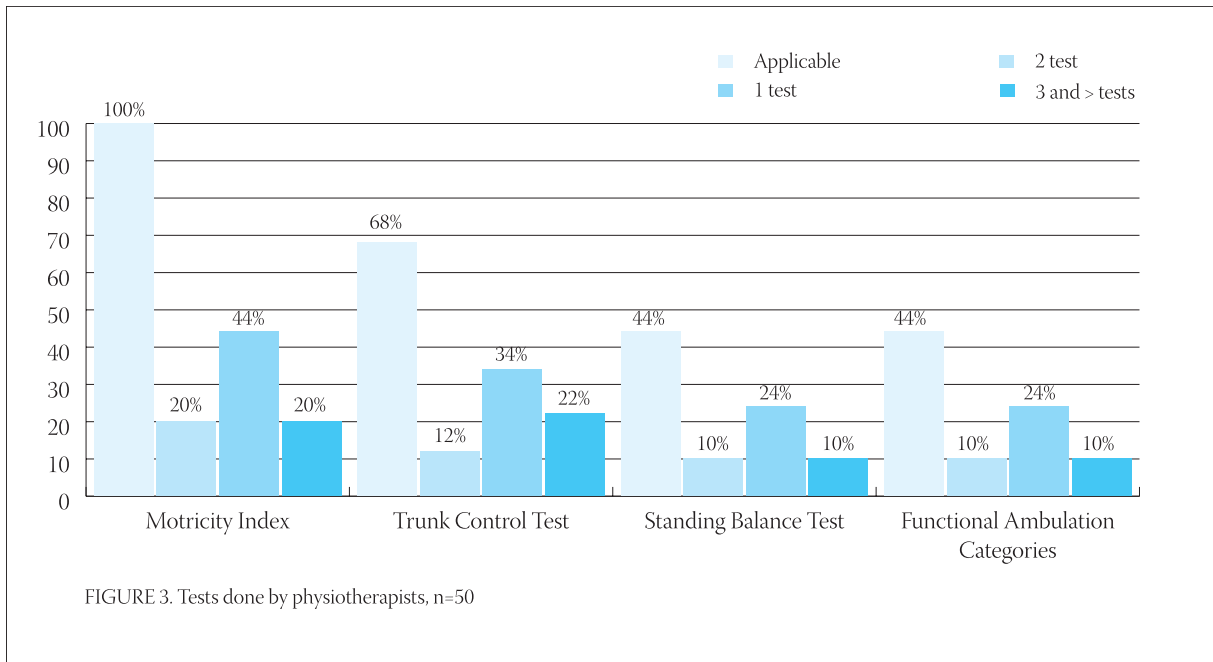


FIGURE 3. Tests done by physiotherapists, n=50

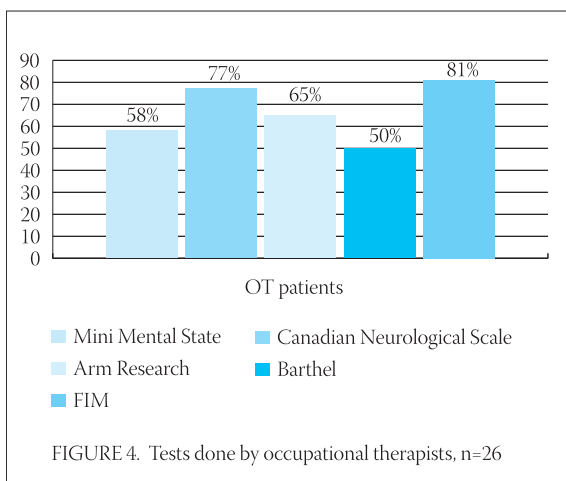


FIGURE 4. Tests done by occupational therapists, n=26

DISCUSSION

The study investigates the use of different functional tests in Neurorehabilitation in General Hospital Setting such as Rashid Hospital in Dubai. Our aim was to choose the simple, reliable and valid tests for measuring impairment, disability and handicap which can be used as standardized and be applicable for different neurological impairments for monitoring treatment progress in General Hospital. The same tests were used in many researches to measure some specific deficits in different diseases, but we made our individual choice of measurements that enable us to have evidence of all aspects of

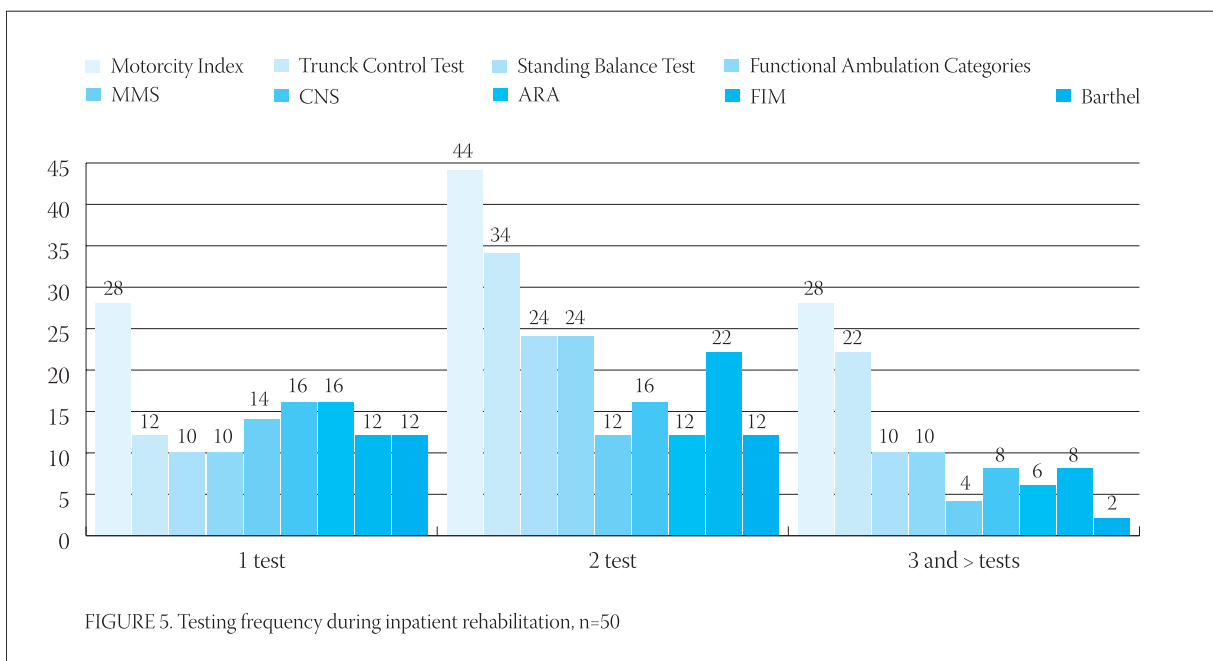


FIGURE 5. Testing frequency during inpatient rehabilitation, n=50

functional impairments. Patients with signs of upper motor neuron deficit were tested. They were recruited from different wards (Neurology, Neurosurgery, Trauma, and Internal Medicine) in the Hospital. Group of 50 patients were tested with 9 tests, for measuring motor impairment, mobility, cognitive functions, disability and activities of daily living. Physiotherapists performed 4 tests (Motricity Index, Trunk Control Test, Standing Balance Score and Functional Ambulation Categories Test) and Occupational therapists 5 tests where it was applicable (Mini Mental State Examination, Canadian Neurological Scale, Action Research Arm test, Barthel ADL Index test, Functional Independent Measurements). By this set of tests we wanted to collect comprehensive evidence of functional deficit and disability of tested patients. The majority of tested patients had signs of one side weakness - 60%, 30% of all four limbs weakness, and only 10% of lower limbs weakness. Reason for admission in hospital in 54% of patients was stroke, 18% had traumatic brain injury, 10% spinal cord injury and 18% had different neurological diseases with signs of upper motor neuron deficit. All patients were under the treatment of primary medical team who offer admission to the hospital. There was no Rehabilitation ward in the Hospital, but Physical Medicine & Rehabilitation services were provided at each ward in the Hospital by permanent treatment of physiotherapists and occupational therapists. There were nine physiotherapists and two occupational therapists involved into inpatient rehabilitation. Physiatrist was consultant for PM&R team members and on their daily meetings they were creating plan and program of rehabilitation for each of patients referred to neurorehabilitation. All patients underwent treatment once a day during hospitalization. They were seen by physiotherapist and 52% of patients were also referred to occupational therapy treatment. Number of existing occupational therapists was much less than physiotherapists, so only patients who need cognitive training and specific hand function training were included in OT treatment. Physiotherapists applied Motricity index test to all patients, TCT to 68%, SBT to 44%, and FAC also to 44%. Occupational therapists did FIM to 81% of patients, Canadian Neurological Scale to 77%, Action Research Arm Test to 65%, and Mini Men-

tal State Examination to 58% and Barthel index to only 50% of OT patients. Majority of these tests were done two times, as it was planned, but also huge number of tests was done only one time. The main reason for this is that in our hospital setting decision maker for patient's discharge from hospital was primary medical team very often without any consultation with PM&R team members. The lack of communication between different teams led frequently to sudden discharge from the hospital without informing PM&R team members, so follow up measurements couldn't be done. Some tests like Mini Mental Scale, Standing Balance Test and Functional Ambulation Categories are tested only once – when patient was able to understand and perform the test. For some patients with severe disability Barthel test was not enough sensitive for measuring fine functional changing in acute stage of rehabilitation, so it was not used. Three and more tests were done where patient had longer hospitalization and where it was possible to record changing in score values in shorter period of time. FIM, Motricity Index and Trunk Control test were applicable for all tested patients and other tests were not applicable for all patients as a routine, but they were very useful for certain number of patients as a measurements of functional improvement. Majority of applied tests were created for stroke patients, but with some adaptations can be also useful for recording other upper motor neuron deficits and for measuring functional rehabilitation outcomes. The limitations of this study are present hospital's setup and organization, shortage of staff (OT) and increased payment fees that limited us and made obstacles for better utilization of recommended tests. PM&R team is involved into neurorehabilitation process from the beginning, so it is necessary to have Rehabilitation ward in the Hospital where neurorehabilitation process can be followed as soon as patient is able to perform functional training and where decision maker for discharge will be Rehabilitation specialist. It is possible to use measurements in daily clinical practice and they were proved as useful. Combination of tests performed by different professionals and comprehensive approach by all team members is very important for measuring outcomes in rehabilitation and evaluating patient's impairment and disability.

CONCLUSION

It is possible to use measurements in daily clinical practice and they were proved to be useful. It is very important to have proper setup of standardized tests, which are simple, reliable and valid for measuring impairment, disability and handicap and which can be used as a standardized and be applicable for different neurological impairments to monitor treatment progress. Combination of tests performed by different professionals and comprehensive approach of all team members is very important for measuring outcomes in rehabilitation and evaluating patient's impairment and disability. Proper hospital setup, optimal number of staff, good team work and communication are leading to better outcome in neurorehabilitation process.

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