

# Rehabilitation planning in the acute phase after encephalic vascular accident

## *O planejamento da reabilitação na fase aguda após o acidente vascular encefálico*

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### ABSTRACT

The rehabilitation of patients with encephalic injuries is a process that seeks early recovery of the deficits and the preparation for reintegration into community life, with the best possible functional outcome, independence, and quality of life. This study aims to make it known to the Brazilian medical community the key-points referring to the rehabilitation programs specialized in the acute phase of an Encephalic Vascular Accident from the initial event until the transition back to community life. Based on their expertise, the authors made an analysis of 50 articles selected from the MEDLINE and the COCHRANE LIBRARY data bases, utilizing "Stroke" and "Rehabilitation" as

descriptors, referring to patients older than 18 years, of both genders, in the period from 1990 to 2008, in the English, Portuguese, French, and Spanish languages. More studies will be necessary in the future for the discussion of questions such as: measurements for quality of life, deficiency prognosis, stratification of the patients in relation to their response to rehabilitation, intensity, and duration of medium and long term rehabilitation, and measurements for the quality of rehabilitation services.

**Keywords:** Rehabilitation Centers, Stroke/rehabilitation, Quality of Life

### RESUMO

A reabilitação de pacientes portadores de lesões encefálicas é um processo que visa a recuperação precoce dos déficits e a preparação para uma reintegração na vida em comunidade, com o melhor resultado funcional possível, independência e qualidade de vida. Este estudo tem por objetivo levar ao conhecimento do corpo assistencial brasileiro os pontos-chave referentes aos programas de reabilitação especializados na fase aguda do Acidente Vascular Encefálico desde o evento inicial até a transição para a comunidade. Para isso, baseando-se em sua expertise, os autores realizaram uma discussão de 58 artigos selecionados nas bases de dados MEDLINE e COCHRANE LIBRARY, usando como descritores

"Stroke" and Rehabilitation", referentes a pacientes maiores de 18 anos, de ambos os sexos, no período de 1990 a 2008, nas línguas inglesa, portuguesa, francesa e espanhola. Mais estudos serão necessários no futuro para a discussão de questões como: medidas de qualidade de vida, prognóstico das deficiências, estratificação dos pacientes quanto à resposta à reabilitação, intensidade e duração da reabilitação à médio e longo prazo e medidas de qualidade dos serviços de reabilitação.

**Palavras-chave:** Centros de Reabilitação, Acidente Cerebral Vascular/ reabilitação, Qualidade de Vida

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## INTRODUCTION

The rehabilitation of stroke patients is a process that seeks the following:

- Prevention of physical or cognitive secondary complications;
- Reduction and early recovery of sensory-motor and cognitive disabilities;
- Acquisition of new neuromotor engrams (neuroplasticity and relearning);
- Maximum utilization of the residual potential of body functions (training and improvement);
- Compensation for and adaptation to physical and cognitive disabilities;
- Relearning, change, and reformulation also in the social, behavioral, family, student, and professional spheres;
- Independence, reintegration into the community, and quality of life for patients and family members.

Studies have demonstrated that the treatment units specializing in the rehabilitation of strokes can promote faster and more functional returns than the non-specialized services.<sup>1</sup> In general it encompasses highly complex procedures even for the lightest stroke lesions and, therefore, it is very important that patients submitted be well selected and stratified in their prognoses and response to the rehabilitation program.

Rehabilitation medicine is based in the “bio-psycho-social” approach to the individual in an attempt to integrate him or her into society in a productive and independent manner.

In the WHO international classifications, health states (diseases, disturbances, lesions etc.) are mainly classified in the ICD-10 (International Classification of Diseases, Tenth Revision), which supplies an etiological structure. In addition to these aspects, rehabilitation medicine encompasses some components relevant to health related to well-being and quality of life and describe them as health domains and health related domains.

These domains are described based on the perspective of the body, of the individual, and of society and include Functionality and Disability. Functionality is a term that includes all the functions of the body, activities, and participation; similarly, disability is a term that includes the limitations to activities or restrictions in the social participation of the individual.

Functionality and disability associated to the health states are classified in the ICF. Therefore, the ICD-10 and the ICF complement each other, and the physiatrist utilizes

these two members of the WHO international classification family together. The ICD-10 provides a “diagnosis” of diseases, disorders and other health conditions, and this information is complemented by the additional information provided by the ICF on functionality. Together, the information on the diagnosis and on functionality provides a broader and more significant image of the health of the person or population, which can be utilized in the decision-making process.

We also cannot forget the great importance of the national health policies. Decree 3.298, from December 20, 1999, which describes the National Policy for the Integration of People with Disabilities, is an example. The Rehabilitation Center must be attentive and participate in the development of future policies for a national improvement in the treatment of people with disabilities and provide a better productive reinsertion of the disabled person into Brazilian society.

Despite that, the measurements of quality of life, the prognosis of disabilities, the stratification of the patients on their response to rehabilitation, the seriousness of after-effects, what is the best intensity and duration for rehabilitation on medium and long terms, and which are the best evaluation methods of the rehabilitation strategies are still being discussed in the pertinent literature.

Our rehabilitation service belongs to a tertiary general hospital with an interdisciplinary character, which focuses on the integration between clinical, surgical, and rehabilitating teams, and that bases its assistance actions on a managed institutional program specializing in attending neurological patients. It has demonstrated expertise acting in the acute phase of these lesions, therefore performing a key role in the publication and spread of scientific-assisting knowledge in the rehabilitation of stroke patients in the Brazilian medical community.

## OBJECTIVE

The objectives of this study are:

- To bring awareness to the Brazilian medical community as to the key points referring to rehabilitation programs specializing in strokes starting from the initial acute event until the patient’s release and transition back into the community.
- To encourage rehabilitation professionals to review their conducts to improve rehabilitation services in the country, helping them to improve existing strategies.

This study is based on the selection of bibliographic references on stroke rehabilitation and on the experience and personal opinions of the authors of this study, who act from the assistant and managerial point of view of interdisciplinary teams for the rehabilitation from the acute phase.

For that, based on their expertise, the authors made a selection of articles based on the MEDLINE and the COCHRANE LIBRARY data base, utilizing “Stroke” and “Rehabilitation” as descriptors, in the period from 1990 to 2008, in the English, Portuguese, French, and Spanish languages. In this way, 1,059 articles were found from which 58 were selected to form the recommendations in this study, with the selections based on the methodological quality of the studies, and on the experience of their authors. Only articles on review, systematic review, meta-analysis, random clinical tests, guidelines, and clinical epidemiological studies were selected. All the recommendations described here refer to the rehabilitation of adult patients, older than 18 years, of both genders, suffering from the after-effects of strokes and who were in the acute intra-hospital phase. The concepts of disease, impairment, disability, and handicap, heralded by the World Health Organization (WHO) were also taken into consideration.

## RESULTS

*Most important points in the rehabilitation during the acute hospital phase<sup>1-17</sup>*

1. Most patients suffering from disability are candidates for a rehabilitation program. The decision of which is the best program is multifactorial and must be made for each individual patient by a medical professional specialized in rehabilitation. Even for those seriously impaired there is hope for rehabilitation. What distinguishes them is their objectives.
2. The identification of risk factors for secondary clinical and neurological complications is a determining factor in the evolution and prognosis of the lesion.
3. In general, the literature shows that functional improvement of the disabilities happens in most cases only in the first months after the acute event regardless of the etiology of the lesion and recommends that the evaluation by the medical rehabilitation professional be done while still in the acute intra-hospital phase, after clinical stabilization. However, from two years on,

- the literature recommends maintaining the rehabilitation process, especially seeking improvement on the gains obtained up to the moment of acquisition of new abilities. We must remember, though, that the evolution will depend on numerous factors such as lesion etiology and location, patient's age, associated clinical comorbidities, acute phase treatment, and period of the rehabilitation, among other things. Therefore many patients can have good evolution and new functional gains even after two years post-lesion.<sup>8,13,15</sup>
4. The teams must be interdisciplinary so that the treatment develops the motor, cognitive, emotional, social, and family areas at the same time. Apart from variations, the literature recommends a minimum team composed of a physiatrist, a physiotherapist, an occupational therapist, a psychologist, a nurse, a nutritionist, and a speech therapist. Other professionals such as an art therapist, an educator, or physical trainers can also contribute.<sup>18</sup>
  5. From the beginning the objectives of the program must be established, the pertinent evaluation methods, and the best therapeutic strategy for each one of the areas. For the patients admitted to the program, the interdisciplinary teams managed by the physician must promote weekly re-evaluations and discussions for the adaptation of the strategy according to the gains seen, neurological evolution, prognosis, difficulties, and new rehabilitation goals.<sup>8</sup>
  6. The rehabilitation program is based on the patients' active learning together with their families, therefore patients and family members must be encouraged to participate in the decisions, planning, and documentation of the gains obtained in the rehabilitation.<sup>19,20</sup> The education and participation of the family are very broad and include, among other aspects:<sup>21</sup>
    - an active role in the therapeutic strategy proposed;
    - help in the adaptation of the patient's expectations;
    - conversion of the teachings promoted during their hospital stay to the practical life in their residences;
    - residential monitoring of the disabilities and handicaps.
  7. The attendance protocol for the rehabilitation strategy planning and evaluation of the prognosis vary according with the etiology of the stroke, but must generally include:
    - Anamnesis and complete physical exam;
    - Evaluation of the pre- and post-stroke functional status;
    - Etiology and anatomoclinical correlation of the stroke;
    - Evaluation of the type and seriousness of the initial deficits (physical and cognitive);
    - Type and seriousness of the clinical co-morbidities;
    - Current nutrition and hydration status;
    - Evaluation of the presence of pain;
    - Level of consciousness, capacity to follow and obey commands and to participate actively in the therapies;
    - Evaluation of communication and speech abilities;
    - Evaluation of deglutition;
    - Evaluation of the respiratory function;
    - Evaluation in relation to the risk of deep venous thrombosis;
    - Evaluation in relation to the risk and/or presence of Hemiplegic's Painful Shoulder Syndrome, and/or the presence of glenohumeral subluxation, painful or not;
    - Evaluation in relation to the risk or presence of Immobilism Syndrome, of skin integrity, and of the risk of ulcers;
    - Evaluation of the risk of urinary incontinence, sphincter alteration, and risk of neurogenic bladder;
    - Evaluation of functional intestinal alterations;
    - Evaluation and stratification of the sleep vigil cycle alterations;
    - Evaluation of the need for medication treatment or neurochemical blockages for spasticity, tonus and movement disorders;
    - Evaluation of the risk of psychiatric diseases, especially mood alterations;
    - Evaluation of the family situation and support prior to the stroke;
    - Evaluation of previous cultural, labor, sexual, social, and environmental characteristics;
    - Evaluation of the need for self-care training;
    - Evaluation of the need for architectural adaptations of the residence considering mobility, independence in Daily Life Activities (DLAs), and prevention of falls;
    - Evaluation of the need for training for DLAs;
    - Evaluation of physical strength and clinical stability as to overloads;
    - Evaluation and prescription by the physician of orthotics as to ancillary technology, or wheel-chair, according to the personal needs of each patient, their motor and cognitive seriousness, and the environment where they will be utilized;
    - Evaluation of the need for automotive modifications in the patient's means of transport or for adapted public transportation.
  8. Quantitative evaluation instruments for disability must be individually selected depending on the etiology of the stroke. Among them the most prominent are:
    - National Institute of Health Stroke Scale (NIHSS), utilized for the classification of the seriousness of the CVA in acute phase;
  9. In addition, the unified instruments used by the physician for the functional evaluation of disabilities must include:
    - Glasgow Comatose Scale, used to evaluate the level of consciousness;
    - Functional Independence Measure (FIM) or Barthel Index, scales that evaluate the degree of independence in the DLAs, such as dressing, gait, bath, and transferences;<sup>22</sup>
    - Mini Mental Scale Examination (MMSE);
    - Fugl-Meyer Motor Scale, utilized for the quantitative and qualitative evaluation of the sensory-motor functions (already validated for the Brazilian context);<sup>23</sup>
    - Medical Outcomes Study 36 - Item Short-Form Health Survey - (SF-36), for the evaluating quality of life (already used in the Brazilian context);
    - Functional Assessment Measure (FAM), which evaluates the degree of independence in the LADs related to cognitive and behavioral functions such as attention and memory (with no translation or validation in Brazil yet).<sup>24</sup>
  10. There is not sufficient evidence in the literature to recommend the use of the International Classification of Functionality (ICF). However, some studies have already shown its utility. The ICF is currently under discussion, validation, and standardization.
  11. The main deficits found after the CVA, in general, are:<sup>1,5,8-15,25,26</sup>
    - Consciousness Level: Disturbances in the consciousness are more likely when the cerebral lesion is either extensive

or when there is a cerebral edema or increase in intracranial pressure. After a stroke a deep and prolonged coma is rare and it happens more likely as a complication from intracranial hemorrhage than from an infarction. The evaluation of the level of consciousness involves the observation of spontaneous behavior, response to external stimuli (verbal or painful), interaction with the environment, the Glasgow Comatose Scale, and the NIHSS itself. Normally, the level of consciousness is described as alert, sleepy, torpid, or comatose. Repeated observations are needed, for such findings fluctuate frequently. Alterations in the consciousness have prognostic value.

- Cognitive, emotional, and behavioral disturbances: Disturbances of the upper cortical functions and emotions are common after a stroke, especially aphasias, agnosias, apraxias, spatial perception alteration, judgment, memory and attention deficits, orientation, learning, problem solving, anxiety, and depression. Dementia is rare after the first stroke, but it occurs after multiple strokes. The true frequency of these findings is still unknown, especially in the Brazilian literature. Though it is very common, the presence of mood and communication alterations and apraxias in left-side lesions, and visual-spatial alterations such as negligence, sexualization, and behavioral liberalization in right-side lesions. Neuropsychological exams many times are necessary for a quantitative evaluation. Cognitive or emotional deficits ranging from moderate to serious will interfere notably in the functional reorganization and in the learning of new abilities. The frontal lobes can also be present with the triad abulia, apathy, hypokinesia. In general, the presence of the frontal syndrome considerably worsens the evolution and the long term functional gains.
- Motor, sensitivity, and mobility deficits: Motor function evaluation must include the complete evaluation of motor control and muscle strength, mobility, balance, sensitivity alterations, lack of coordination, altered patterns of synergy of movement (dissynergies, sinkinesias etc.) tonus alterations such as hypo or hypertonia, alterations in joint range or in the muscular or artic-

ular biomechanics, involuntary movement, or postural alterations such as Pusher Syndrome. Common patterns are hemiparesis (upper and lower member) and the monoparesis (upper or lower member). Initially, the motor system many times appears with total plegia, even in cases with partial lesions. Most cases leave the plegic phase and initiate the return of voluntary muscular contraction within the first three months after the stroke. Especially with the upper members it is known that the biggest return happens within the first month after the stroke. The position of the members at rest, in active movement, the muscular tonus, and the pathological reflexes, as well as the presence of involuntary movement are important registers. If necessary, standardized scales of sensory- motor evaluation must be utilized.

- Sensory and Visual Disturbances: Many sensory and visual impairments can occur. The most common are homonymous hemianopsia, olfactory and auditory acuity disturbances. Pupil response exams, ocular mobility, direct observation of retina, corrected measurement of auditory and visual acuity and visual field are important. There can be also complex visual deficits such as dyplopia, vertigo, visual distortions, as well as color and forms disturbances and anosmia. Severe visual disturbances increase the complexity of the rehabilitation. Multiple paralysis of the eye is a bad prognostic sign, but it must always be distinguished from ocular apraxia.
- Speech and language deficits: Ability for functional communication is essential for a good outcome of the rehabilitation process. On average 40% of the sufferers of stroke after-effects present some degree and type of disturbance in their communication. The evaluation of alterations in communication encompasses a detailed routine of the sensory-motor exam of the speech, medical anamnesis, functional evaluation of language and communication, and the utilization of standardized tests. The aphasias occur due to vascular events in the dominant hemisphere and can cause disturbances in the comprehension and verbal expression, reading, and writing. The evaluation includes naming objects, fluency,

content, speech prosody, grammatical forms, repetition, and comprehension abilities. Other alterations in communication such as dysarthrias, speech apraxias, dysphonias, alterations in speech prosody and pragmatics need to be distinguished from aphasia.

- Dysphagia: Very prevalent after a stroke, dysphagia interferes directly in the prognosis of independence and yields secondary clinical complications. It must be evaluated and treated since the acute phase.
  - Pain: Serious cephalalgia, cervicalgia, and facial pain can result from cerebral hemorrhage or ischemia. Pain in the upper limbs can be associated with adhesive capsulitis, rotator cuff lesion, and other pathologies such as immobilism syndrome itself. Their manifestations are: regional pain complex syndrome, peripheral nerve compression, decumbency ulcers, and cramps. Post-stroke neuralgia is particularly serious and occurs frequently when there is an onset of the thalamus. The spontaneous improvement of the central pain after a stroke is rare and, sometimes interferes with the rehabilitation of the patient.
12. Admission to the rehabilitation program must be considered for patients with at least one the following symptoms or difficulties:
    - mobility;
    - performance of daily life activities or training;
    - and intestinal control;
    - cognition;
    - pain
    - sensory-motor;
    - dysphagia;
    - communication;
    - mood or behavior.
  13. The determiners for choosing the rehabilitation intensity are different for each patient and depend on:<sup>27,28</sup>
    - expectations;
    - motivation;
    - degree of attention;
    - seriousness of deficits and functional ineptitudes;
    - prognosis and exact objectives of the rehabilitation;
    - capacity to re-learn;
    - strength for physical activity.
  14. Even the most serious patients must be evaluated to measure the possibility of functional

gains in the rehabilitation and, in the same way as the other patients, must be active participants in the rehabilitation process.

15. An evaluation of the physical condition and strength of the patient must be made from the beginning of the program. Patients with serious clinical limitations of physical activities must receive a lighter rehabilitation support, be guided to better clinical stability, and later reinserted into the traditional neuromotor rehabilitation program.<sup>27,29,30</sup>
16. There is strong evidence that function can spontaneously return as much as 6 months after the stroke, partly due to the cortical and subcortical neuroplastic adaptive capacities of the injured neural tissue and of the preserved adjacent tissue.<sup>31-36</sup> In addition, the learning of new motor activities and the somato-sensitive and functional stimulation can also lead to modifications of the cephalic activation patterns of the functional areas, especially in the initial phases with a higher natural plasticity of the CNS.<sup>32,33,35,37</sup> In patients suffering from after-effects of a stroke, the intense repetitive use of the paretic limb, many times accompanied by restriction of the non-paretic limb, as in the induced-restriction therapies, can promote functional improvement and changes in the cortical pattern of motor representation.<sup>38</sup> Although clinical protocols and the best inclusion and exclusion criteria are still under analysis, peripheral electrical stimulation, central stimulation via TMS of the injured cortex and areas functionally correlated to learning, the repetitive and trained use of the robotic therapies and virtual reality can also promote functional improvement concomitantly with changes in the cortical pattern of functional representation. There is no consensus or formal recommendation for the use of these techniques yet, but many studies have shown promising results, especially in the initial aftermath of the stroke, suggesting that in the future, therapies that utilize the neuroplastic capacities of the CNS may be used routinely in the rehabilitation protocols.<sup>32,33,36,39-47</sup>
17. When a clean bill of health is given, the medium term goals for the treatment and the prognosis of the after-effect must be already established. The functional evolution and the medium and long term prognosis of stroke patients are still being discussed intensely in the literature. Despite this, they are essential in prognostic evaluation.<sup>1-4,8-10,14</sup>
  - The neurological and functional seriousness of the acute phase, revealed by bad results in the NIHSS during the acute phase, show correlation with the

Barthel scale, FIM, and initial Rankin values, of the hospital release and of the chronic phase, showing that the initial gravity of the stroke interferes with the independence and with the disability in the chronic phases.

- Some studies state that when the rehabilitation process is initiated while still in the acute phase, only a minority of patients will need to remain institutionalized in the chronic phase and that the beginning of early rehabilitation is a determining factor for long term improvement. Studies that have utilized FIM, Barthel's Index and SF36 have shown better functional results in the chronic phase in patients who began rehabilitation within 7 days of the lesion compared with those who began rehabilitation after 30 days of the lesion. Furthermore, it is known that patients included in rehabilitation programs early on spend less time in the hospital and in the chronic rehabilitation phase, and need less rehabilitation resources in the long term.<sup>48,49</sup>
- What worsens the medium and long term evolution is a history of recurring strokes, clinical co-morbidities and neurological complications associated with convulsions, multiple fractures, osteoporosis, chronic pain, depression, sleep cycle vigil alterations, nocturnal apnea and/or associated hypoxia, multiple cognitive alterations for up to 3 months post-stroke, pressure ulcers, progressive cognitive deterioration, and old age at the beginning of rehabilitation.<sup>50-52</sup>
- A coordinated and specialized neurological treatment in the stroke's acute phase leads to functional improvement in the medium and long term.
- The presence of urinary incontinence at the time of hospital release 30 days after the stroke is a strong predictor of the need for vesical self-care 3 years after the stroke, and seems also to be a strong predictor of functional dependence and of not returning to work in the chronic phase. Some studies associate the presence of urinary incontinence seven days after the stroke with high indices of institutionalization and low functional indices 3 months after the stroke.<sup>53</sup>
- A Barthel's index lower than 40 6 months after the stroke is a strong predictor of serious disability 3 years later.

- The beginning of functional return of the upper limb within 30 days of the stroke is a strong predictor of the presence of motor function in the upper limb 3 years later. Even though this index has not been correlated with quality of life, nor with quality of manual sensory motor function, some studies have already found a correlation with independence in the DLAs.<sup>54</sup>
- The literature already states that FIM admission values of around 30-60 are correlated with the FIM's hospital release (generally around 70-90) and 3 months after the stroke, suggesting also that moderate disability in the medium term is related to initial functional seriousness.<sup>50</sup> Some studies also correlated initial values and FIM's clean bill of health with the type of stroke. Higher initial values of FIM are found in stroke patients. However, these present comparatively lower variations in the medium and long term in the scale values, suggesting that a hemorrhagic stroke can have a higher initial functional gravity, but maybe a higher proportion of functional return and not absolute in the long term.<sup>55</sup> In addition, higher functionality indices prior to the stroke (some studies mention Frenchay Activity Index as a good marker) are correlated to lower values in the Rankin Scale at the moment of hospital release, showing that the functional level prior to the stroke can be a protecting factor that influences the improvement afterwards.<sup>56</sup>
- The presence of immobility and/or Immobilism Syndrome during the clean bill of health in the acute phase in the geriatric population is correlated with a worse functional evolution in the medium and long term. Some studies mention the capacity to get up from a chair with or without help maintaining oneself in orthostatism for a few seconds as a test predictive enough of the mobility capacity to predict a better evolution. However, passive physiotherapy, even if only with the use of the orthostatic board, also impacts positively on the functional mobility and on the risk of complications stemming from immobilism in the long term.<sup>57,58</sup>
- The presence of hip and trunk control within 3 to 6 months of the lesion is a strong predictor of acquisition of gait,

with or without assistance or auxiliary measures.

- The presence of visual-spatial impairments, paresis of the upper limb, chronic pain, depression, old age, compromised previous functionality, and low socio-cultural status can interfere negatively with the independence for sub-acute stroke phases.

*Transition to the community after hospital release in the acute phase*<sup>1-4,8-10,14,18-20</sup>

1. The patient must be referred in order to give continuity to interdisciplinary ambulatory rehabilitation according to the needs evaluated during the internment program
2. Residential rehabilitation programs are still under discussion. With the appearance of new technologies such as telemedicine, residential support alternatives, monitoring, and orientations have already been studied. The main advantage of residential rehabilitation is to facilitate the evaluation and intervention in the patient's real environment. It can become easier for family members and patients to understand and transpose the orientations given during rehabilitation to practical life.
3. In the programming of hospital release, new evaluations must be scheduled at least monthly to monitor the adaptation of the patient to the community and any functional alterations that may have occurred. Other functions must be evaluated in addition to those already mentioned during hospitalization such as:
  - Success adapting to social, working, and family functions;
  - Quality of life;
  - Sexual function and activity.
4. We must guarantee the continuity of neurological and clinical treatment and of the rehabilitation process in the sub-acute phase, even with the most serious patients or who have not shown good response to the treatment.
5. We must be attentive to the health of the care-giver. It is necessary to work with patients and care-givers to avoid negative effects, promoting the resolution of problems and facilitating the reintegration in the family and in the social ambit.
6. Free activities must be allowed, valued, identified, and encouraged, as long as they are safe.
7. At the moment of the clean bill of health we must assure that:

- the residence is a safe place;
- the patient has been evaluated and counseled about the risk of falling. The main factors that lead to falling are: muscular weakness, balance impairment and dissociation of waists, difficulties in transferences, serious sensorial or spatial difficulties, postural hypotension, visual problems, mental disorientation, the use of drugs that depress the central nervous system, architectural risks, inadequate family support, uncontrolled impulsiveness and aggressiveness, old age, and a previous history of falling. The nursing professional plays an important role in the family education for this requirement.
- patient and family members are suitably trained for the handling of the disability and for the maintenance of residential rehabilitation;
- patient and family members are capable of identifying which residential and community problems most interfere in the functional performance reached;
- necessary architectural adaptations have been made for the return to a safe life and that promotes independence, mobility, social and family integration without risks;
- all orthotic, prosthetic and ancillary technology resources possible and necessary for mobility and function have been prescribed.

## CONCLUSION

Rehabilitation is a process that seeks early recovery from deficits and the preparation for reintegrating into community life, in search of the best functional outcome possible, independence, and quality of life. The literature emphasizes the need for structuring of services specialized in rehabilitation. Among other recommendations the literature suggests:

1. The need to institute early interventions in the acute phase, aiming to facilitate the recovery and prevention of future complications.
2. The importance of establishing a real rehabilitation prognosis starting at the acute phase.
3. The importance of establishing a rehabilitation program or service respecting the needs and the functional prognosis of each individual patient.
4. The importance of utilizing interdisciplinary teams so that the motor, cognitive, emotional, social, and family areas are treated at the same time.

5. The need to stabilize the patient's clinical condition, capacity, and physical strength from the beginning and throughout the entire rehabilitation.
6. The importance of evaluating the expectations, motivation, degree of attention, seriousness of deficits and functional ineptitudes, re-learning capacity, and physical strength for activities as determiners in the process of choosing the type and intensity of the rehabilitation program.
7. The importance of a documented, rigorous, and consistent evaluation in each recovery phase to direct the treatment decisions and monitor the patient's progress.
8. The importance of the combination "monitoring and treatment" during the transition to community life.
9. The importance of the presence of family members in the rehabilitation process and in the transition to community life, guiding, encouraging, and helping the family members to participate actively in the rehabilitation process.
10. The need to safely utilize occasional functional, architectural, and ancillary technology adaptations that may be necessary to return home after the clean bill of health.
11. The need for a well-documented clean bill of health plan, that looks beyond the programming for clinical, neurological, rehabilitation monitoring, safety measures, and patient's guidance.
12. There is a need for rehabilitation even in patients whose functionality is more seriously impacted. What changes is not whether rehabilitation is prescribed, but the goals of rehabilitation.

More studies are necessary in the future for the discussion of questions such as: measurements of quality of life, diagnosing disabilities, the stratification of patients in relation to their response to rehabilitation, the intensity and duration of rehabilitation in the medium and long terms, and measurements of the quality of rehabilitation services.

## REFERENCES

1. Delisa Gans BM: Rehabilitation Medicine, Principles and Practice, second ed, Lippincott Company cap 39, 1993.
2. Thomas LH, Cross S, Barrett J, French B, Leathley M, Sutton CJ, Watkins C. Treatment of urinary incontinence after stroke in adults. Cochrane Database Syst Rev. 2008 Jan 23;(1):CD004462.
3. SUTC - Stroke Unit Trialists' Collaboration. Organised inpatient (stroke unit) care for stroke. Cochrane Database Syst Rev. 2007 Oct 17;(4):CD000197.

4. Grotta JC, Jacobs TP, Koroshetz WJ, Moskowitz MA. Stroke program review group: an interim report. *Stroke* 2008 Apr; 39(4): 1364-70. [http://www.ninds.nih.gov/find\\_people/groups/stroke\\_prg/09\\_2006\\_stroke\\_prg\\_report.htm](http://www.ninds.nih.gov/find_people/groups/stroke_prg/09_2006_stroke_prg_report.htm)
5. Cecatto RB, Jucá SSH, Nacarato MN, Maeda FRG, Prieto FF. Alterações de comunicação dos pacientes portadores de lesão encefálica adquirida (DMR/unidade JD. Umarizal/HCFMUSP) *Acta fisiatr* 2006; 13(3):
6. Kalra L, Ratan R. Recent advances in stroke rehabilitation 2006. *Stroke*. 2007 Feb;38(2):235-7.
7. Kalra L, Langhorne P. Facilitating recovery: evidence for organized stroke care. *J Rehabil Med*. 2007 Mar;39(2):97-102.
8. ESST - Early Supported Discharge Trialists. Services for reducing duration of hospital care for acute patients. *Cochrane Database Syst Rev*. 2005 Apr 18;(2):CD000443.
9. Duncan PW, Zorowitz R, Bates B, Choi JY, Glasberg JJ, Graham GD, Katz RC, Lambert K, Reker D. Management of Adult Stroke Rehabilitation Care: a clinical practice guideline. *Stroke*. 2005 Sep;36(9):e100-43.
10. VHAD - Veterans Health Administration, Department of Defense. VA/DoD clinical practice guideline for the management of stroke rehabilitation in the primary care setting. Washington (DC): Department of Veteran Affairs; 2003 Feb. Various p. [331 references].
11. Sulch D, Melbourn A, Perez I, Kalra L. Integrated care pathways and quality of life on a stroke rehabilitation unit. *Stroke* 2002 Jun;33(6):1600-4.
12. Agency on Health Care Policy and Research. Clinical Practice Guideline 16: Post-Stroke Rehabilitation. AHCPR Publication No. 95-0062. Available at: <http://www.ncbi.nlm.nih.gov/books/bv.fcgi?rid=hstat6.chapter.27305>. Accessed October 28; 2002.
13. Cifu DX, Stewart DG. Factors affecting functional outcome after stroke: a critical review of rehabilitation interventions. *Arch Phys Med Rehabil*. 1999; 80(5 suppl 1):S35-S39.
14. Gresham GE, Duncan PW, Stason W et al. Post Stroke Rehabilitation. Practice Guideline Number 16, Rockville, MD: U.S. Department of Health and Human Services. Public Health Service, Agency for Health Care Policy and Research. AHCPR Publication Number. 1995: 95-0062.
15. Cifu DX, Lorish TR. Stroke rehabilitation. 5. Stroke outcome. *Arch Phys Med Rehabil*. 1994 May;75 (5 Spec No): S56 - 60.
16. Kalra L. The influence of stroke unit rehabilitation on functional recovery from stroke. *Stroke* 1994 Apr;25(4):821-5.
17. Royal College of Physicians. National clinical guidelines for stroke. Available at: <http://www.rcplondon.ac.uk/pubs/books/stroke/>. Accessed December.
18. Evans RL, Connis RT, Hendricks RD, Haselkorn JK. Multidisciplinary rehabilitation versus medical care: meta-analysis. *Soc Sci Med* 1995; 40 (12): 1699-1706.
19. Evans RL, Bishop DS, Ousley RT. Providing care to persons with disability: effect on family caregivers. *Am J Phys Med Rehabil* 1992; 71 (3): 140-4.
20. Evans RL, Matlock AL, Bishop DS, Stranahan S, Pederson C. Family intervention after stroke: Does Counseling or education help? *Stroke* 1988;19 (10): 1243-9.
21. Smith J, Forster A, House A, Knapp P, Wright J, Young J. Information provision for stroke patients and their caregivers. *Cochrane Database Syst Rev*. 2008 Apr 16;(2):CD001919.
22. Riberto M, Miyazaki MH, Jucá SSH, Sakamoto H, Pinto PPN, Battistella LR. Validation of the Brazilian version of Functional Independence Measure. *Acta Fisiatr* 2004; 11(2): 72-76.
23. Fugl-Meyer AR, Jaasko L, Leyman I, Olsson S, Steglind S. The post-stroke hemiplegic patient. A method for evaluation of physical performance. *Scand J Rehabil Med* 1975; 7: 13-31.
24. Hall KM: The Functional Assessment Measure (FAM). *J Rehabil Outcomes Measurement* 1(3):63-65, 1997.
25. Cecatto RB, Almeida CI. Síndrome de Pusher após acidente vascular encefálico: relato de caso. *Acta Fisiatr* 2008; 15(3): 195-201.
26. Flick C. Stroke rehabilitation 4. Stroke outcome and psychosocial consequences. *Arch Phys Med Rehabil*. 1999 May;80(5 Suppl 1):S21-6.
27. Graham I, Atar D, Borch-Johnsen K, Boysen G, Burell G, Cifkova R, Dallongeville J, De Backer G, Ebrahim S, Gjelsvik B, Herrmann-Lingen C, Hoes A, Humphries S, Knäpft M, Perk J, Priori SG, Pyörälä K, Reiner Z, Ruylope L, Sans-Menendez S, Op Reimer WS, Weissberg P, Wood D, Yarnell J, Zamorano JL, Walma E, Fitzgerald T, Cooney MT, Dudina A, Vahanian A, Camm J, De Caterina R, Dean V, Dickstein K, Funck-Brentano C, Filippatos G, Hellemans I, Kristensen SD, McGregor K, Sechtem U, Silber S, Tendera M, Widimsky P, Zamorano JL, Altiner A, Bonora E, Durrington PN, Fagard R, Giampaoli S, Hemingway H, Hakansson J, Kjeldsen SE, Larsen L, Mancía G, Manolis AJ, Orth-Gomer K, Pedersen T, Rayner M, Ryden L, Sammut M, Schneiderman N, Stalenhoef AF, Tokgözoğlu L, Wiklund O, Zampelas A; European Society of Cardiology (ESC); European Association for Cardiovascular Prevention and Rehabilitation (EACPR); Council on Cardiovascular Nursing; European Association for Study of Diabetes (EASD); International Diabetes Federation Europe (IDF-Europe); European Stroke Initiative (EUSI); Society of Behavioural Medicine (ISBM); European Society of Hypertension (ESH); WONCA Europe (European Society of General Practice/Family Medicine); European Heart Network (EHN); European Atherosclerosis Society (EAS). European guidelines on cardiovascular disease prevention in clinical practice: full text. Fourth Joint Task Force of the European Society of Cardiology and other societies on cardiovascular disease prevention in clinical practice (constituted by representatives of nine societies and by invited experts). *Eur J Cardiovasc Prev Rehabil*. 2007 Sep;14 Suppl 2:S1-113.
28. Horn SD, DeJong G, Smout RJ, Gassaway J, James R, Conroy B. Stroke rehabilitation patients, practice, and outcomes: is earlier and more aggressive therapy better? *Arch Phys Med Rehabil*. 2005 Dec;86(12 Suppl 2):S101-S114.
29. Ivey FM, Hafer-Macko CE, Macko RF. Exercise training for cardiometabolic adaptation after stroke. *J Cardiopulm Rehabil Prev*. 2008 Jan-Feb;28(1):2-11.
30. Van de Port IG, Wood-Dauphinee S, Lindeman E, Kwakkel G. Effects of exercise training programs on walking competency after stroke: a systematic review. *Am J Phys Med Rehabil*. 2007 Nov;86(11):935-51.
31. Kawakkel G, Kollen B e Lindeman E. Understanding the pattern of functional recovery after stroke: facts and theories. *Restor Neurol Neurosci* 2004; 22: 281-299.
32. Bütefisch CM. Plasticity in the human cerebral cortex: lessons from the normal brain and from stroke. *Neuroscientist* 2004; 10(2): 163-173.
33. Elbert T e Rockstroh B. Reorganization of human cerebral cortex: the range of changes following use and lesion. *Neuroscientist* 2004; 10(2): 129-141.
34. Dobkin BH. Strategies for stroke rehabilitation. *The Lancet Neurol* 2004; 3: 528-536.
35. Nudo RJ. Recovery after damage to motor cortical areas. *Curr Opin Neurobiol* 1999;9:740-747.
36. Taub E, Uswatte G e Didikiti R. Constraint-Induced Movement Therapy: a new family of Techniques with broad application to physical rehabilitation - a clinical review. *J Rehab Res Dev* 1999; 36(3): 237-251.
37. Nudo RJ, Plautz EJ, Frost S. Role of adaptive plasticity in recovery of function after damage to motor cortex. *Muscle and Nerve* 2001; 24: 1000-1019.
38. Riberto M, Monroy H M, Kaihama H N, Otsubo P P S, Battistella L R - A terapia de restrição como forma de aprimoramento da função do membro superior em pacientes com hemiplegia. *Acta Fisiatr* 2005; 12(1): 15-19.
39. Cecatto RB, Chadi G. The importance of neuronal stimulation in central nervous system plasticity and neurorehabilitation strategies. *Funct Neurol* 2007; 22 (3): 137-143.
40. Cecatto RB, Almeida CI. Modulação do córtex motor após um acidente vascular encefálico cortical por meio de estimulação de cerebelo: a estimulação cerebelar pode auxiliar o retorno funcional após o AVC de córtex motor? *Einstein: Educ Contin Saúde* 2009; 7(2 Pt 2): 65-7.
41. Fregni F, Boggio PS, Valle AC, Rocha RR, Duarte J, Ferreira MJ, Wagner T, Fecteau S, Rigonatti SP, Riberto M, Freedman SD, Pascual-Leone A. A sham-controlled trial of a 5-day course of repetitive transcranial magnetic stimulation of the unaffected hemisphere in stroke patients. *Stroke*. 2006 Aug;37(8):2115-22.
42. Mansur CG, Fregni F, Boggio PS, Riberto M, Gallucci-Neto J, Santos CM, Wagner T, Rigonatti SP, Marcolin MA, Pascual-Leone A. A sham stimulation-controlled trial of rTMS of the unaffected hemisphere in stroke patients. *Neurology*. 2005 May 24;64(10):1802-4.
43. Kido TA, Stein RB. Short-term effects of functional electrical stimulation on motor-evoked potentials in ankle flexor and extensor muscles. *Exp Brain Res* 2004; 159: 491-500.
44. Kimberley TJ, Lewis SM, Auerbach EJ, Dorsey LL, Lojovich JM e Carey JR. Electrical stimulation driving functional improvements and cortical changes in subjects with stroke. *Exp Brain Res* 2004; 154: 450-460.
45. Han BS, Jang SH, Chang Y, Byun WM, Lim SK, Kang, DS. Functional magnetic resonance image finding of cortical activation by neuromuscular electrical stimulation on wrist extensor muscles. *Am J Phys Med Rehabil* 2003; 82(1): 17-20.
46. Charlton CS, Ridding MC, Thompson PD, Miles TS. Prolonged peripheral nerve stimulation induces persistent changes in excitability of human motor cortex. *J Neurol Sci* 2003; 208: 79-85.
47. Hummel FC e Cohen LG. Drivers of brain plasticity. *Curr Opin Neurol* 2005; 18(6): 667-674.
48. Dobkin BH. Do electrically stimulated sensory inputs and movements lead to long-term plasticity and rehabilitation gains? *Curr Opin Neurol* 2003;16: 685-92.
49. Musicco M, Emberti L, Nappi G, Caltagirone C; Italian Multicenter Study on Outcomes of Rehabilitation of Neurological Patients. Early and long-term outcome of rehabilitation in stroke patients: the role of patient characteristics, time of initiation, and duration of interventions. *Arch Phys Med Rehabil*. 2003 Apr;84(4):551-8
50. Lin JH, Hsieh CL, Lo SK, Hsiao SF, Huang MH. Prediction of functional outcomes in stroke inpatients receiving rehabilitation. *J Formos Med Assoc*. 2003 Oct;102(10):695-700.
51. Pettersen, R, Dahl T, Wyller TB. Prediction of long-term functional outcome after stroke rehabilitation. *Clin Rehabil* 2002; Mar 16(2): 149-159.
52. Mosqueda LA. Assessment of rehabilitation potential. *Clin Geriatr Med*. 1993 Nov;9(4):689-703.
53. Patel M, Coshall C, Lawrence E, Rudd AG, Wolfe CD. Recovery from poststroke urinary incontinence: associated factors and impact on outcome. *J Am Geriatr Soc*. 2001 Sep; 49(9):1229-33.
54. de Groot-Driessen D, van de Sande P, van Heugten C. Speed of finger tapping as a predictor of functional outcome after unilateral stroke. *Arch Phys Med Rehabil*. 2006 Jan;87(1):40-4.
55. Kelly PJ, Furie KL, Shafiqat S, Rallis N, Chang Y, Stein J. Functional recovery following rehabilitation after hemorrhagic and ischemic stroke. *Arch Phys Med Rehabil*. 2003 Jul;84(7):968-72.
56. Külzer AM, Scolari CC, Gus M. Relationship between usual physical, cognitive and social activities and functional recovery at hospital discharge after acute stroke. *J Rehabil Med*. 2008 Mar;40(3):195-9.
57. Morris PE, Herridge MS. Early intensive care unit mobility: future directions. *Crit Care Clin*. 2007 Jan;23(1):97-110.
58. Sommerfeld DK, von Arbin MH. Disability test 10 days after acute stroke to predict early discharge home in patients 65 years and older. *Clin Rehabil*. 2001 Oct;15(5):528-34.