

Review Article

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Pathogenetic Consequences of Prolonged Immobilization in Elderly and Senile Individuals and Modern Approaches to Restorative Treatment

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ABSTRACT

Aging is a natural process characterized by impaired neurohumoral regulation, altered receptor sensitivity, and weakened homeostasis mechanisms. These fundamental shifts at the systemic, organ, and cellular levels determine the particular vulnerability of elderly and senile patients to external and internal damaging factors.

One of the most powerful and clinically underestimated pathogenetic triggers in geriatrics is prolonged immobilization forced bed rest. Age-related increased sensitivity to physical inactivity and accelerated aging of physiological systems lead to the rapid development of severe complications: hypostatic pneumonia, thromboembolism, muscle atrophy, contractures, osteoporosis and mental disorders.

Specific syndromes associated with prolonged bed rest deserve special attention: bedsores, urinary and fecal incontinence and constipation. These conditions, perceived as inevitable manifestations of old age, are treatable in most cases with proper diagnosis, adequate care, and comprehensive therapy. A key role in the prevention and treatment of such disorders lies not only in medication but also in non-drug approaches, such as therapeutic exercise, massage, dietary therapy, and psychosocial rehabilitation. The effectiveness of treatment is largely determined by the timeliness of initiation, as well as adherence to the principles of gradualism and caution when prescribing physical therapy and balneological procedures.

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Care of Patients on Bed Rest

The duration of bed rest is a particularly important issue in geriatric practice [1,2]. Over the past two decades, views on the duration of bed rest for elderly and senile people and the need for it in various diseases have changed dramatically [3-5]. Until recently, the prevailing opinion was that an old person should “conserve their strength” and stay in bed as long as possible, especially when feeling unwell or ill [6,7].

A review of clinical data completely rejects this point of view [4, 8-14]. Prolonged bed rest in elderly and senile people rather quickly causes significant structural and functional changes, resulting in the development of complications such as hypostatic pneumonia, thromboembolism, difficult urination and urinary

tract infections, and pressure ulcers; appetite decreases, leading to weight loss and general weakness [9,15]. Protein loss increases as a result of ensuing muscle atrophy, oxidative processes in tissues decrease, and calcium excretion increases, which can cause senile osteoporosis and osteomalacia; bed rest in older age groups is a common cause of joint stiffness and contractures, constipation, insomnia, mental disorders and depression [10,16].

The mechanisms regulating the function of the cardiovascular system are particularly disturbed [17,12,19]. A sharp decline in the adaptive capabilities of the sympathoadrenal system and an increase in the body's oxygen debt are also observed [13-23]. All this confirms the position that with aging, the body becomes especially sensitive to a lack of movement [9-24]. Disturbances in the functional state of the body under conditions of hypodynamia in elderly and senile people occur much more quickly, and their intensity is more pronounced than in middle-aged or mature people [22,7]. Consequently, it is necessary to shorten the period of bed rest whenever possible, and not allow the patient to remain immobile longer than is absolutely necessary [11,25].

However, there is a whole range of diseases in which patients of older age groups also require rather prolonged bed rest [8,16,26]. These are mainly diseases accompanied by a rise in

body temperature (pneumonia, acute pyelocystitis, influenza, etc.) [5,6]. In a number of chronic diseases and their complications (cachexia, uremia, severe anemia, circulatory failure, etc.), as well as acute infarction and severe dementia, the patient is also forced to maintain bed rest [13,15]. In all cases, the application of already sufficiently developed modern methods of care for old people allows for a significant reduction of the negative impact of hypodynamia on the general condition of the body [17,18]. Pressure ulcers and urination disorders due to an inflammatory process in the urinary tract and prostate diseases are especially often observed in patients with hemorrhages and thromboses of cerebral vessels, brain tumors, pronounced dementia, etc. [9,23].

The early application of such restorative therapy methods as light massage and therapeutic exercises in bed is of enormous importance for restoring the health of people in older age groups [2,10,19].

Pressure Ulcers

They appear mainly in patients forced to lie on their back for a long time, and nowadays, even in geriatric practice, they are considered a failure of care [3,21]. The general condition of the body also plays a role poor nutrition, exhaustion, dehydration [15-21]. The development of pressure ulcers is promoted by an uncomfortable, uneven bed, poorly remade, with scars and folds on the sheet or the patient's shirt, and insufficient washing and drying of the skin after urination and defecation [1,6,14]. Pressure ulcers most often form on the sacrum, sometimes in the area of the shoulder blades; these areas of the body should be examined daily in seriously ill patients [8,5]. The quality of nutrition (introduction of a sufficient amount of complete proteins with food that is easily accessible to the action of digestive enzymes) and the elimination of dehydration (if necessary, by intravenous administration of physiological sodium chloride solution) are of great importance [1,18]. The prescription of multivitamin complexes is extremely necessary, and in some cases, anabolic hormones in reduced dosages [5,15].

Urinary Incontinence

To decide on appropriate therapy for urinary incontinence, a correct diagnosis must first be made [17-13]. In some cases, it is simply a disruption of life patterns when a patient is admitted to the hospital, deep sleep after taking a hypnotic, or the absence of the usual night vessel near the bed [10,23]. Urinary incontinence often ceases when the patient returns to the usual course of life [2,19]. In other cases, it is necessary to wake the patient and offer them the opportunity to urinate [6-15].

Urinary incontinence can be a consequence of bladder inflammation in the presence of stones, prostate diseases, and in women urethral lesions, cystocele, etc. [6,19]. Most often, urinary incontinence in geriatric practice is observed in feeble-minded or demented patients, in CNS diseases such as stroke, brain tumor, myelitis, disseminated sclerosis, etc. [8,14].

In mentally healthy individuals, after eliminating local causes, reflex training for emptying after filling the bladder with antiseptic solutions can be applied [1,25]. In women suffering from urinary incontinence of central origin, a therapeutic effect can be obtained with repeated (twice a week) injections of testosterone propionate or preparations of similar action [5,18]. For bedridden patients, an inflatable rubber bedpan is necessary; for ambulatory patients, a urine collector (of different shapes for men and women) with a reservoir for collecting urine [15,17].

Constipation

Delayed bowel emptying, constipation, often becomes a serious problem for an elderly and old person, especially one forced to observe bed rest [9,17]. Very often, it is associated with the intake of food lacking ballast vegetables, fruits, coarse bread, etc.; lack of movement, deficit of fluid intake, taking medications, primarily hypnotics, sedatives, and analgesics [10,19]. When treating constipation, it should be taken into account that enemas in old people more often cause intestinal irritation than in younger people [2,23]. The same applies to rectal suppositories [7,14]. The main method of treating constipation should be diet and the correct regimen of the patient: lacto-vegetarian food rich in vegetables and fruits (apples, plums, prunes, raisins, dried apricots, etc.); walks whenever possible [15-21]. Only as a last resort is the systematic intake of herbal laxatives and small (150-200 g) enemas in the morning from a weak chamomile decoction used [16,18].

Fecal incontinence is often mistakenly perceived as an inevitable manifestation of old age [1,11,16]. With the correct diagnosis and appropriate treatment, in the vast majority of cases, this distressing phenomenon for the patient can be significantly reduced or even eliminated [2,5].

Clinically, incontinence is manifested by frequent or constant leakage of semi-formed stool, as well as the passage of formed stool 1-2 times a day into the bed or onto clothing [9-15].

The causes of incontinence are diverse [14,19]. Most often, it is the use of laxatives, proctitis, rectal prolapse, rectal cancer; less often ulcerative colitis of the rectum, Crohn's disease, malabsorption syndrome (impaired fluid absorption), ischemic colitis [2,17]. Fecal incontinence can be a consequence of impaired neurogenic control over defecation [10,23].

In patient care, attempts to prevent reflex emptying of the large intestine are important [3,7]. For example, if stool occurs after morning tea, its intake should be combined with being on the toilet or bedpan [8,13]. Agents that delay bowel emptying, enemas (preferably from chamomile decoction), and occasionally suppositories are indicated [1,18]. Treatment of the symptom of fecal incontinence requires a thoughtful assessment, joint decisions, and actions by both medical personnel and the patient themselves [5,4].

Rehabilitation

Restorative therapy, or rehabilitation, is viewed as a complex process that includes: medical rehabilitation treatment of the patient; psychological bringing them out of a state of psychological depression, reactive neurosis caused by the illness; social, or community restoration in the family and society; occupational, professional partial or complete restoration of working capacity [9-14]. The goal of rehabilitation is the adaptation of the patient or disabled person to daily life and the reduction of their dependence on others [11-15]. The entire treatment process from the first day of illness is essentially a process of medical rehabilitation, the success of which depends on how early it is started [2-15]. All types of rehabilitation are closely interconnected and aim to restore the patient's health to its usual state [10,16]. In elderly, and especially senile age, recovery processes occur more slowly and are less perfect, which causes a more protracted rehabilitation period and lower effectiveness of therapy aimed at improving the body, realizing its hidden adaptive capabilities, and restoring impaired functions [6,13,21]. Difficulties in conducting rehabilitation in geriatric practice are often associated with the combination of

pathological processes, the complexity of monitoring the course of treatment, often the presence of depression, a negative attitude towards the doctor's recommendations and in particular, drug therapy, and dementia of patients [4,5,7]. In this regard, great persistence must be shown in conducting restorative treatment for elderly and senile people, and the age-related characteristics of their physical and mental state must be taken into account with special thoroughness [1,2,5].

Restorative therapy, which became widespread in economically developed countries in the post-war period, has also taken its rightful place in the treatment of people of older age groups, primarily those who have suffered complications of atherosclerosis cerebral stroke and myocardial infarction, as well as traumatic injuries that easily occur in elderly and senile age due to age-related changes in the musculoskeletal system [4,9].

Particular difficulties, naturally, are caused by restorative therapy in those who have suffered acute cerebrovascular accidents, strokes with the development of hemiplegia [2,3]. However, even in these conditions in people of older age groups, significant successes can be achieved [8,12]. Timely undertaken and systematically conducted rehabilitation measures in most cases lead to functional recovery, allowing patients to care for themselves independently or only with minimal outside help [11,15].

Restorative treatment of elderly and senile people should be evaluated primarily from the point of view of social and moral advantages both for the patients and for those around them [1,10]. It also provides significant economic efficiency, as it frees a large number of medical personnel from caring for patients, as well as relatives who are often forced to leave their professional activities due to the need to care for a loved one [6,13].

In rehabilitation therapy, the effect of treatment depends enormously on the authority of the doctor and the patient's faith in the possibility of improving their health [2-9]. The patient's optimism, self-confidence, and will to recover largely depend on how responsibly the doctor and their assistants treat the management of chronic diseases and their complications [4-8].

When treating people of older age groups, particularly in restorative therapy, the doctor must take into account that the body of elderly and to a lesser extent an old, person possesses certain reserves and the ability to restore functions as a result of their proper training and stimulation [11,16].

A therapy plan with notification of the patient about its details has a great psychotherapeutic impact [13,21]. The justification of this plan improves the patient's well-being, strengthens their determination to fight for their recovery, relieves depression, and thoughts about the hopelessness of the condition [5,10]. The patient realizes that they are classified as a patient in whom functional recovery is possible [2,6]. As the condition improves, psychological preparation of the patient for further life should be carried out, taking into account the social environment to which they will have to return [4,12].

When implementing rehabilitation therapy at its various stages, drug therapy may have to be applied if necessary [8,14]. However, after the end of the acute period, the main means of treatment should be movement and gradual training, necessary both for restoring impaired functions of the limbs (in hemiplegia, traumatic injury, etc.) and for general homeostasis [1,26].

One of the important rules for training patients who have suffered acute cerebral circulatory disorders with paresis and paralysis, as well as injuries, is not to do for them that they can do themselves [5,11]. The patient must not be constantly helped, as they get used to it and do not want to make attempts at self-care [2,6]. Such dependence on others very often has a negative effect and disrupts the entire rehabilitation program [3,10]. Daily therapeutic physical exercises are very important for people of older age groups, since with irregular exercises, the successes already achieved are easily lost in the intervals between them [4,9].

It is necessary to take into account the principle of the integrity of the body, the enormous importance of reflex influences from the healthy part on the diseased part, and therefore to pay attention to exercises not only of the affected but also of the healthy part of the body [14,15]. With a lack of active movements in the healthy part of the body as well, joint stiffness, bone and muscle atrophy easily develop in elderly people, and especially in the very old, which reduces the possibility of compensating for the insufficiency of functions of the affected part [1,8].

The correct execution of therapeutic physical exercises is of great importance [2,5]. Initially, they must be performed at a very slow pace, which is especially important for patients with hemiplegia, in whom mental reactions are slowed down [3,11]. Only after the movement has been checked and is performed correctly is an increase in the pace of the exercise possible [4,6]. Group therapeutic physical exercises, which reduce the feeling of isolation, are highly desirable [1-9]. Rehabilitation departments should have special equipment mobile chairs, armchairs, supports that facilitate walking, etc. [1,3,6-10,16,17]. It is important to accustom the patient first to partial and then to complete self-care [2,8]. Mutual assistance, meals not in the ward but in the general dining room of the hospital, etc., are advisable [5,12].

One of the main factors of restorative therapy is well-organized occupational therapy, implemented taking into account the medical indications determined by the need to restore the functions of the affected part of the body, professional skills, and the psychological attitude of the patient [1, 4]. Occupational therapy helps relieve feelings of inferiority and helplessness [3, 9]. As functions are restored, the patient should engage in some kind of work, preferably within the framework of their usual hobby [2,6]. This creates a feeling of satisfaction and joy and helps restore mental balance [1,10].

In the complex of rehabilitation therapy, apparatus physiotherapy, massage, local hydrotherapeutic and thermal procedures are of great importance, especially necessary for the restoration of function in diseases of the musculoskeletal system [5, 8]. However, when carrying out these measures in elderly and senile people, great caution must be exercised due to the imperfection of the adaptive capabilities of their body and the possibility of paradoxical reactions to temperature and other stimuli [14,15].

The adaptive capabilities of the body of elderly and old people, regardless of their age, are positively affected by a training regimen [4,9]. An active motor regimen significantly expands the functional capabilities of the circulatory and respiratory systems; it eliminates the body's oxygen debt and has a very positive effect on the state of the blood coagulation and anticoagulation systems [2-3].

The question of the organizational forms of rehabilitation therapy for people of older age groups, the creation of special hospitals or departments for them, and the outpatient conduct of restorative therapy is highly relevant [1,6].

The success of therapy largely depends on how the social, community rehabilitation of the patient returning from the hospital to the family, to usual conditions, is carried out [5,10]. This is especially important for patients with residual phenomena of paresis and paralysis; they are usually ashamed of their physical disability [1,8]. It is necessary to suppress the patient's tendency towards isolation and depression even during the period of treatment in the hospital [2,9]. This requires not only psychological contact between the doctor and the patient but also close contact between the doctor and the patient's family [3,4]. The patient's relatives should be acquainted with the essence of the disease, its consequences, the prospects for restoring the affected functions, the rules for caring for the patient, and influencing their psyche [1,11]. In medical institutions for the treatment and rehabilitation of chronically ill patients, doctors on certain days of the week should conduct conversations with the relatives of patients returning to their home environment or who have already returned to their families [1,6]. During these conversation-consultations, many issues of both medical and social nature are clarified [5,12].

After returning home, the patient needs periodic monitoring by a reputable doctor and nurse capable of maintaining their optimism and faith in the possibility of improving their condition [2,8]. Otherwise, patients often fall into apathy, do not follow the prescribed regimen, and stop their assigned exercises and occupational therapy [4,9]. The result is a gradual loss of partially restored functions and a deterioration of the condition, which has a very negative impact on the patient's psyche, causing a relapse of feelings of hopelessness and depression [3,10]. It should not be forgotten that the improvement of health after restorative therapy is like the training of an athlete who loses what has been achieved if they stop training [1,3].

The creation of day hospitals for people of older age groups in need of restorative therapy, widely practiced in a number of countries, is a successful form that promotes more effective medical and social rehabilitation [2,5]. Patients, who are brought by special or city transport in the morning and taken away in the evening, receive the necessary physiotherapeutic procedures in these day hospitals, engage in occupational therapy, observe the required diet and rest regimen; they are periodically examined by a doctor [4,8]. Other forms also deserve a positive assessment the organization of clubs for the elderly with the possibility of occupational therapy, board games, etc., and various options for involving community activists to help elderly and old people in need of care [1,9]. All this can significantly reduce the workload of the medical personnel of district medical institutions [1,6].

An extremely important section of social restoration is occupational professional rehabilitation [5,11]. Along with medical, functional, and family-domestic rehabilitation, it is necessary for complete social recovery [2,3]. In most cases, for elderly and senile people, in order to utilize their working capacity, a reduction in the volume and intensity of the workload the creation of facilitated working conditions is necessary [4,10].

Labor activity certainly contributes to a faster restoration of health [1,8]. However, in order to achieve the fullest possible rehabilitation "from bed to workplace" a well-thought-out, phased methodological development of recovery programs in accordance with the disease profile is necessary [1,9]. Even in the hospital setting, and then during outpatient treatment, optimal physical and mental loads should be established according to the patient's profession [2,6]. The question must be resolved about

the possibility of easing the previous professional work, which is most desirable, or about the need to acquire new skills according to the type of occupation that is possible for the convalescent [5,12].

Medical and social services for old people should be built according to a unified system that, despite the different forms of assistance organized by healthcare and social welfare institutions, would achieve a single goal the preservation or restoration of the physical health of working people in the final periods of their lives [1,4].

Physiotherapy

When prescribing physical methods of treatment, it is necessary to take into account the characteristics of the aging body and, first of all, the cardiovascular system and changes in its reactivity [3,10]. The prescription of apparatus physiotherapy and balneological procedures must be preceded by a thorough clinical investigation and study of the function of the cardiovascular system [2,8]. It should be borne in mind that all types of treatment with physical methods exert not only a local but also a general effect through the CNS, requiring the mobilization of often significant reserves, which the body of elderly and especially an old, person, as a rule, does not possess [1,9].

Taking into account the imperfection of regulatory and adaptive mechanisms in elderly and senile age, it is necessary to determine the duration, intensity, and area of application of procedures in accordance with the patient's condition [1,6]. In many cases, the intervals between treatment sessions should be increased [4,11]. Due to the prolonged recovery period, a longer rest is necessary immediately after the procedures [2,5]. The entire daily regimen and the loads associated with treatment by other methods and the patient's usual activities must be considered [1,8].

Galvanization and electrophoresis at low current strength are most effective [3,10]. Thermal stimuli in elderly and old people cause very weak and delayed compensatory reactions of the skin capillaries [1,9]. Often, they are inadequate and even paradoxical, and in response to the action of a thermal stimulus, not dilation but constriction of the peripheral vascular network is observed [2,6]. Sensitivity to UV irradiation is increased [4,12]. As a rule, medicinal electrophoresis, ultrasound treatment with the introduction of medications from the skin, local application of UHF therapy, and Bernard (diadynamic) currents in reduced dosages are well tolerated [1,5]. As an equivalent to a course of treatment with injections of 2% novocaine solution, the introduction of 5% novocaine solution by electrophoresis (from the positive pole) can be recommended [3,8].

When conducting electroprocedures, the reduced sensitivity of the skin nerve endings to stimuli, its trophic disturbances, and easy traumatization should be taken into account [1,4]. Skin after burns caused by overdose or incorrect application of electrodes recovers very poorly; persistent trophic disorders often occur [2,9].

Great caution must be exercised when prescribing and conducting hydrotherapy [1,7]. Elderly people with a satisfactory state of the cardiovascular system, as a rule, tolerate oxygen, nitrogen, and iodine-bromine baths well [5,10]. Sulfide baths, which should be recommended only as a local procedure on the extremities, place a heavy load on the cardiovascular system [1,3]. An unfavorable effect on coronary circulation in people with coronary sclerosis and a tendency to exacerbation of coronary insufficiency is often observed with the use of carbonic (Narzan) baths [2,8]. They can be prescribed in a hospital or sanatorium setting to patients over 60

years of age only after a strict assessment of the patient's condition and study of electrocardiographic data; as a rule, these baths are prescribed to patients who have already been successfully treated with them in the recent past [1,11]. The intake of carbonic baths should be preceded by pine or oxygen baths [4,9]. Underwater massage is a heavy load for an elderly person [1,5]. Intestinal lavages should be done only in a horizontal position [2,6].

Physiotherapy methods play a crucial role in the prevention of premature aging and the treatment of diseases, especially during the rehabilitation period [3,10]. While the usual routes of drug therapy and rehabilitation often lead to the development of intoxication and allergic reactions, physiotherapy methods, as a rule, allow avoiding this danger, which is one of their great advantages [1,8].

Treatment at Health Resorts

The established idea that people over 60 can be sent for rest and treatment only to health resorts close to their permanent place of residence, and that the application of intensive balneotherapy methods is inadmissible, although still valid, in many cases no longer satisfies either the doctor or the patient [1,4]. This mainly applies to people up to the age of 65-70 with chronic diseases of the musculoskeletal system, peripheral nervous system, digestive apparatus, liver, and kidneys, for whom the most effective therapy can often be carried out at resorts whose climate differs from the local one and requires adaptation [2,9]. Often this also applies to people for whom staying at a resort, as well as participating in tourist trips, is a habitual factor [5,17]. The correct path of treatment for an elderly person can be found by taking into account not only changes in the structure and functions of the body, which is certainly mandatory, but also the patient's life history and lifestyle [1,18]. The question of treatment at a resort is decided differently for a patient being sent repeatedly, when their reaction to climate change and treatment in the recent past is known, and for a patient being sent for the first time or after a long break, when significant shifts in health status have occurred [1,3].

Before deciding to send an elderly person for sanatorium-resort treatment, it is necessary to conduct a particularly thorough clinical investigation using various methods of functional diagnostics to exclude latently occurring diseases (neoplasms, coronary insufficiency, etc.) and to correctly assess the functional capabilities of the body [2,5].

Use of Medications

When treating elderly and senile people, it is necessary to take into account that drug therapy must be only one of the links in the complex of therapeutic measures [1,5].

Self-medication is unacceptable for elderly and old people [1,6]. It often contributes to the further development of diseases, quite often progressing into severe, incurable forms [4,9]. The risk of adverse side reactions in people over 60 years of age compared to people aged 30–40, as well as the hospitalization of senile people due to complications after drug therapy, increases by 1.5–2 times [2,3]. The greatest number of deaths associated with drug therapy occurs in the 80–90 age group [1,8].

When conducting drug therapy in elderly and old people, even as a result of purely age-related changes in their organs and systems, there is an increased risk of toxic manifestations of cumulation, undesirable biological effects of drugs on the body, interactions between individual agents, and persistent hypersensitivity to an

agent, in many cases caused by its intake in previous years [1,4].

With aging, both the pharmacokinetics and pharmacodynamics of medicinal substances change in the human body, being disturbed at different levels: absorption in the gastrointestinal tract, hepatic metabolism, biological transport, excretion, sensitivity, and receptor response [5,9].

Absorption

The peroral method of drug administration is used most frequently in geriatric practice [2,10]. Physiological age-related changes in the gastrointestinal tract, which are highly individual in aging people, can be the cause of significant changes in the absorption of orally administered medicinal substances [1,3]. Both the rate and the efficiency of the absorption process change [1,6].

Studies of the gastrointestinal tract of practically healthy elderly and senile people show hypokinesia of the stomach and intestines progressing with age [4,8]. The general tone of various parts of the stomach regularly decreases during the aging process [2,5]. This often causes a decrease in the evacuation capacity of the stomach and slower passage of ingested medications into the intestine [1,9]. Since the site of maximum absorption is the small intestine due to the larger surface area of its mucous membrane compared to the stomach and large intestine, delayed evacuation of the drug from the stomach reduces its absorption rate [1,3].

Drugs with a short half-life are particularly sensitive to delayed gastric emptying [4,10]. A decrease in the rate of drug evacuation in combination with normal or accelerated elimination can prevent the achievement of its therapeutic concentration in plasma and tissues [2,6]. Delayed gastric emptying can have an undesirable effect on acid-labile drugs (e.g., penicillin) [1,8].

A decrease in the absorption rate of medicinal substances in people of older age groups can be caused by concomitant diseases, as well as by an age-related reduction in blood flow in the intestinal mucosa [1,5]. All these factors require the doctor to exercise special caution when choosing doses, routes of administration, and frequency of drug intake in geriatric patients [4,9].

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