

Intervention in the Hospitalized Acute Patient with Cerebral Damage -DACER Model-

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Abstract

The next article presents a type of intervention in patients who, after suffering Brain Damage, are hospitalized -DACER MODEL-. This model is the result of scientific evidence and clinical experience. The patient should experience as soon as possible, motor, sensory, cognitive and behavioral patterns, suitable to promote as normalized brain reorganization as possible. The model is structured in three fundamental premises, the first is early intervention, work the sooner the better with the patient. Global, unifying the entire environment (family and health workers) in the specific intervention of each affected person. And intensive, creating a stimulating environment for the patient to receive adequate care throughout the day.

DACER MODEL consist of implementing performances in the phase in which the patient is hospitalized, to minimize future neurological and organic sequelae. To achieve this objective, the model includes three key actions: 1) Training and support for relatives and environment of the affected through the School of Families, a training action aimed at families, which is carried out in the hospital itself. 2) Specialization and support to health personnel who directly care for the patient with brain damage and 3) Early intervention of a multidisciplinary team specialized in neurorehabilitation, including medical professionals, neuropsychology, speech therapy, occupational therapy and physical therapy.

Keywords: Brain Damage, Neurorehabilitation, Acute Patient, Early Intervention, Intensive Performance, Global Stimulation

Introduction

Home and Origin of the Model

The DACER MODEL of intervention in the hospitalized acute patient was born in 2012, as a result of the experiences developed by DACER professionals, specialists in neurorehabilitation, with patients admitted to stroke units and ICU (Intensive Care Units) of neurology and neurosurgery. For a few years now, there have been many publications that support not only C.N.S (central nervous system) ability to minimize the effects of injuries by modifying its own structural and functional organization, but also the fact that for these mechanisms to be effective, it is necessary to enhance and modulate them from the first moment. We know that, contrary to what was thought, it is safe to start neurorehabilitating treatment

within the first 24 hours [1-3]. It has also been shown that every day of delay in initiating neurorehabilitator treatment, it implies a higher degree of disability to hospital discharge [4].

Precocity is, therefore, a key point to improve the patient's situation at the discharge [5]. But it is not the only one, more and more studies show the importance of the interventions at the moment to be global and intensive [6]. This model was created to offer an intervention approach that would make it possible to bring to clinical practice these premises. A patient cannot receive 24 hours of rehabilitation or professional stimulation. But the brain learns all day, with every conversation, every mobilization, with every activity. Every time a person relates to the patient, he or she is influencing in some way what happens in the process of reorganization of the central nervous system. Patients should be encouraged by team members and their family to continue practicing skills for the rest of the day,

as intensive treatment provides better results if extended even to the external rehabilitation phase of the Patient [7-10].

The patient's environment plays a crucial role in improving it. If you know how to act, you can turn each daily activity into a stimulating task. It is not, therefore, a question of doing different things, but of doing them in the right direction and repeatedly, introducing small changes in the task as you integrate the previous one. This point is very clear in education. Society assumes that the learning of the child is an ongoing process that takes up 24 hours. And in this process, not only do education professionals (teachers, psychologists...) influence the whole environment (parents, grandparents...). In fact, it is considered essential that the child does not receive contradictory messages.

The patient's recovery from brain damage is primarily a process of relearning. In that process, as in the child's, each has its function and place. Rehabilitation professionals, healthcare professionals and the patient's close environment must join forces to work in the same direction and offer you all the stimulation and help you need to succeed with as less degree of dependence as possible. However, this is essential, but not enough, it will be essential for the prognosis of patients, carrying out a multidisciplinary, comprehensive, specialized, and coordinated rehabilitation [11]. Taking these principles into account, DACER developed a model of holistic intervention of "24 hours" that includes not only the work of neurorehabilitation professionals, but also the entire health and family environment of the patient.

Objectives

Develop a comprehensive model of intervention in the approach of the hospitalized acute patient with neurological injury. The treatment is developed from an early, global and intensive action, involving neurorehabilitation professionals, healthcare professionals and families. To ensure the success of the interventions, and that these are developed through a structured methodology, the model includes specialized training to each of the actors involved.

Basic Patient Needs According to the Dacer Model

The damaged brain needs to re-experience normality in order to be able to reorganize properly [12-15]. For this to be possible, the following aspects must be covered in an organized and structured manner. The intervention structure takes place throughout the day, for short periods of time, alternating with periods of rest and sleep given that these are rehabilitative by themselves. Experimental and clinical studies in animals and humans suggest that healthy sleep promotes neuroplasticity resulting in improved learning and memory [16-18]. Allowing prolonged sleep during the acute phase of stroke could be beneficial (neuroprotective sleep function) [19].

Sensory Stimulation

Sensory stimulation is the base of the proper functioning of the C.N.S. As early as the 1950s, different studies of sensory deprivation showed the consequences of it; besides, Kandel further states in his research that this sensory deprivation in the early stages of life alters the structure of the cerebral cortex [20-22]. The patient needs to regain the perception of himself. The sensory system, with its different receivers, is the first gateway to the C.N.S [23].

Stimulation of the sensory system is carried out taking into account the following principles:

- ✓ The damaged C.N.S. needs more time to process the information. Therefore, the patient needs time to respond [24].
- ✓ Stimulation should be guided and organized so that it has the intensity necessary for information to arrive without overstimulation [25].
- ✓ We must introduce cognition into the process from the first moment, at the level that is possible for each patient. In this way, we favor the passage of sensitivity to perception [26-32].
- ✓ The mouth, hand, and feet are areas of great representation, which makes them priority areas of stimulation [33].
- ✓ We take into account: sight, touch, vestibular system, proprioceptive system, hearing, taste and smell.

Alignment of Body Segments

In order to function normally, the musculoskeletal system needs to maintain the alignment of its various body segments. Since you cannot generate muscle tone over an abnormal alignment [34].

The maintained incorrect postures, coupled with the injury of the S.N.C., favor changes in the length of the muscle fibers and shortenings in the peripheral nervous system, which places the patient in a situation of biomechanical disadvantage, alterations of the proprioceptive information that carry with them alterations of the body scheme and malfunction of the internal organs (lungs, intestine...) that cause medical complications associated with the immobilization to which they are subjected.

In addition, the organized movement of the limbs requires a stable posture [35-37]. On the basis of a stable posture, the normal movement is built.

To maintain body alignment and promote a stable posture, we consider:

- ✓ It is necessary to analyze all body segments separately and together: head, scapular waist, upper limbs, pelvic waist, knees and feet.
- ✓ It is necessary to analyze the relationship of the segments in the different planes: front, transverse and sagittal.
- ✓ To maintain a proper alignment and proper posture, we use external elements such as towels, pillows, balls, belts, elastic sashes...
- ✓ We favour positions in decubitus (side, supine), transit to sedation in bed, sedation at the edge of the bed and high sedation at the edge of the bed, to favor the weight load on the lower limbs.
- ✓ We encourage the patient to continuously have to the eye and integrated his most affected side.
- ✓ We promote the correct organic functioning making its infusion possible.

Suitable Respiratory Mechanics

In addition to being necessary to reduce secretions and prevent the risk of pneumonia and associated complications, good respiratory mechanics are essential to avoid drowsiness and improve alertness [38-42]. Dr. Lewit, a pioneer of physical therapy, to paraphrase the philosopher Lammark and his theory of evolution, points out that function forms structure and structure serves function. A prolonged change in function, such as breathing inefficiently with the chest, induces changes in structure, such as changes in posture and the

accessory muscles of breathing. In turn, these structural changes promote inadequate breathing, which in turn maintains structural changes, forming a vicious circle of dysfunction [43]. We are aware that this respiratory dysfunction means that those affected cannot properly ventilate the lung bases with which they accumulate secretions and can suffer pneumonia very easily.

We are looking for:

- ✓ Stimulate the diaphragm.
- ✓ Improve ventilation/infusion.
- ✓ Re-expand poorly ventilated areas.
- ✓ Decrease secretions.
- ✓ Encourage the elimination of secretions.
- ✓ Facilitate the cough mechanism.

Normal Movement

The patient needs to experience normal movement again to get away from it as little as possible. Pathological movements that arise spontaneously, if perpetuated and established, generate musculoskeletal disturbances – skeletal, changes in segment alignment and in the medium term, more pathology [44]. The lack of attention to the affected member and its exclusion from activities, favor the appearance of the non-use learned by generating higher levels of disability [45-48]. In addition, in the face of the shortfall in motion of a part of our body, the body scheme will be diminished.

Motor stimulation is carried out taking into account the following principles:

- ✓ To master any motor activity, the patient needs to experience it and practice it in real situations [49].
- ✓ The affected member should always be present and participate in the activities as far as possible.
- ✓ The activity should be adapted to the level of the patient and not promote pathological movements.
- ✓ The motivation and active participation of the patient is important to the extent of their possibilities.

Restoration of Cognitive Processes

Traditionally interventions in cognitive processes have been left for the subacute or chronic phase, thinking that it is better to miss the spontaneous recovery period in order to better quantify deficits. Currently this trend has been reversed and there are proposals to work with patients from the first moment of the injury [50]. Although there are few studies on the effectiveness of early intervention in cognitive aspects, some studies have shown this efficacy [51].

Depending on the location and extent of the brain injury, cognitive functions such as orientation, attention, memory, language, visoperceptive, praxias and/or executive functions at different intensity may be affected. How people in your environment relate to the patient will influence the correct cognitive, behavioral and emotional functioning of the patient [52, 53].

To promote correct cognitive stimulation, the following aspects must be taken into account:

- ✓ Activities must be functional and/or motivating. Any activity of daily life has a multitude of cognitive components to work with.
- ✓ The level of demand of the task must be adjusted to the patient's abilities.
- ✓ Breaks are a must.

- ✓ It is essential to adapt the environment to the needs of the patient, with the aim of minimizing the impact of cognitive deficit and reducing functional and behavioral deficit. In the acute phase, it serves to increase the safety of the environment (lock doors that face stairs) or decrease over-stimulation [54].
- ✓ Error-free learning. Error-free learning provides the right answers specific to a task or tutorial until information is consolidated [55].
- ✓ Always take care of the emotional reactions associated with brain damage. People with cognitive deficits caused by brain damage often exhibit fears, frustrations, and anxiety when they perform activities that require a lot of cognitive effort, and often use avoidance behaviors in the face of these stressful situations [56].

Adaptive Conduct

In the hospital phase the most common behavioral, emotional and social alterations are aggressiveness, impulsivity, irritability, misfit social behavior, emotional ability, anxiety, apathy and/or depression. Some epidemiological studies suggest that the prevalence of these alterations ranges from 40 to 80% of cases, depending on the type and severity of the damage [57].

Human behavior is influenced by internal (thought, sensations, feelings...) and external (environment) stimuli. A behavior can be triggered by many factors (internal, external, or a combination of both) and sometimes it is impossible to prevent it from occurring, so the main function of the environment is to assist in the control and modulation of that behavior.

To promote the appearance of adaptive behaviors and prevent misalignment behavior:

- ✓ People in the near environment should be an appropriate role model. Humans learn most of their behaviour through model observation: by observing others we get an idea of how new behaviors are performed [58].
- ✓ Offer specific and appropriate treatment. Alterations persist over time and even tend to get worse if no specific intervention is performed [59].

Communication

Communication is the process by which we exchange opinions, express our ideas, feelings, thoughts, claim our rights; In short, it is to contact others by making them partakers of who we are and have and is fundamental to living in society. This communication can be done verbally through language and speech, but also through gestures, signs or images.

When damage occurs in the S.N.C., this communication may be altered, posing a personal and social challenge for the patient [60]. This process of loss of language involves difficulties of expression and/or understanding; but it does not mean the patient does not have ideas, feelings or thoughts. What happens is that it is unable to plan and structure that inner language, it does not find the appropriate words or there is a problem in the motor programming of its phono-articulatory organs. The process of language retrieval is complex and should be oriented for the correct reorganization of the S.N.C [61, 62].

It is essential:

- ✓ Avoid the loss of communicative intent on the part of the patient; without it, it will later be very difficult to work the language alterations.
- ✓ Encourage and improve listening comprehension.
- ✓ Improve understanding of facial and body expression.
- ✓ Decrease anomia.
- ✓ Decrease perseverations and certain automations that can block and reduce the chances of language recovery;
- ✓ Stimulate oral language.
- ✓ Find alternative or augmentative communication systems where necessary.

Safe Swallowing

Swallowing is an organic process whose main objective is to produce proper nutrition and hydration of the patient, that is, to be effective, and to be carried out safely, without risk of aspiration [63]. In this process several structures with different innervation of the oral and pharyngeal area are involved, assuming that a damage to the S.N.C. can affect in several ways in the swallowing process. This disruption of swallowing is called dysphagia [64].

But swallowing is not just a means of getting nutrients and being able to survive; but in our society, most meetings with our friends and family revolve around activities related to food and/or drink. Not to mention the sensory and olfactory experiences that food brings; Eating is a pleasure: When eating, our neurons secrete “dopamine” which is associated with the brain’s pleasure system and motivation. The affected orally swallowing, will not be as important in the supply of these nutrients that they can be ingested by other pathways; but as in social and cultural constraints and in the deprivation of sensory experiences that will greatly frustrate the person affected by brain damage.

The work of preserving orally swallowing should begin from the beginning to prevent the deprivation of experiences by this route from provoking hypersensitivity, loss of orofacial musculature, decreased swallowing reflex, to prevent respiratory complications caused by aspiration... In addition, orofacial stimulation should be performed since as we noted above, the mouth is one of the areas with the greatest representation in the cerebral cortex. Likewise, the family must be taught in the techniques of orofacial stimulation, so that they can perform them on a daily basis and in the knowledge of the guidelines for eating food safely.

Therefore, it is essential:

- ✓ From the beginning of the injury, perform stimulation of orofacial structures; because as we already mentioned at the beginning of this article, the mouth and hand, are areas of great representation, which makes them priority areas of stimulation.
- ✓ Perform an early sensory stimulation of the orofacial area, to avoid hypersensitivity and aversive responses to food in terms of its texture, temperature and taste.
- ✓ Work orofacial motor skills to correct imbalance or alterations of the orofacial musculature that can interfere and hinder swallowing function.
- ✓ Perform a study of the posture, utensils and textures more

suitable for each patient to ensure safe and effective swallowing.

- ✓ Train the patient and/or family in the management of oral hygiene to reduce the likelihood of aspiration pneumonia.

Activities of daily living, as an integrator of components and core of the intervention model

The activities of daily living are those tasks that the individual develops in order to survive independently, integrated into society and satisfactory, as expected for his specific personal characteristics (age, roles...) [65]. They are divided into basic activities (directly related to survival such as eating, dressing...) and advanced activities (related to the most complex tasks as manage money, use the phone...) [66]. The human being is an active being, who invests most of the time in meaningful occupations. In these activities, it develops its potential and is performed as a person.

When there is a brain injury:

- ✓ The task-related training is the one that enhances neuroplasticity the most [67].
- ✓ The activities must be functional and /or motivating. Any activity of daily living has many components to work on [68].

For these reasons, the activities of daily living constitute the core of DACER intervention model, since they allow the integration of all components (Sensory, motor, cognitive ...) and thus favor the reorganization of the C.N.S.

From this approach, we establish the following principles:

- ✓ To convert the hospital routine into a source of stimulation and organization is a basic objective of the DACER model.
- ✓ It is not about introducing new activities, it is about using those that are done on a daily basis to serve as stimulation for the patient in the hospital and later at home.
- ✓ The hospital period is basic for the family to learn to interact with the patient in their daily lives.

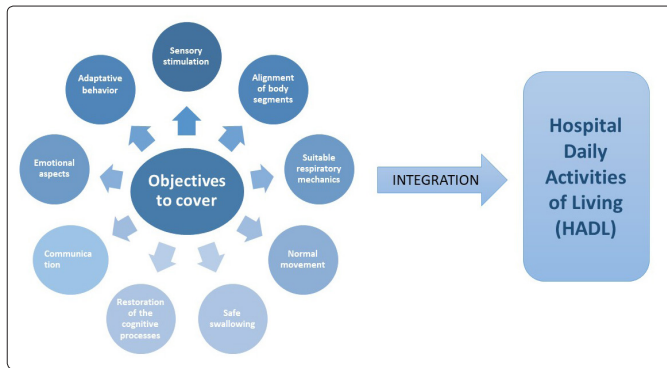
To make it possible, DACER model establishes that there are two basic lines of action in this field:

Family

- ✓ Training of the family so that, during the activities of daily living, they integrate the basic principles of stimulation, so that we guarantee the continuous work of the central nervous system.
- ✓ Weekly record sheets that allow the family to become aware of the routine they should follow during their hospital stay.
- ✓ Family training to prepare for the return home and to organize the environment so that the daily routine remains a source of stimulation once he/she return home.

Professionals

- ✓ Daily living activities are also a key element in the rehabilitation process.
- ✓ The model considers that the use of daily living activities as a means of rehabilitation is key to favor the recovery of the different affected components.



[Figure 1]

Model Dacer Structure

In order to offer the patient a global, early and intensive stimulation that addresses all the needs of the affected person, it is necessary that the whole environment is involved and committed to the process.

To this end, the model is based on three fundamental pillars:

1. Training and support to the family members and environment of the affected.
2. Specialization and support for health workers (nurses, auxiliary staff, care givers).
3. Early intervention of a multidisciplinary team specialized in neurorehabilitation (doctors, neuropsychologists, speech therapists, occupational therapists and physiotherapists)

These three pillars make it possible to offer in addition to specialized rehabilitation, a continuous and permanent stimulation program.

Training and support for the patient environment: “School of Families” [69, 70].

The School of Families is a training activity that takes place in the hospital. It is taught by specialized DACER professionals and has the following objectives:

- ✓ Let the family understand what a brain injury is and know its specific characteristics against other types of injuries.
- ✓ That the family feels empowered to relate to the patient.
- ✓ Let the family know basic strategies to stimulate their family member globally, early and intensively, contributing to the recovery of the affected according to their serious state.
- ✓ Let the family know basic strategies to help the patient make transfers, contributing to their recovery and reducing the risk of injury.
- ✓ Let the family feel empowered to take responsibility for the affected party.
- ✓ Decrease the family’s level of anxiety and feelings of distress by increasing your sense of control over the new situation.

The school is organized in one session once a week that family member can attend as many times as they deem necessary.

- ✓ Session 1: How to stimulate your family member with brain damage. In support of the school, three support guides and audiovisual material have been developed

- ✓ How to stimulate your family member with brain damage [69].
- ✓ How to stimulate your child with brain damage (pediatric guide) [70].
- ✓ How to stimulate your family member with brain damage in Intensive Care Units.
- ✓ Popi & Pepa. Learn by playing (Audiovisual Animation Series for Child Brain Damage).

Specialization and support for health workers (nurses, auxiliaries and care givers)

Health workers who directly care for brain damage patients during their admission to the hospital have a very prominent role for a twofold reason: on the one hand, the way they work daily can become a means more than stimulation to the patient, on the other hand, can advise the family and motivate them to be involved in the recovery process of the affected person.

With specific training, we aim to meet the following objectives:

- ✓ Unify the basic principles of approaching the patient with brain damage by nurses, clinic assistants and hospital wardens.
- ✓ Staff to include in their daily management of the patient with brain damage specific strategies that contribute to their motor, sensory, cognitive and behavioral recovery
- ✓ To help staff understand the importance of involving the family in the treatment of their family member and to know how to give them basic management guidelines to promote their later rehabilitation.

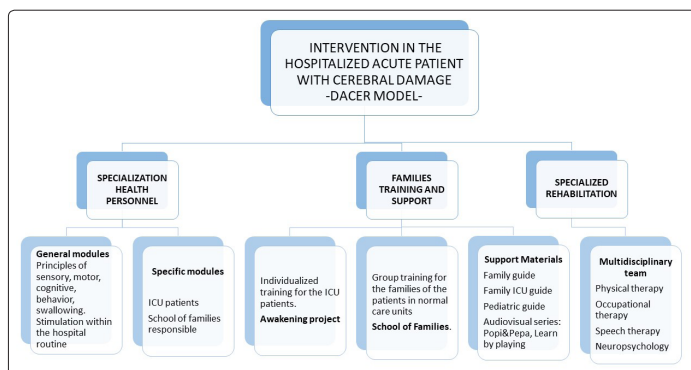
To make this possible, two training activities are carried out on an annual basis:

- ✓ Early stimulation strategies for brain damage patients.
- ✓ Intervention in the hospitalized acute patient with cerebral damage

Specialized Intervention

As mentioned above, the initiation of neurorehabilitator treatment within the first 24 hours is not only safe, but decreases the degree of disability at the high [2-4]. Post-traumatic neuroplasticity is the adaptive property of the CNS to reorganize its synaptic connections, modifying the biochemical and physiological mechanisms involved in its communication, being able to create new neural branches that compensate damaged areas.

Thanks to this ability, after suffering an injury, the CNS is able to learn again. There is scientific evidence to suggest that early, intensive and function-driven treatments promote neuroplasticity and may even limit the extent of injuries. The complexity of the sequelae that can be derived from the injuries of the Central Nervous System, necessitate the intervention of a multidisciplinary team, with specific training in this type of injuries, that can meet all the needs of the patient. The specific professional or professionals, the number of hours... will depend on the initial patient assessment and affected areas. They are part of the specialized intervention team: Physicians, neuropsychologists, speech therapists, occupational therapists, physiotherapists.



[Figure 2]

Conclusions

We have generated a structured model of early stimulation, (from hospital admission in the intensive care unit to normal care) global (unifying basic principles of treatment of patients with brain injury and assisting all areas involved) intensive (24-hour stimulation) through ADVS. It includes the specialization of healthcare professionals, the training of informal caregivers (family or friends) to ensure in clinical practice the precocity, intensity, and continuity of treatment of patients with acute-phase brain damage in the way of achieving a holistic approach to rehabilitation. With this model, families and healthcare professionals learn what happens in an injured brain and what guidelines they can put in place from the first moment, to work with the acute patient in their hospital stay. In addition, the specialized intervention in all areas, of neurorehabilitation professionals in this phase, completes the design of this new model of intervention in the acute patient with hospitalized neurological injury.

Conflicts of Interest

All authors have contributed to this manuscript and have no interest of conflict to declare.

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