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# THE SYSTEM OF DIFFERENTIATED MEDICAL NEUROREHABILITATION IN THE TRAUMATIC POST-COMA CONDITIONS OF LONG-TERM DISORDERS OF CONSCIOUSNESS

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## SUMMARY

### Background:

The study focuses on achieving the proper degree of daily patient activation, the minimization of the manifestations, the consequences of post-coma immobilization syndrome, especially the syndromes of repressed consciousness, highlighting the key importance of the type of individual rehabilitation programs' content. The main aim of this study was to develop and justify a system of differentiated medical (physical) rehabilitation of patients with post-traumatic post-coma long-term disorders of consciousness, identify key principles for the functioning of this system, and highlight the basic guidelines for specialized rehabilitation medical institutions.

### Material/ Methods:

The work is based on the results of diagnosis, rehabilitation and restorative treatment of 220 patients with traumatic post-coma disorders of consciousness, who were examined and underwent neurorehabilitation (NR) treatment at the State Institution Romodanov Neurosurgery Institute of National Academy of Medical Sciences of Ukraine and the „Nodus” Practical Center for Neuro Rehabilitation from January 2007 to July 2018 inclusive.

### Results:

All patients after courses of rehabilitation treatment were discharged for outpatient monitoring or continued treatment of somatic complications of the underlying disease at their place of residence. During the rehabilitation treatment conducted over the study period, none of the patients died.

### Conclusions:

The conclusion as to the applied effectiveness of the established system of rehabilitation is made after comparing the expected results of the rehabilitation and rehabilitation with the real achievements, carrying out a detailed analysis of the implemented individual programs at each stage of the restoration of consciousness, as well as clarifying the design of daily exercises and the principles of the distribution of loads in order to solve the set clinical problems, and both general and current goals.

**Key words:** severe traumatic brain injury, coma, post-coma disorders of consciousness, individual rehabilitation program, rehabilitation methods.

## INTRODUCTION

The ever-increasing frequency and prevalence of neurotrauma in the world has long been of an „epidemic” nature [7,18]. Objective advances in medicine over the past decade, related primarily to resuscitation, intensive care, neurosurgery, have led to an increase in the number of survivors, even with extremely severe clinical forms of traumatic brain injury [12].

However, for the last three years, a decrease in these figures has not been observed [7,10,18,22], rather, on the contrary, the conduct of hostilities in eastern Ukraine has only increased the number of patients with extremely severe brain injury; being diagnosed with a prolonged coma [15,19,20].

Despite the fact that the fundamental data and descriptive methods of the restorative treatment of patients with various pathologies of the central nervous system is innumerable [4,5,6,32,33], distorted ideas about the application of rehabilitation, the absence of generally systematic and any standards whatsoever, evidence of efficiency criteria, as well as recommendations for the differentiated use of the methods of rehabilitation have created a tangible detachment and pathological autonomy of this branch of Ukrainian medicine from others.

A major limiting factor is the mass identification of rehabilitation with physiotherapy and sanatorium-resort methods of treatment that have been used at the National Higher School for decades, which led to the narrowing of this concept and, as a result, to the simplification of scientific attention and the extinction of research interest.

In addition, the very level of the rehabilitation concept, approaches, methods and techniques in leading specialized and municipal health care institutions of the million-plus cities of Ukraine, municipal/ regional health care institutions, where patients with severe traumatic brain injury receive assistance, is in terms of physical therapy, manual therapy, the use of general physiotherapy techniques and remains at the level of the 1960s-1980s.

Existing modern technologies [28,29,31,37,39,45,49,52], which have been used in Europe, the USA, Japan for many years and have a successful socio-economic and professional image, are sporadically represented in our country but have not received wide-spread use, or the range of use has been artificially narrowed despite the fact that the availability of rehabilitation services for patients with the consequences of severe traumatic brain injury has significantly increased.

All this creates chaos and a lack of control within domestic rehabilitation, and creates all grounds for speculation not only with the very concept of “rehabilitation,” but also with the introduction of therapeutic measures under this concept, which, at best, adapt the patient to the conditions of the disease that have arisen, and at worst, simply take away the strength and time from the patient, reducing the chances of improving the quality of life and avoiding disability to a minimum.

In addition to the problematic and controversial issues [8,25,27,41,42] that shape the relevance of this work, as world practice shows [9,11,14,16,21,24,46], it is necessary to note the fact that today against the backdrop of impressive in-

formational accessibility, scientific openness and the blurring of boundaries between many medical specialties, there is a need for the interdisciplinary prevalence of many medical technologies that collectively reduce the cost of medical services, increase the overall effectiveness of each stage [40] and treatment in general, minimizing its risks. And in the case of rehabilitation treatment, as a reasonable logical continuation of, say, the surgical or therapeutic stages of inpatient care, is the most justified from all sides of this issue.

Strangely enough, literary data and competent non-commercial reports on the instrumental neurorehabilitation of patients with traumatic post-coma states of long-term disorders of consciousness based on the complex differentiated use of leading rehabilitation approaches and strategies, as well as specialized equipment in domestic and foreign literature has turned out to be quite limited in number. Practically all the researchers [34,38,43,44] who are studying similar issues or describe the issue [2,23,30,35,36,47,50,51] to the topic of this work, speak about the need for rehabilitation, however, they do not indicate which, and moreover do not interpret its structures and forms.

In contrast, there are enough works [17,48] that describe rehabilitation measures and schemes of rehabilitation treatment in neurological and neurosurgical patients from various nosologies using achievements that date back to the 1960s-1990s. But we have been unable to find a detailed description of the proposed methods, or clear principles of a differentiated approach to the choice of methods.

Given that now there is an opportunity in the light of modern achievements of restorative medicine and rehabilitation technologies to comprehensively review existing, often outdated, approaches and methods and evaluate the effectiveness of rehabilitation methods that are used not only in Ukraine, but also in advanced countries of the world, there is a justified need to create an up-to-date, differentiated individual physical rehabilitation system that meets the requirements, and, following the principles of evidence-based medicine, one that helps to increase the level of medical care for patients with posttraumatic post-coma syndromes of prolonged disorders of consciousness; this being one of the most unpredictable and difficult for patients to have treated and cured effectively.

### **Purpose of the study**

To develop and justify a system of differentiated medical (physical) rehabilitation of patients with post-traumatic post-coma long-term disorders of consciousness, identify key principles for the functioning of this system, and highlight the basic guidelines for specialized rehabilitation medical institutions.

## **MATERIAL AND RESEARCH METHODS**

The work is based on the analysis of 220 patients with traumatic post-coma disorders of consciousness, who were examined and underwent neurorehabilitation (NR) treatment at the State Institution Romodanov Neurosurgery Institute

of National Academy of Medical Sciences of Ukraine and the „Nodus” Practical Center for Neuro Rehabilitation from January 2007 to July 2018 inclusive.

To preserve the random principle of patient selection in the study, create the conditions for a true statistical analysis of data and to avoid a biased approach in formulating conclusions and research results the following criteria were established:

1. Anamnestic – the patient has an isolated, associated or combined severe traumatic brain injury.
2. Dynamic-syndromic – the transition of a long-term coma into the syndrome of a post-coma disturbance of consciousness.
3. Time criterion – intermediate and remote periods of the course of a traumatic disease (from 1 month after the moment of TBI).
4. Medical – at least one course of neurorehabilitation was conducted.
5. Age of the patient – 18 years and older.
6. The beginning of observation for each case is known.
7. The end of observation in each case is known.
8. The absence of acute somatic pathology, which required urgent surgical treatment, limiting the differential use of the system of physical rehabilitation in traumatic post-comatose conditions.

The following clinical forms and their combinations were classified as severe traumatic brain injury (TBI): severe brain contusion, compression of the brain with intracranial hematomas or fragments of fractured skull bones and diffuse axonal damage [16].

Syndromes that were characterized by an impairment of consciousness and had the staging of its recovery after an acute cerebral coma resulting from severe TBI were included within the traumatic post-comatose conditions. These syndromes were: syndromes of depressed consciousness, consciousness reintegration syndromes, transient syndromes and clear consciousness syndromes.

There were 220 cases ( $n = 220$ ) that met all the 8 above-mentioned selection criteria. These cases formed the main study group.

The average age of the patients in the main study group ( $n = 220$ ) was 36 years old ( $\bar{x} = 36.04$ ;  $\sigma \pm 16.2$ ;  $m = 1.09$ ). Males accounted for 85% ( $n = 187$ ), females - 15% ( $n = 33$ ).

The ratio of women to men in this group of studies was 1: 5.67, which indicates that men were almost 6 times more likely to have a severe head injury than women.

The greatest number of post-coma disorders of consciousness after severe brain injury was found amongst men and women, of prime working age, and it is the young men who suffer the most damage of this kind.

All patients were diagnosed with cerebral coma, according to the Glasgow Coma Scale, which had different depths: moderate, deep, terminal (exorbitant) and, depending on this, it was organized differently into post-coma syndromes of impaired consciousness. Therefore, to predict the dynamics and success of rehabilitation treatment, all patients with an initial level of coma, which preceded

the rehabilitation, were divided into subgroups (coma I was diagnosed in 68% of cases, coma II in 27%, coma III in 5% of cases).

A clinical and statistical analysis of the indicators of these subgroups, in accordance with the course of the disease and the impact on the choice of rehabilitation method and the closest prognosis, which were the first to determine the patient's further way of treatment, were taken into account when creating a system of differentiated rehabilitation.

For further neurorehabilitation treatment, patients in the intermediate or remote period of TBI were sent to a specialized somatic division/ department or transferred to a specialized rehabilitation institution, and since the period from the time of the incident to the beginning of rehabilitation was different, and obviously influenced the success of treatment and the minimization of neurological and somatic disorders in patients with post-coma disorders of consciousness, patients from two of the study groups were again divided into subgroups.

Considering the results of recent studies [12], which indicate that starting from the third month after severe brain injury, dystrophic post-ischemic and post-traumatic phenomena sharply increase in the brain substance (cortex, thalami optici and others), which reach their peak by the sixth month after a severe TBI, which could constitute a kind of "morphological window" for using intensive restorative technologies to minimize these changes. To determine this possibility, depending on the moment of injury before the first course of neurorehabilitation, the main group of the study ( $n_1 = 220$ ) was divided into the following subgroups:

- I – 1-3 months – a subgroup of early neurorehabilitation ( $n = 62$ );
- II – 3-6 months – a subgroup of delayed early neurorehabilitation ( $n = 44$ );
- III – more than 6 months – a subgroup of late neurorehabilitation ( $n = 114$ ).

The dynamics of the restoration of consciousness, in line with the stages, according to the Dobrokhova classification (see: Appendix) following a traumatic cerebral coma was assessed at the following control points from the onset of the severe TBI: 1 month, 3 months, 6 months, 9 months, 12 months. Analyzed exactly was what stage of consciousness recovery the patient had reached, or for how long (months) he had remained in the already achieved stage of post-coma disturbance of consciousness.

For each patient of both the main and the control groups, taking into account the international classification of functioning, disability and health (ICF), approved by the fifty-fourth World Health Assembly for international use, on May 22, 2001 a rehabilitation diagnosis was formulated on the basis of which an individual rehabilitation programme was further developed (Order of the Ministry of Health No. 623 of October 8, 2007).

For the patients of both groups, during the intermediate period, methods of rehabilitation and restorative treatment, including surgical correction of the complications / consequences of the underlying disease, were used. The volume of these methods involving in the main group of studies after severe TBI is presented in Table 1.

Table 1. Methods of neurorehabilitation of the patients from the main group of study after severe TBI

13	n of patients, (N=220)	%
Kinesiotherapy (mechanotherapy (including CPM, PNF, exercise therapy), apparatus functional hand therapy, SET therapy, walking on moving surfaces in non-inertial apparatus systems)	220	100
Polymodal (transcranial magnetic stimulation with single stimuli, therapeutic rhythmic transcranial magnetic stimulation), structured stimulation of the brain (including methods of virtual visual reality, photopulse visual acoustic effects, cerebellar stimulation)	220	100
Neurophysiological treatment: selective non-invasive electrical stimulation of the mediastinal nerves	127	57,72
Physiotherapy (hydrotherapy, magnetotherapy, pressotherapy, neuromuscular electrical stimulation, darsonvalization)	220	100
Elements of manual therapy, therapeutic massage	220	100
Apparatus methods for restoring and increasing the gravitational gradient (verticalization on the tilt table, apparatus verticalization in the system of dynamic instability, lateral therapy, apparatus simulation of the walking, use of active and passive support systems)	127	57,72
Surgical treatment (including neurosurgery)	140	63,64
Medicinal (symptomatic) therapy	220	100
Speech therapy (including therapeutic speech massage)	138	62,73
Neuropsychological correction (neuropsychiatric rehabilitation, psychoneurological correction (including cognitive-behavioral therapy, mirror therapy, busy board, sessions)	138	62,73
Ergotherapy classes (including social-oriented events: walks, visits, excursions, meetings, etc.)	138	62,73
Orthosotherapy (orthosis static, dynamic, functional)	220	100

Each patient with a post-coma disturbance of consciousness in the interim period of the underlying disease continued during rehabilitation treatment to require medical therapy, which included symptomatic pharmacotherapy as well. Rehabilitation treatment was carried out inpatient and outpatient. Treatment courses lasted on average two months each. Each patient received at least one full course of neurorehabilitation. However, most patients underwent more than one course of such treatment.

The largest number of patients – 59.55% (n = 131) with post-traumatic post-coma disturbances of consciousness received three courses of rehabilitative treatment.

## RESULTS

All patients after courses of rehabilitation treatment were discharged for outpatient monitoring or continued treatment of somatic complications of the underlying disease at their place of residence. During the rehabilitation treatment conducted over the study period, none of the patients died.

The character of the rehabilitation carried out in patients of B group (the most intensive rehabilitation programme group), having a proven effectiveness, formed the basis for the generalization of the positions and approaches of the following scheme – a system of differentiated physical rehabilitation in traumatic post-coma states, see Fig.1.

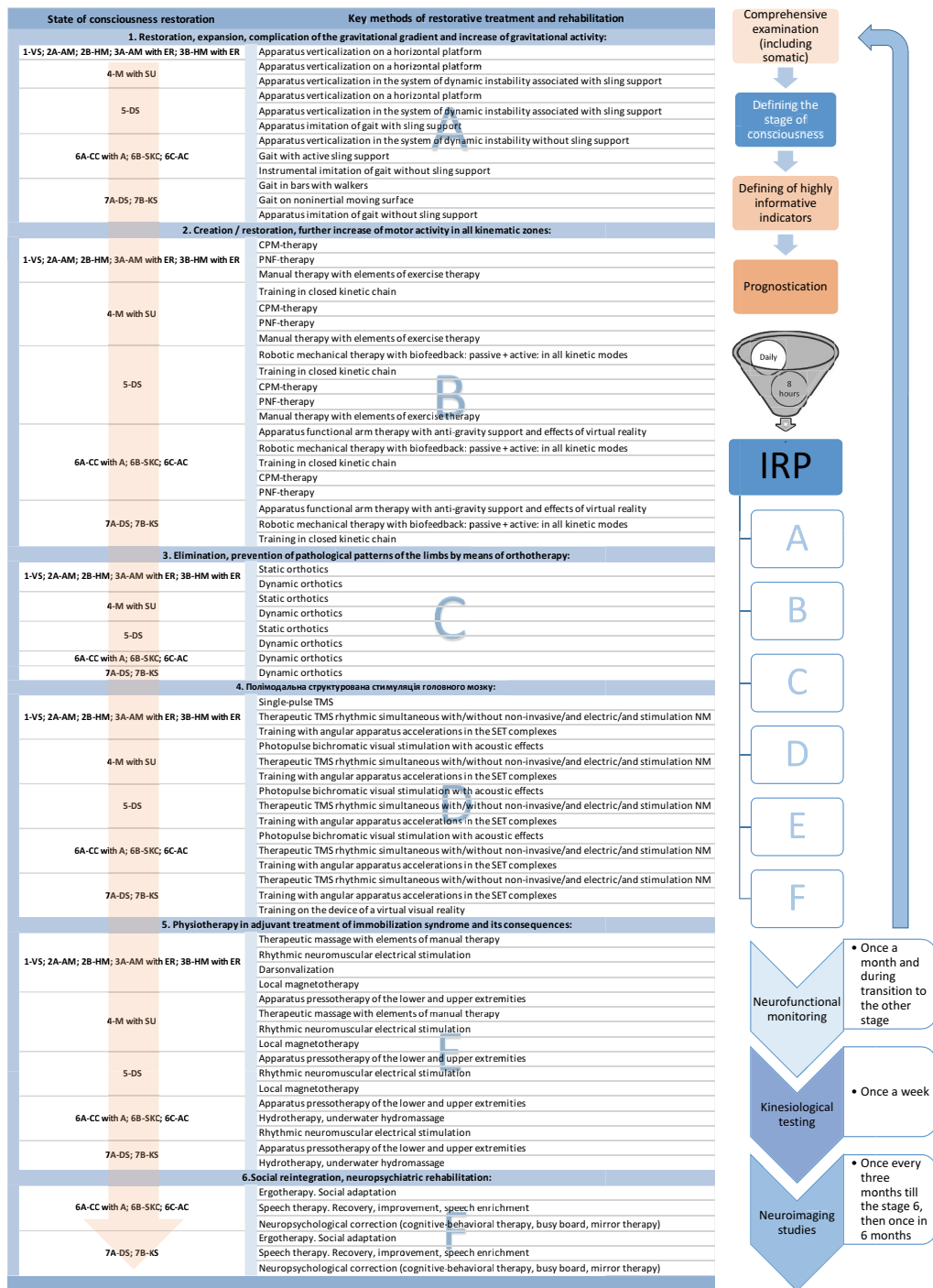


Fig. 1. Diagram of the interaction of differentiated physical rehabilitation system components in traumatic post-coma conditions

The developed system is based on the fact that in accordance with the accepted concepts of neuroplasticity, neurophysiological and pathophysiological [3,13,26] mechanisms of brain recovery after a severe TBI, imposed in strict accordance with current clinical objectives, dosed, intensive, maximally filled and enriched treatment and rehabilitation at each stage of post-coma post-traumatic consciousness recovery, daily physical activity in combination with polymodal brain stimulation not only reduces the severity of the immobilization syndrome and its consequences from the first days of the rehabilitation programme, but also acts as a powerful combined activator of both neuroplasticity and sanogenesis in general. Such a simultaneous, systemic, grouped „bombardment of the unconscious” brain with various internal and significant external modulated stimuli gradually moves the „closed - with small dimensions” neurodynamic systems into „open - with large dimensions.” This was proved by the dynamics of the non-linear quantitative multidimensional and multifractal properties of EEG studied in this work. Further, on the basis of complicated brain neurodynamics, integrative brain activity begins to manifest – the post-traumatic consciousness evolves, the range of processes closes: a gradual transition to higher stages of the restored consciousness reveals new physical capabilities in the patient, which, in turn, being actualized in the proposed rehabilitation system, further strengthening neuroplasticity. A peculiar movement in an upward spiral, where with each, as if similar coil in the “physical activity – level of consciousness” pair, the intended rehabilitation route is realized.

Since the key role of influences varies over time from the restoration of the gravitational gradient to the neuropsychocorrection, this rehabilitation system also reflects this feature.

If among the above methods of restorative treatment and rehabilitation of this system we choose the “minimum necessary” set that we would like to see in each ICU, for it is here that early rehabilitation should begin, we should single out apparatus verticalization, magnetic transcranial stimulator, CPM therapy methods, the functional methods of orthos physical therapy.

Starting from the 10th day of a long coma, regardless of the neurosurgical amount of care, this will enable us to intensify the patient, not only reducing the manifestations of the immobilization syndrome and prevent complications that have been shown to reduce the recovery potential in the short and long term, and most importantly, to accelerate the coming out from a coma and regaining consciousness after a severe TBI.

Therefore, the basic principles of the functioning of this system is the principle of the differentiated selection of rehabilitation methods, as well as the principle of cyclic continuity, when the transition to each higher stage of consciousness recovery repeats the cycle of actions of medical intervention but of a much higher order.

The decisive factor in planning a restorative treatment strategy is not the period of post-traumatic disease, but the stage of post-coma consciousness.

The light brown arrow on the left, besides the direction of consciousness recovery, indicates the sequence of attracting clinical tasks, as well as the methods



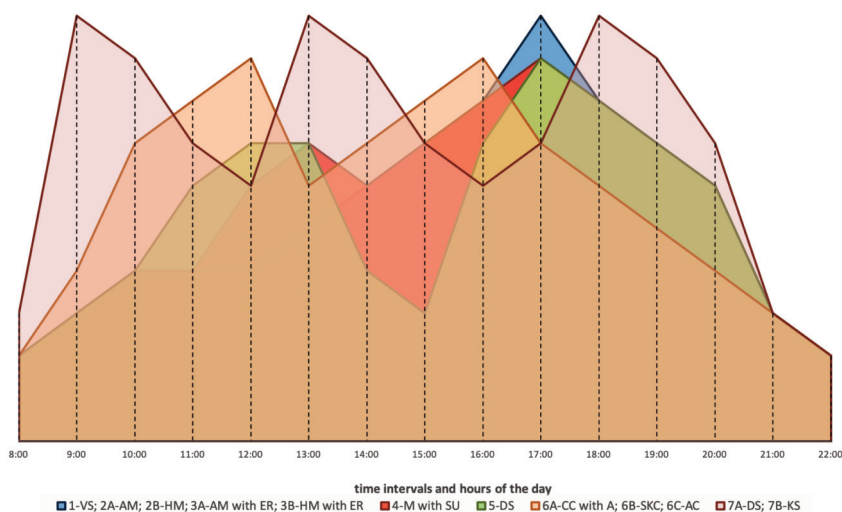


Fig. 2. The recommended distribution of daily load during the rehabilitation day. The superposition of peak values depending on the stage and time period of the working day

that help to solve these problems during the rehabilitation route. So, for example, at the stage of vegetative status, verticalization is the key, and at stages 6 and 7 it is ergotherapy, logopedic and neuropsychological correction.

Prediction not only determines the chances of achieving something better than it is, but forms the priority of the total load implemented through an individual rehabilitation program (IRP) with a daily mode of training sessions with existing or added activity, an average of 8 (2) hours per day (intensely, “aggressively”). IRP at each stage should include all the listed blocks, where their implementation corresponds to the trend “from A to F” as another principle of maximum load of the IRP.

The recommended distribution of daily load (classes, procedures, sessions) in the course of the rehabilitation route of patients with post-coma disturbances of consciousness is presented in Fig. 2. The peak-composition for each stage has its own patterns and arguments.

The increment of the load curve for each group of syndromes (Fig. 2) reflects the increase in load, and the decrement shows a decrease, respectively. The superposition of peak values means the evolution of the load according to the following rule: starting from the vegetative status and during the stages of depressed consciousness syndromes, peak values fall in the afternoon, late afternoon, which corresponds to the biorhythms of the parasympathetic nervous system (“kingdom of the vagus”) – as it turned out a safe period of the day for these patients (there were fewer different paroxysms, episodes and negative phenomena in response to the loads, including the newly introduced ones).

Further, as the level of consciousness progresses from the stages of syndromes with extreme limitation of contact, the expansion of the load occurs due to the appearance of peak values in the middle of the day and in the morning. And finally, at the high stages of the restored consciousness, the peak values are evenly distributed throughout the day, but with a reduction in the total time of loads of 1-2 hours from the average value. It should be particularly noted that on weekends classes continue, only their intensity and duration (t) is:

$$t_{\text{IRP}} = \Sigma (A_{100/100} + B-F_{30/30}) \quad (7.2.1.),$$

which means 100% fulfillment of the tasks of unit A and other blocks B-F for 30% of the daily load and total volume at any stage of recovery of consciousness.

Classes, sessions, procedures in patients with long-term disorders of consciousness, as a rule, are accompanied by numerous failures and schedule violations due to the need for ongoing sanitary and hygienic procedures (hypersalivation, vomiting, uncontrolled stool production and urination). Therefore, in such situations, the main thing is to accomplish the full amount of planned restorative or therapeutic, or diagnostic measures per day, rather than an attempt to “catch up with the schedule” by reducing the length of classes, sessions, procedures, especially their cancellation.

Relatives' visits should be clearly fixed in time. For this, it is better to choose the second half of the day (evening), when the current clinical tasks have been completed. This approach minimizes their intervention in the rehabilitation route and minimizes disruption to the daily schedule of classes. At the same time, the presence of patients' relatives in the classes is to be encouraged. Where patients especially with consciousness reintegration syndromes, transitional syndromes, can not only demonstrate their acquired skills, but also simultaneously revitalize social activity in a family circle.

All current surgical interventions are not indications for the complete abolition of rehabilitation activities in the postoperative period, but only require revision of the IRP and a differentiated selection or involvement of “authorized, indicated” methods of restorative treatment for the period defined as “special” after the operation. Rehabilitation of patients with post-traumatic post-coma long-term disorders of consciousness should occur continuously during a specific IRP of this rehabilitation route.

A similar tactic applies to negative phenomena, such as epiparoxism, purulent-septic complications, temporary use of artificial respiration, etc. – the daily load is minimized, but not canceled.

Daily monitoring and the monitoring of patients with depressed consciousness syndromes and consciousness reintegration syndromes during rehabilitation is conducted according to the rules of the intensive care unit using monitoring equipment (pressure monitoring, heart rate, pulse oximetry, video surveillance), since these patients are of the most unpredictable category, as in terms of sudden deterioration, crises, and high level injuries (unintentional self-injury). Patients at

the stage of transitional syndromes, a syndrome of clear consciousness can be in conditions of general chambers with preserved video surveillance of their movement within the chamber or box or on an outpatient basis with daily attendance of classes, procedures, sessions. It is not recommended for patients with a level of consciousness lower than the level of the seventh stage of post-comatotic recovery of consciousness [52], to remain on an outpatient basis during active intensive rehabilitation to reduce the symptoms, in accordance with mirogenetic theory [53].

The developed complex system of physical medical rehabilitation in traumatic post-coma conditions, based on the principles of differentiated selection of rehabilitation methods, as well as principles of cyclic continuity, when the transition to each higher stage of consciousness recovery repeats the cycle of actions of medical intervention but of a much higher order and is accomplished through the implementation of intensive IRP loaded with rehabilitation methods which directly affect the degree of daily activation of the patient and minimization of the manifestations and consequences of the post-coma immobilization syndrome, especially in syndromes of repressed consciousness, is a completely new, outlined and reasonable, predictable, highly effective system for providing highly specialized care to such patients in an economically complex, burdened, but competitive environment.

## **CONCLUSION**

1. The minimum required list of early rehabilitation methods should include instrumental verticalization, transcranial magnetic stimulation, CPM therapy methods and functional orthotherapy, which will allow, starting from the 10th day of the I-II-III coma, regardless of the amount of neurosurgical assistance and even mechanical ventilation, the start of patient activation. This not only reduces the manifestations of immobilization syndrome and prevents complications that lower the restorative potential in the near- and longer-term future, but most importantly, it effectively potentiates the fastest way out of a coma and recovery of consciousness after severe traumatic brain injury.
2. As a result of the rehabilitation, 46 (20.91%) patients of the main group, within one year after a post-traumatic coma, recovered to the level of clear consciousness syndromes, 138 (62.7%) patients were able to overcome their unconsciousness and recover to the level of consciousness reintegration syndromes. 24 (10.91%) patients remained in a vegetative state, despite the rehabilitation and restorative measures, but it is noteworthy that these patients had the least intense individual rehabilitation programmes.
3. The principle of a differentiated selection of rehabilitation methods and the principle of cyclic continuity directly influenced the degree of daily activation of the patient, a minimization of the manifestations and consequences of post-coma immobilization syndrome, especially in the syndromes of repressed consciousness at the stages of early rehabilitation, and turned out to be key

moments in the interaction of all components of the developed complex medical (physical) rehabilitation system in patients with prolonged post-coma disorders of consciousness after a severe traumatic brain injury.

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Appendix. Classification of post-coma violations of consciousness<sup>1</sup>

<b>Group characteristic</b>	<b>Syndrome (recovery stage)</b>	<b>Main distinctive feature / disorder</b>	
<b>I. Syndromes of repressed consciousness</b> <i>Including: post-coma states of absent consciousness (1-3) and states with extreme contact restriction (4-5)</i>	1	Vegetative status	Eye opening
	2A	Akinetic mutism	Fixing the eyes, keeping track of the eyes
	2B	Hyperkinetic mutism	Fixing the eyes, keeping track of the eyes in combination with chaotic movements
	3A	Akinetic mutism with emotional reactions	Differentiated emotional reactions
	3B	Hyperkinetic mutism with emotional reactions	Differentiated emotional reactions in combination with chaotic movements
	4	Mutism with speech understanding	Speech understanding, executing the command
	5	Disintegration of speech	Attempts to speak
<b>II. Syndromes of consciousness reintegration</b>	6A	Confusion of consciousness with aspontaneity	Answers to questions with gross disorientation and extreme passivity
	6B	Speech-kinetic confusion	Answers to questions with gross disorientation speech –motor agitation
	6C	Amnestic confusion	Answers to questions with gross disorientation and global amnesia, confabulation.
<b>III. Transient syndromes between disorders of consciousness and clear consciousness</b>	7A	Dysmnistic syndrome	Relative ordering of behavior, the possibility of conversation with disorientation, as a consequence of verbal memory disorders, abstract thinking and planning; Paraphases and mistakes of judgments are revealed
	7B	Korsakoff syndrome	Relative ordering of behavior, the possibility of conversation when disorientation, due to disorders of the sensory- image memory, perception of space and time. Confabulations, deceptions of perception are noted.
<b>IV. Clear consciousness</b>	8	Pronounced cognitive and emotional-volitional disorders	Proper orientation in the environment with a gross decrease in the level of judgment, memory, criticism, ability to volitional effort and adequate emotional reactions.
	9	Borderline (including moderate cognitive, psychopathic, neurosis-like) impairments	Cognitive, emotional-personal and neurotic disorders that occur only when adaptation is necessary (unusual environment, increased demands, stress)
	10	Premorbid psychic state	The absence of new (compared to premorbid) mental disorders

<sup>1</sup> Dobrokhotova T.A., Grindel OM, Bratina N.N. et al. (1985). Restoration of consciousness after a long coma in patients with severe head trauma. Журнал невропатологии и психиатрии. 5:720-726.