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**Master's Thesis**

**THE SPECIAL ASPECTS OF NURSING PROCESS IN RHEUMATOID  
ARTHRITIS**

**Master of Science in Nursing**

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**Master thesis abstract**  
**THE SPECIAL ASPECTS OF NURSING PROCESS IN**  
**RHEUMATOID ARTHRITIS**

the purpose

Rheumatoid arthritis is one of the most common diseases, which is not only a serious medical concern, but also an important socio-economic problem, since it holds one of the leading positions among the causes of temporary and permanent disability in the population, leading to immense economic losses. The disease is characterized by high disability rates (up to 70%). Disability is occurring early; 50% of RA patients become physically challenged within the first 5 years from the onset of disease. The main causes of death in this disease include infectious complications and renal failure.

methods

The study has determined the typical problems of patients with Rheumatoid arthritis and evaluated their quality of life. The study has investigated the etiological factors and the pathogenesis of rheumatoid arthritis. This work has established the main goals, the structure and the methods of nursing process when working with patients with rheumatoid arthritis.

Findings

The nurse is responsible for the timely and correct implementation of the doctor's orders regarding: diet, physical activity and rest, medication intake; preparing patients for additional imaging and laboratory tests, physical therapy and physical therapy. The nurse monitors the side effects of treatment and educates the patient about the importance of adequate physical activity and regular physical therapy, as well as the importance of physical therapy procedures and rehabilitation measures to maintain and increase functional capacity.

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## LIST OF ABBREVIATIONS

**COX** = cyclooxygenase

**CRP** = C-reactive protein

**ESR** = erythrocyte sedimentation rate

**ET** = exercise therapy

**FC** = functional class (grade)

**GCS** = glucocorticosteroids

**IL** = interleukin

**MRI** = magnetic resonance imaging

**NSAIDs** = nonsteroidal anti-inflammatory drugs

**PG** = prostaglandin(s)

**RA** = rheumatoid arthritis

**RF** = rheumatoid factor

**TNF** = tumor necrosis factor

**UV radiation** = ultraviolet radiation

**VAS** = visual analogue scale of pain assessment

## INTRODUCTION

**Rheumatoid arthritis (RA)** is a systemic inflammatory disease of the connective tissue involving predominantly small joints in the form of erosive-destructive polyarthritis of unknown origin and with a complex autoimmune-mediated pathogenesis [5]. The initial manifestation of the disease may appear after exposure to intense exercise or emotional stress, during hormonal restructuring, after an infection or due to exposure to other adverse factors [2]. The main therapeutic focus is on pain management, slowing down the progress of the disease and restoration of damage using surgical techniques [9]. Early detection of the disease using contemporary modalities may substantially reduce the damage, which may be inflicted on joints and other tissues [16].

RA reduces human life expectancy by an average of 3-12 years. Regardless of other risk factors, such as diabetes, alcohol abuse, elevated cholesterol levels and obesity, the risk of heart disease in people with RA is twice as high [44]. The mechanism behind the increased risk for heart disease is unknown; chronic inflammation is believed to be a major factor. The use of new biologicals may increase life expectancy and reduce cardiovascular risks, as well as slow down the development of atherosclerosis [52]. Limited studies have demonstrated reduced risk of cardiovascular disease; at the same time, an increase in total cholesterol level is observed in a setting of intact atherogenic index [22, 44].

***The background of the study.*** RA is one of the most common diseases, which is not only a serious medical concern, but also an important socio-economic problem, since it holds one of the leading positions among the causes of temporary and permanent disability in the population, leading to immense economic losses [30].

The disease is characterized by high disability rates (up to 70%). Disability is occurring early; 50% of RA patients become physically challenged within the first 5 years from the onset of disease. After 20 years from the onset of the disease, 90% of the patients become physically challenged to a greater or lesser extent [24].

RA is one of the most common types of joint damage and one of the main causes of incapacity to work, which causes deterioration in the quality of life and

significant financial expenses [30]. A significant reduction in the quality of life of patients with RA is due to pain, limited mobility and loss of functional activity, and often self-care deficits [38].

Together with coronary heart disease, alcoholism, depression and diabetes, RA is among the factors, which are most commonly associated with long-term health problems [41]. RA has negative psychological and economic ramifications not only in those suffering from it, but also in their significant others, as well as in the society as a whole. This is of special importance when the patient is young and of productive age [52].

Survival rates of inadequately treated patients with RA are comparable to those in patients with diabetes mellitus, stroke and three vessel coronary heart disease [42]. Such high mortality rates are largely attributable to comorbidities (involvement of cardiovascular disease, kidney disease, infectious complications and osteoporotic fractures), which develop as a result of immunological RA-associated disorders [44].

The main causes of death in this disease include infectious complications and renal failure [47].

**Epidemiology.** RA is the most common human autoimmune disease, which is registered in all countries of the world and in all climatic zones and geographic regions, as well as in people of all ages, races and ethnic groups [23]. The prevalence is 0.5–1% (up to 5% in the elderly) in the developed countries [30]. From 5 to 50 people per 100,000 of the population get RA every year. Thus, approximately 49 thousand people died from RA worldwide in 2010 [47].

The average age of onset of the disease is 40-50 years for females and somewhat later for males. Females are affected 3-5 times more often than males [15].

In recent years, it has been convincingly shown that the only real way to stop the steady progression of the disease is the earliest possible diagnosis and early initiation of active treatment, which should then be conducted in a long and continuous fashion under careful efficacy and tolerability monitoring [29]. Therefore, the importance of early detection and adequate treatment of RA and patient care is beyond doubt [52].

### **The aim of the study**

Based on global experience in treatment of patients with RA and to provide scientific rationale for the principles guiding the organization of nursing process in this disease, as well as the goals and the structure of this process.

### **Study objectives**

1. To investigate the etiological factors and the pathogenesis of RA and its diagnostic criteria. To characterize the principles of treatment and the modern techniques employed.
2. To define the goals/the structure of and the methods for implementing the nursing process when working with patients with RA.
3. To present the typical problems of patients with RA and to assess their quality of life.

### **The object of research**

Provision of nursing care to patients with RA.

### **The subject of research**

The factors that define the quality of nursing care in patients with RA.

### **The methods of study:**

Epidemiological, statistical and clinical methods (observation, comparison and measurement).

### **The scientific and practical value of the study.**

The results of the research study deepen the knowledge of the etiological factors and pathogenesis of RA, its diagnostic criteria and principles of treatment. In course of the study, the investigator has defined the main goals, the structure and the methods of providing nursing care when working with patients with RA. The study has determined the typical problems of patients with RA and evaluated their quality of life.



**CHAPTER 1.**  
**ETIOLOGICAL FACTORS, PATHOGENESIS AND DIAGNOSTIC**  
**CRITERIA OF RHEUMATOID ARTHRITIS**  
**(LITERATURE REVIEW)**

**1. Etiological factors and pathogenesis of rheumatoid arthritis.**

It is currently unknown what causes the disease. Indirect evidence, such as elevated white blood cell counts and increased erythrocyte sedimentation rate (ESR) suggest an infectious origin [9]. The disease is believed to develop as a result of an infection causing immune system disorders in genetically predisposed individuals; in this case, so-called immune complexes (made of antibodies and microbial bodies) are formed, which are deposited in the tissues and lead to joint damage [43].

As with most autoimmune diseases, 3 major factors can be distinguished (referred to as the rheumatological triad) [26]:

**1. Genetic predisposition** [6, 21, 53]:

- Hereditary susceptibility to autoimmune reactions;
- The disease is more frequent in carriers of a particular MHC class II antigen: HLA – DR1, DR4.

**2. Infectious factors**, i.e. the hypothetical triggers of rheumatic disease, include the following:

- Paramyxoviridae, i.e. the viruses of mumps, measles and respiratory syncytial infection;
- Hepadnaviridae, i.e. the hepatitis B virus (HBV);
- Herpesviridae, i.e. herpes simplex virus, herpes zoster virus, cytomegalovirus and Epstein-Barr virus (the levels of this virus are significantly higher in the synovial fluid of patients with RA);
- Retroviruses, e.g. the T-lymphotropic virus.

**3. External trigger (hypothermia, hyperinsolation, intoxication, mutagenic drugs, endocrinopathies, stress).** In women, longer duration of breastfeeding reduces the likelihood of developing RA. Breastfeeding for 24 months and longer reduces the risk of developing RA by half.

RA is an autoimmune disease [37]. This group of diseases is characterized by changes in the behavior of defense cells, i.e. the lymphocytes. Rather than performing active “search-and-destroy missions” against invasive bacteria, fungi and viruses, the lymphocytes begin attacking the body’s own healthy cells. This abnormal process of impaired interaction of immune system cells involved in the immune response includes the following stages [4, 26]:

- Synovial cells acquire the features of macrophages, produce pro-inflammatory cytokines (primarily tumor necrosis factor alpha and interleukin 1 [IL-1]), become antigen-presenting cells and cause activation of type 1 T-helpers.
- Large numbers of type 1 T-helpers appear in the synovial fluid and synovial membrane of the joint, which produce gamma interferon and activate macrophages.
- Activated macrophages and monocytes produce pro-inflammatory cytokines, such as tumor necrosis factor alpha, IL-1 and IL-6.
- An increase of IL-8 levels in the synovial fluid causes a high concentration of neutrophils in it.
- IL-1 causes fever and osteoclast activation, which contributes to osteoporosis of the subchondral plate of bone. Tumor necrosis factor causes adhesion molecules to appear on the surface of endothelial cells contributing to exudation and causing wasting, anemia and chronic inflammation. By activating hepatocytes, IL-6 increases hepatocytic production of C-reactive protein and activates B-lymphocytes (i.e. their conversion into plasma cells).
- The levels of immunoglobulin-producing plasma cells are significantly increased in the blood.
- There is a sharp increase in the concentrations of IgMs and IgGs to the modified Fc region of IgG antibody (also referred to as rheumatoid factors) in the blood and in the synovial fluid of 80% of patients.
- The production of the endothelial growth factor contributes to proliferation of synovial tissue capillaries. The angiogenesis and proliferation of active fibroblasts and synoviocytes lead to the formation of pannus, an aggressive tissue with tumor-like growth properties, which is capable of penetration into

the cartilage and the articular surface of the bone (thereby forming erosions), and into the ligamentous apparatus. [28]. The clone of uncontrollably replicating and aggressive synoviocytes, which constitute the pannus, is formed at relatively late stages, i.e. several months from the onset of the disease.

- The formation of immune complexes in the blood as a result of IgG interacting with rheumatoid factors leads to complement activation and microcirculatory damage, which explains the visceral manifestations of RA. At late stages, the proliferative processes (i.e. pannus growth) may be independent of autoimmune-mediated mechanisms and be maintained autonomously [38].

## **1.2. Clinical manifestations of rheumatoid arthritis.**

The progression of RA involves three stages [8]. The first stage involves a periarticular edema of synovial bursae, which causes pain, local hyperthermia and swelling around the affected joints. Second stage involves a fast division of cells leading to induration of synovial membrane. In the third stage, the inflamed cells release an enzyme that destroys bones and cartilage, which often leads to deformities in the affected joints, increased pain and loss of motor function [38].

As a rule, the initial progression of the disease is slow, with a gradual unfolding of clinical symptoms over several months or years; subacute or acute course is much less frequent. In approximately 2/3 of the cases, the disease manifests as polyarthritis; in the rest of the cases, it manifests as mono- or oligoarthritis. Moreover, the articular syndrome often has no clinical specifics, which greatly impedes differential diagnosis [29]. The articular syndrome is characterized by the presence of morning stiffness lasting more than 30 minutes and similar manifestations of “tight gloves” and “body slimmer” later in the day, and by continuous and spontaneous joint pain that gets worse with active movements [17]. The duration of stiffness depends on the activity of the process: the higher the activity, the longer the stiffness. The articular syndrome in RA is characterized by its monotonous course, substantial duration and persistence of residual phenomena after treatment. [5]. The clinical presentation may include prodromal clinical

manifestations (insignificant transient pain and the relatedness of pain to meteorological conditions and disorders of the autonomous nervous system) [29].

Clinical experts differentiate between the involved joints and the excluded joints. The involved joints include (in order of incidence): II and III metacarpophalangeal joints, proximal interphalangeal joints, metatarsophalangeal joints, knee joints and radiocarpal joints, elbow joints and ankle (talocrural) joints. The excluded joints include the following: distal interphalangeal joints, I metacarpophalangeal joint (of the thumb of the hand). RA is often associated with other diseases of the joints, such as osteoarthritis, rheumatism and systemic connective tissue disease [17].

RA may start with any joint in the body, but the most frequent sites of onset include small joints on the fingers, hands and wrists. The involvement of the joints is usually symmetrical; that is, if there is pain in the right hand joint, soon there will be pain in its counterpart in the left hand. The more joints are affected, the more advanced the stage of the disease is [24].

Already in the initial period of RA, the process involves the joints of the hands and radiocarpal joints, which constitute a single functional unit. Metacarpophalangeal and proximal interphalangeal joints are primarily affected. The progression of the process is leading to formation of various subluxations and deformities [17].

The most typical signs of rheumatoid arthritis is the ulnar deviation of the hand, i.e. deviation of the fingers towards the ulnar bone due to subluxations of metacarpophalangeal joints caused by inflammation and weakness of the muscular-ligamentous apparatus and reduction (flattening) of the arches of the hand. Such a peculiar shape of the hand is referred to as walrus deformity. The deformity of fingers in the shape of “swan’s neck” occurs in formation of a flexion contracture in metacarpophalangeal joints and in hyperextension of proximal interphalangeal joints/flexion of distal interphalangeal joints. The boutonniere deformity of the fingers may occur due to manifest flexion of metacarpophalangeal joints in a setting of hyperextension of distal interphalangeal joints [17].

All of these hand deformities dramatically limit its function, impede casual movements, elements of self-care and professional activity, ultimately leading to disability [38].

Other frequent symptoms include fatigue, the so-called “asthenovegetative syndrome” and morning stiffness. The duration of stiffness usually correlates with the activity of the disease. Typical characteristics include muscle pain, loss of appetite, depression, weight loss, anemia, cold and/or sweaty palms and feet, and impaired function of salivary and lacrimal glands, which results in insufficient production of tears and saliva [42].

Extra-articular manifestations are not infrequent in RA, which may include cardiovascular manifestations (e.g. pericarditis, vasculitis, granulomatous valve disease and atherosclerosis) and respiratory manifestations (pleurisy and interstitial disease). Typical skin changes include the following: rheumatoid nodules, thickening and hypotrophy, vasculitis and livedo reticularis. Nervous system lesions include the following: compression neuropathy, sensorimotor neuropathy, multiple mononeuritis and cervical myelitis [44]. On the part of the organ of vision, the following lesions are possible: dry keratoconjunctivitis, episcleritis, scleritis, peripheral ulcerative keratopathy. Renal damage is frequent in the form of amyloidosis, vasculitis,

nephritis and nephropathy associated with prolonged administration of nonsteroidal anti-inflammatory drugs. Peripheral blood problems may include anemia, thrombocytosis and neutropenia [41].

The clinical course of rheumatoid arthritis may have the following variants [49]:

***Classic variant*** (symmetrical involvement of both small and large joints, with a slowly progressive course).

***Mono- or oligoarthritis involving predominantly large joints***, more often knee joints. The onset of the disease is apparent and manifest; all signs are reversible within 1–1.5 months (the arthralgias are of migrating nature, radiological changes are absent, and anti-inflammatory drugs have a relatively positive effect; however, all the characteristic symptoms of rheumatoid arthritis subsequently occur).

***Rheumatoid arthritis with pseudoseptic syndrome*** (this type is accompanied by a hectic-type fever, chills, hyperhidrosis, weight loss and development of amyotrophy, anemia, vasculitis and visceritis; in some cases, the clinical signs of arthritis fade into the background).

***Felty syndrome*** (a combination of polyarthritis and splenomegaly; a possible variant may be without splenomegaly, but with leukocytopenia, neutropenia and visceritis).

***Still syndrome.***

***Juvenile rheumatoid arthritis*** (the onset of the disease is in the persons younger than 16 years of age): allergic septic syndrome; a articular-visceral form with limited visceritis.

***Articular-visceral form:*** the presentation includes rheumatoid vasculitis; damage to the heart, lungs, kidneys and digestive organs; nervous system damage.

### **1.3. Diagnosis of rheumatoid arthritis.**

To date, there is no test or sign that would unequivocally confirm or rule out the diagnosis of RA. The diagnosis of the disease is based on detecting the set of the most common manifestations [25].

A number of tests needs to be performed in order to establish the diagnosis of RA [29], such as the following:

***assessment of subjective symptoms:*** the duration and severity of morning stiffness; the duration of deterioration in well-being; limited range of motion in the joints.

***clinical assessment:*** identification of extra-articular manifestations; assessment of functional status or quality of life.

***additional assessments:*** ESR, C-reactive protein (CRP), serum rheumatoid factor (RF), serum electrolytes; hepatic enzymes, protein fractions, creatinine; urinalysis, synovial fluid examination; test of feces for occult blood; radiographic imaging of the joints (hands and/or feet).

The most advanced test is the titer of antibodies to cyclic citrullinated peptide (CCP), i.e. anti-CCP (the specificity of this test result is approximately 90%); of note, these antibodies are present in the serum of 79% patients with RA [35].

The diagnostically important special clinical aspects include lack of skin color changes over inflamed joints, development of tendosynovitis of the flexor or extensor muscles of the fingers and the formation of amyotrophies, typical hand deformities known as the so-called "rheumatoid hand" [17].

In a setting of early RA, magnetic resonance imaging (MRI) and Doppler ultrasonography are more sensitive for detecting joint damage than X-rays [31].

#### ***Diagnostic criteria of RA [37]:***

1. Morning stiffness of 1 hour and longer, for more than 6 weeks.
2. Swelling of 3 and more joints that lasts for at least 6 weeks.
3. Hand arthritis that lasts for at least 6 weeks.
4. Symmetric arthritis that lasts for at least 6 weeks.
5. Rheumatoid nodules. Subcutaneous nodules on protruding areas of bones and extensor surfaces or around the joints (as identified by the physician).

6. RF-positive serum detected with any available method, where the positive result in the control group of healthy individuals is < 5%.

7. Typical radiological changes.

The diagnosis of RA is considered veritable when no less than 4 criteria are present. In 90% of the patients where RA diagnosis is challenging and no RF is detectable in the serum, citrulline antibodies can be detected in the blood.

***The criteria of unfavorable prognosis include the following:*** [29]:

- involvement of previously intact joints with the next flare;
- the systemic nature of the disease; persisting activity of the disease where no remission has occurred over one year;
- persisting ESR elevation;
- early (up to four months from onset) radiological changes in the affected joints, i.e. rapid progression of destructive changes; persistence of HLA-DR4 antigens;
- poor tolerability of disease-modifying drugs.

#### **1.4. Classification of rheumatoid arthritis.**

***In terms of clinical manifestations (stages)*** [24]:

---

- very early: duration up to 6 months;
- early: 6-12 months;
- advanced: more than a year;
- late: more than two years.

***According to ICD-10*** [38]:

M 05. Seropositive rheumatoid arthritis.

M 05.0. Felty syndrome (rheumatoid arthritis with splenomegaly and leukopenia).

M 05.3. Rheumatoid arthritis with involvement of other organs and systems.

M 05.8. Other types of rheumatoid arthritis.

M 05.9. Seropositive rheumatoid arthritis not otherwise specified.

M 06. Other types of rheumatoid arthritis.

M 06.0. Seronegative rheumatoid arthritis.

M 06.1. Still disease in adults.



- M 06.2. Rheumatoid bursitis.
- M 06.3. Rheumatoid nodule.
- M 06.8. Otherwise specified rheumatoid arthritis.
- M 06.9. Rheumatoid arthritis not otherwise specified.
- M 08.0. Juvenile rheumatoid arthritis.

**According to disease activity [41]:**

- 0: remission;
- I: low;
- II: moderate;
- III: high.

The disease activity is determined by the duration of morning stiffness, by pain assessment and by ESR and CRP levels (see Table 1).

**Table 1.**  
**The degree of activity of RA**

<b>Parameter / The degree of activity of RA</b>	<b>0</b>	<b>I</b>	<b>II</b>	<b>III</b>
Morning stiffness	absent	30–60 minutes	until midday	during the day
Pain, on VAS (cm) *	absent	less than 3	4–6	> 6
ESR, mm/h	< 15	16–30	31–45	> 40
CRP, units	< 1	< 2	< 3	> 3

\* **VAS** = visual analogue scale of pain assessment. Using the numerical scale, the patient scores the severity of their pain from 0 to 10 (where 0 stands for no pain, and 10 stands for intolerable pain). During VAS self-reporting of pain, the patients place a separating mark designating the severity of their pain; the unmarked 10 cm-long segment of the scale on the left side is designated as “no pain”, and the respective segment on the right side is designated as “intolerable pain”. The severity of pain is measured as the distance (in mm) from the left end of the scale. During

pain assessment, the investigator should clarify over what period of time it is being assessed (e.g., the average pain intensity over the past week).

***The morphological stage of RA [42]:***

- I. Synovitis (acute, subacute, chronic).
- II. Productive dystrophic.
- III. Ankylosing.

***The imaging characteristics [24]:***

- The presence of erosion;
- The radiological stage of RA according to Steinbrocker:
  - I: periarticular osteoporosis;
  - II: osteoporosis + narrowing of the joint space (isolated attritions may be present);
  - III: same as Stage II + multiple attritions;
  - IV: same as Stage III + bone ankylosis.

***Immunological characteristics [25]:***

- Rheumatoid factor: seropositive/seronegative;
- Anti-CCP: seropositive/seronegative.

***According to functional classes (FC) [37]:***

- **FC I:** preserved capacity for self care and non-professional/professional activities;
- **FC II:** preserved capacity for self care and non-professional activities; impaired professional activities;
- **FC III:** preserved capacity for self care; impaired capacity for professional and non-professional activities;
- **FC IV:** all types of activities are impaired.

**CHAPTER 2.**  
**CONTEMPORARY VIEWS OF THE PRINCIPLES OF TREATMENT**  
**OF RHEUMATOID ARTHRITIS**

**2.1. Diet therapy of rheumatoid arthritis.**

There is an ongoing investigation of therapeutic approaches to RA using not only pharmacotherapeutic and biological modalities, but also combination approaches, which include diet therapy, functional improvement of gastrointestinal tract and elimination of vitamin and microelement deficiencies [14].

An important consideration in the treatment of RA is prevention of osteoporosis, i.e. restoration of impaired calcium balance by increasing its intestinal absorption and reducing elimination of calcium from the body. An essential component in the package of anti-osteoporotic measures is a high-calcium diet [24]. Sources of calcium include dairy products (especially hard cheese, which contains 600 to 1000 mg of calcium per 100 g of the product, as well as cheese spread; to a lesser extent, high-calcium products include cottage cheese, milk or sour cream), almonds, hazelnuts and walnuts, as well as calcium supplements combined with the fat-soluble vitamin D or its active metabolites. Vitamin D has been shown to play a role in reducing auto-aggression and improving immunity in patients with RA [13]. It is vitamin D to act as the main supportive element in the diet of patients with RA; high concentrations of vitamin D are found in fatty fish varieties; proper assimilation of vitamin D requires the diet to be rich in fruits and vegetables. Much depends on where the patient lives. For example, the residents of Northern regions have a special need in a diet rich in vitamins and minerals. Vitamin supplements and cod-liver oil are alternative acceptable sources of vitamin D[24].

Many patients may benefit from the Mediterranean diet that produces anti-inflammatory effects due to the protective properties of polyunsaturated fatty acids and omega-3 vitamins and the positive effects on intestinal microbiome. To achieve these benefits, it is recommended to eat fish, legumes, soybeans and walnuts. Prolonged dietary consumption of fish and other sources of polyunsaturated fatty acids is protective against the development of RA. Cold-pressed flaxseed oil, added to everyday dishes, will also be useful. [37].

It should be borne in mind that almost all drugs prescribed for RA have side effects. If it is not possible to avoid using anti-inflammatory drugs, greater attention should be paid to protecting the compromised gastric mucosa. It is recommended to take most of these drugs after meals. In some cases, splitting the daily diet into smaller more frequent meals is beneficial [24].

Special attention should be paid to the foods that will need to be excluded from the diet. Complications may be triggered by allergen- and histamine-containing foods. In order to alleviate the condition of the patient in the acute stage of RA, the following foods should be excluded: sugar-containing products containing large amounts of carbohydrates, including those of natural origin (such as honey). The patient should take care to avoid the food products that enhance excretion of calcium from the body, such as caffeine-containing drinks and such vegetables as sorrel, rhubarb, spinach and cauliflower. Alcohol and dietary salt should be restricted as well [13]. In order to prevent overloading the body with large amounts of carbohydrates, carbonated drinks, pastries, sweets and chocolate should be excluded; natural sweeteners should be used instead of sugar if necessary. The contraindicated foods also include broths, spices, smoked and salty foods, and canned fish, meat or vegetables. Fermented foods should be used with caution [24].

## **2.2. Drug treatment of rheumatoid arthritis.**

When an infection (i.e. tuberculosis, yersiniosis) is present or suspected, treatment with appropriate antibacterial drugs will be necessary. In the absence of overt extra-articular manifestations (e.g. high-grade fever, Felty syndrome or polyneuropathy), the treatment of articular syndrome is started with selection of nonsteroidal anti-inflammatory drugs (NSAIDs) [24]. Corticosteroids can be injected into the most inflamed joints [27]. The immune complex-mediated nature of the disease provides the rationale for courses of plasmapheresis, which in most cases gives a pronounced effect. The instable results of this therapy are an indication for adding the so-called disease-modifying drugs. [24]. The latter drugs are acting slowly, therefore they should be used for not less than 6 months, and in a decisively positive effect the treatment will have to continue longer (for years) [15].

An important constituent of treatment is exercise therapy (ET) aimed at maintaining maximum range of motion in the joints and maintaining muscle mass [24].

Physiotherapeutic procedures (i.e. electrophoresis with non-steroidal anti-inflammatory drugs, phonophoresis with hydrocortisone, applications with dimethyl sulfoxide) and health resort treatment are of auxiliary importance and are only used when the arthritis is mild in severity. In a refractory mono- and oligoarthritis, synovectomy is performed either by intra-articular administration of radioactive isotopes of gold or yttrium (radiosynovectomy), or with classic surgical approaches. In persisting deformities of joints, reconstructive surgeries are performed [3].

Systemic pharmacological therapy includes the use of four classes of drugs: symptomatic treatments, i.e. nonsteroidal anti-inflammatory drugs (NSAIDs) and glucocorticosteroids (GCS); disease-modifying (basic) anti-rheumatic drugs, genetically engineered biologicals (disease-modifying biologic agents) and cytostatic immunosuppressants [24, 27].

***Nonsteroidal anti-inflammatory drugs.*** Modern NSAIDs have a pronounced anti-inflammatory effect, which is due to the inhibition of the activity of cyclooxygenase (COX), a key enzyme in the metabolism of arachidonic acid. The discovery of two COX isoforms, which have been defined as COX-1 and COX-2, is of particular interest; these isoforms are playing different roles in the regulation of prostaglandin (PG) synthesis. NSAIDs have been demonstrated to inhibit the activity of COX isoforms, but their anti-inflammatory activity is due to inhibition of specifically COX-2 [24]. Most known NSAIDs primarily suppress the activity of COX-1, which explains the occurrence of complications such as NSAID-induced gastropathy (in particular, the formation of erosions and ulcers), renal impairment, encephalopathy and hepatotoxicity [5].

Therefore, depending on the type of COX blockage, NSAIDs are divided into non-selective COX inhibitors and COX-2 inhibitors (also referred to as “coxibs”). The representatives of relatively selective COX-2 inhibitors include meloxicam, lornoxicam and other representatives of the “oxicam” class and nimesulide [38]. The representatives of highly selective COX-2 inhibitors include celecoxib and etoricoxib. These drugs have minimal gastrointestinal side effects while maintaining high anti-inflammatory and analgesic activity. COX-2 inhibitors can be used in all RA treatment programs where the use of NSAIDs is required [41]. At the start of treatment, when the inflammation is still active, meloxicam is prescribed at the dose of 15 mg/day, with subsequent step-down to 7.5 mg/day as maintenance therapy. Nimesulide is prescribed at the dose of 100 mg twice a day [42].

Celecoxib, a specific COX-2 inhibitor, is administered at 100–200 mg twice a day. No dose adjustment is required in elderly individuals. However, patients with body weight below average (50 kg or less) may need to start treatment with the lowest recommended dose [24].

Concomitant use of two or more NSAIDs should be avoided, since their efficacy remains unchanged, and the risk for adverse effects is significantly increased [32].

***Glucocorticosteroids.*** A novel approach includes the use of high-dose GCS (“steroid burst therapy”) in combination with slow-acting drugs, which allows increasing the efficacy of the latter. Favorable results have been obtained with combinations of methotrexate with aminoquinoline derivatives, gold salts, sulfasalazine, as well as cyclosporine, a selective immunosuppressant [27].

GCS therapy is used in highly active inflammation. Of note, RA with systemic manifestations is managed with steroid burst therapy (with GCS alone or combined with a cytostatic, e.g. cyclophosphamide); RA without systemic manifestations is managed with a course-based steroid treatment. GCS schedules are also used as a maintenance anti-inflammatory therapy in lack of effectiveness of other drugs [5].

In a number of cases, GCS may be used as topical treatment. Indications to use this class of drugs include: predominantly mono- or oligoarthritis of major joints; protracted exudation in the joint; the predominance of "local status" over systemic status; the presence of contraindications to systemic GCS use. With intra-articular administration, depot corticosteroids may have systemic effects. Prolonged-action betamethasone dipropionate is a drug of choice [27].

***Disease-modifying anti-rheumatic drugs (DMARDs).*** Disease-modifying drugs are still playing a critical role as a part of multimodality therapy in RA; however, there are new emerging trends regarding their use [9]. As opposed to the well-known tactics of gradually escalating RA therapy ("the pyramid principle"), early aggressive treatment with disease-modifying drugs soon after the diagnosis is now being promoted, with the goal to modify the course of RA and to ensure a quality remission of the disease. The rationale for this approach includes the absence of pannus, deformities, osteopenia, and severe autoimmune-mediated complications at the early stages of RA and the high chances for achieving a remission [15].

The principal disease-modifying anti-rheumatic drugs include methotrexate, leflunomide, sulfasalazine, gold-containing drugs, penicillamine and aminoquinolines (hydroxychloroquine). The reserve DMARDs include cyclophosphamide, azathioprine and cyclosporine [24].

Should disease-modifying agents lack efficacy within 1.5–3 months, they should be replaced with other DMARDs or used in combination with low-dose GCS, which allows for reducing the activity of rheumatoid arthritis before the DMARD effect kicks in. Six months is a cut-off by which an efficacious disease-modifying treatment should be selected for the patient. In course of treatment with disease-modifying drugs, there should be careful monitoring of disease activity as well as the emergence and development of adverse effects [5].



**Biologicals.** In RA, synovial membranes secrete large amounts of the glucose-6-phosphate dehydrogenase enzyme, which also destroys disulfide bridges in the cell membrane. In this case, there is a “leak” of proteolytic enzymes from cell lysosomes, which causes damage to adjacent bones and cartilage [26]. The body responds by secreting cytokines, of which tumor necrosis factor (TNF) is probably the one best known. The cytokine-triggered cascades of reactions in the cells further aggravate the symptoms of the disease [38]. The TNF-associated chronic rheumatoid inflammation often causes cartilage and joint damage, which is leading to physical disability [17].

The following drugs are used for treatment of DMARD-resistant arthritis [10, 20]:

1. *Blockers of cytokines/chemokines and their receptors (anti-cytokine drugs):*

- TNF inhibitors (antibodies to TNF and soluble TNF receptors): Adalimumab (Humira), Golimumab (Simponi), Infliximab (Remicade), Certolizumab pegol (Cimzia) and Etanercept (Enbrel).

- monoclonal antibodies to interleukin-6 receptors (sIL-6R, mIL-6R), tocilizumab (Actemra).

- monoclonal antibodies to interleukin-1, anakinra (Kineret).

- monoclonal antibodies to interleukins 12 and 23, ustekinumab (Stelara).

2. *Anti-lymphocyte drugs:* monoclonal antibodies to membrane CD20 receptors that deplete the pool of antibody-producing B-cells, rituximab (MabThera); CTLA-4 + F<sub>c</sub>-IgG<sub>1</sub> hybrid proteins that block T-cell activation, abatacept (Orencia).

3. *Oral low molecular weight inhibitors of intracellular Jak-STAT signaling pathways,* tofacitinib (Jaquinus).

During RA progression, TNF is produced by the immunocompetent cells present in the joint, and is responsible for development of inflammation in synovial membranes. The articular damage in patients with RA is seen as narrowing of the joint space between the bones and as erosions of bones in the joint space. Clinical trials of monoclonal antibodies have shown that their use slows down joint damage [15]. Another promising approach includes the use of specific regulators of T-cell differentiation (halofuginone) [37].

### **2.3. Exercise therapy in rheumatoid arthritis.**

ET is indicated for RA patients at all stages of the disease, provided the acute process has been managed. Patients with highly active disease are recommended to use positional treatment, correction of the arches of the hand and respiratory exercises [24].

Contraindications to the use of ET in RA patients [18]:

1. High (Grade III) activity of disease, with severe pain and gross effusion in the joints;
2. Pronounced damage of internal organs with sufficient organ function (pleurisy, pneumonia, cardiomyopathy, nephritis, vasculitis, etc.);
3. General contraindications to the use of ET: infections, fever, acute and subacute diseases of internal organs, NYHA Class II-III cardiovascular insufficiency.

It is best to conduct ET sessions in RA patients after they have taken their analgesics and/or muscle relaxants, which improve their morning stiffness and pain [36].

The physical exercise is usually performed without or with tools, such as sticks, skipping ropes, skittles, balls and cones. Benches and wall bars can be additionally used. Recently, special equipment is used increasingly more often, where exercises are performed using suspensions, blocks and weights. [18]. Early exercise therapy contribute to prevention of physical limitations and restoration of motor function [24].

There are 3 periods to an exercise therapy [18]:

1. The sessions in the preparatory period continue for 10–15 minutes, for 2-3 days. The aims and objectives: to teach the patient how to relax their body, how to breathe properly and how to synchronise exercises with breathing. Prepare the patient to upcoming exercise challenges.
2. The main of the training period: the duration of exercise sessions is 25-30 minutes, for 10–15 days. The aims and objectives: increasing muscle strength, functional restoration of the musculoskeletal system and increasing range of motion in the joints.

3. Final period: performed in the final 3–5 days of the hospital-based program; the exercise therapist provides the patient with instructions for home-based exercise program and makes sure the patient understands them and is willing to comply. The aims and objectives: to prepare the patient for performing exercise program in the home.

During the acute phase of the disease and in exacerbations of chronic polyarthritis, as well as during high-grade rheumatoid activity, positional treatment is used. As the disease activity declines and in a propensity to contractures, passive range-of-motion exercise should be performed with the assistance of a physical therapist [1].

The main principles of positional treatment [24]:

1. The bed should be level and flat; a board will have to be placed under the mattress.

2. The feet should be supported; a cardboard box or special feet supports should be placed at the foot end of the bed.

3. The patient is encouraged to change their position more often when supine or sitting; to help the lift their body, strong reins should be tied to the foot end of the bed.

Hand relaxation is indicated using small balls. Splints may be used when there is a propensity to ulnar deviation and contractures in the metacarpophalangeal joints. When hip joints are involved with limited range of motions, the patient needs to be placed on a high bed to help them sit down and stand up. In order to prevent flexion contractures in the hip joints, the nurse may need to place a 4-5 cm thick mattress under the upper body (up to the gluteal folds), to maintain hip extension in the relaxed lower extremity. At the same time, the foot should be supported [18].

In propensity to knee joint contractures, a roller may be placed under the heel and sandbags may be placed on thighs (a better option is to use a thick fabric belt 10-12 cm wide with pockets for weights on either side)[24].

When shoulder joints are involved, position should be changed more often, e.g. moving hands to the side; rollers or inflatable balloons may be placed under the shoulder joints. If possible, the patient should put their hands behind their head and behind their back.

In order to preserve the functional capacity of the hand, the patients with RA should prioritize developing and constantly maintaining the correct positional stereotype of the hand and movements in favorable physiological positions. Isometric exercises using a ball or in a splint are used to preserve the transverse and longitudinal arches of the hand. They are performed with proper adjustments, with a contraction strength equal to 1/2 or 1/3 of the maximum hand grip force. The duration of muscle contractions is inversely proportional to the activity of disease: the higher the disease activity, the shorter the muscle contraction time [17].

Basic provisions and principles [18, 40]:

1. Keeping the hand straight when performing work-related movements and activities of daily living (ADL).
2. As much as possible, the patient should limit the load on terminal phalanges (i.e. avoid stressing the fingertips).
3. Avoid movements towards the ulnar side (i.e. towards the little finger).
4. Preserving the transverse and longitudinal arches of the hand.
5. The main initial positions of the hand: the hand is placed on its border.
6. Maintain a correct position of the hand at rest (the hand is resting on its border, on the forearm, on a cone/cylinder or a ball.)
7. For power grips, the patients should be advised to use hook grips with cylindrical or cone-shaped handles.
8. The patients should write with thick triangular-shaped pens or pencils.
9. The patients should be educated in correct functional position of the hand using ADL simulators.

The new functional stereotypes in RA patients should be continuously monitored and encouraged by the nurses and their significant others, as well as by self-control [42].

On a specially equipped ADL simulator, patients with RA should be taught how to properly perform self-care elements, i.e. morning toilet, combing, and using a knife, fork, spoon, etc.. During the period of RA exacerbation, the patients are advised to relax the hand on the ball or a cone [18].

When performing exercise therapy for the entire upper limb, it is also advisable to fix the hand on the ball. Maintaining the hand in correct position will, on the one hand, contribute to the isometric contraction of muscles, and, on the other hand, improve circulation in the entire limb [17].

The correct functional stereotype of the hand is solidified by exercise therapy and craft therapy, such as sewing on a hand- and foot-operated sewing machine, knitting, pyrography or fret cutting [18].

In some cases, especially during sleep, the patient loses control of the position of their hand. In these cases, as well as for prevention of changes in transverse and longitudinal arches of the hand and to increase the muscle strength of the weakened muscles when performing isometric exercises, the patients may benefit from the use of orthoses, i.e. special polymer devices, which keep the joints of the hands and radiocarpal joints in a correct physiological position [9].

#### **2.4. Physical therapy as a part of multimodality treatment of rheumatoid arthritis.**

**Physical therapy has a special place among the therapeutic and restorative interventions in diseases of the joints. Physical therapy methods are used at various stages of the disease [46].**

In the acute phase of the disease, in a setting of systemic hyper-reactivity, phototherapy methods are used (in part, ultraviolet radiation and laser therapy), which contribute to recovery of immunobiological and redox processes in the tissues, activation of metabolism, hyposensitization and exert primary anti-inflammatory, analgesic (via photoinactivation of skin receptors), as well as bactericidal and bacteriostatic effects [46]. Skin erythema dose UV therapy of the affected joint is indicated in polyarthritis. Two major joints or a group of small joints are irradiated in one day (4-6 skin erythema doses). The same joints can be irradiated again in 2-3 days, for a total of 3-5 irradiation sessions for each joint. The total irradiation area should not exceed 600 cm<sup>2</sup> [24].

The following conditions are contraindications to UV therapy: severe heart disease with Class IIB: Class III circulatory failure, severe renal impairment, severe debilitation, anemia, propensity to bleeding, skin disease, hyperthyreosis, Stage II: III hypertension and CAD [46].

The mechanism of tissue action of low-energy red light is based on the processes occurring on the cellular and molecular levels as a result of absorption of light energy by tissue elements. Laser irradiation may have a biostimulating effect. In particular, helium neon laser irradiation may stimulate hematopoiesis, accelerate the regeneration of connective and bone tissue and increase the mass of cellular structures, and improve trophic processes [24]. The effect of stimulation of regenerative processes is associated with an increase in the concentration and utilization of oxygen and free oxygen varieties in abnormally altered tissues, as well as with transition of nucleic acids to a more variable functional status. Owing to its mild stress-inducing effects, laser radiation enhances the activity of the adrenal cortex, causes desensitizing effect and improves immunobiological processes [38].

In the subacute period of RA with proliferative changes, electric therapy procedures are appended with ultrasound. Ultrasonic therapy is effective when applied to affected joints and to their corresponding paravertebral reflexogenic areas (thoracocervical spine and lumbosacral spine) [46]. The intensity of exposure is 0.2-0.4 W/cm<sup>2</sup> in paravertebral areas and 0.2-0.8 W/cm<sup>2</sup> in the area of affected joints. Sonication is performed for 2-3 minutes in each paravertebral area and for 5-10 minutes in an affected joint area. One session involves exposure of reflexogenic areas and of 2-3 joints. The sessions are performed daily or every other day; the course of treatment includes 6-10 sessions of joint exposure [13].

Sonic phoresis of hydrocortisone on the joints is considered to be pathogenetically substantiated (at 0.2-0.4 W/cm). The duration of the procedure is 3-5 minutes and 5-10 minutes in a subsiding process. The sessions are performed every other day, and the course of treatment is up to 10 sessions. Ultrasound has an anti-inflammatory effect, activates the glucocorticoid function of the adrenal cortex, and improves impaired protein metabolism and enzymatic processes [46]. Ultrasound therapy not indicated in patients with high degree of RA activity, in presence of exudative inflammation in the joints in a setting of systemic hyperreactivity, during treatment with steroid hormones, as well as in patients with severe chronic CAD and thyrotoxicosis [46].

During involution of articular inflammation or complete remission, vibrotherapy methods may become important (acupressure vibration massage, thermal vibration massage by means of a special attachment with a gradual increase in the oscillation frequency during the procedure from 50 to 100 Hz using a labile technique, or thermal procedures: inductothermy, microwave therapy and peloid therapy, followed by vibration massage). These procedures have anti-inflammatory, resolving and stimulating effects on reparative and regenerative processes and the compensation capacities of the musculoskeletal system [46]. When using massage therapy, special attention should be given to restoring drainage of lymph from the affected joint. To this end, it is recommended to start massage with periarticular tissues. The skin in diseases of the joints often loses its elasticity, is poorly movable, and may become thickened and tender. Therefore, slowly rubbing the skin is justified due to its layer-wise effects on the skin, subcutaneous connective tissue and fasciae. With consecutive massage of each of these layers, care should be taken not to involve another layer. After massage of soft tissue, the next step is circular rubbing and longitudinal stroking of the ligamentous apparatus where it can be best accessible [13].

In a protracted course of RA (in a minimal activity of the process), it is expedient to include balneotherapy and thermotherapy into the therapeutic schedule. The heat, when used in various forms, reduces pain and muscle spasm. Applying heat 15-20 minutes prior to therapeutic exercise sessions gives the patient an opportunity to tolerate them better. In the stage of regression of inflammatory changes, thermal procedures are employed as actinothermal baths, locally on affected extremities for 20-30 minutes daily, or as sun wave lamps for 15-20 minutes twice a day [46]. The rehabilitation care provider may prescribe paraffin or mineral wax applications (at the temperature of 50-55 °C for 20-30 minutes daily or every other day, a treatment course includes 15 sessions) and hot compresses. Hot pack wrappings may be used: pieces of woolen cloth moistened with water and heated on a water bath to 45–50 °C are applied in 2-3 layers on the joints; then the joints are tightly covered with a terry towel, oilcloth or blanket for 20-30 minutes. This procedure may be repeated as often as several times a day for a few days [13].

**Peloid therapy is performed in lower activity of the abnormal process, reduced exudative inflammation in the joints and improvement of the patient's general condition. Peloid is used as applications to the joints; the temperature of peloid is 38-42 °C, the duration of the procedure is 15-20 minutes. Peloid therapy is used every other day or for 2 consecutive days with a one-day interruption; the course of treatment is 10-14 sessions. Peloid applications have pronounced local anti-inflammatory and resolving effects. Under their influence, peripheral blood vessels are dilated; hemodynamics and microcirculation increase; muscle spasm is relieved, and muscle contractures are improved. Other positive changes include increased metabolism and trophic processes in the affected tissues of the joints and muscles, and stimulation of regeneration processes. [46].**



Peloid therapy may be used as applications, i.e. as local (focal); parafocal, when the peloid is applied next to the affected site to avoid exacerbation of the disease; segment/reflex-based, when the peloid is applied on the projection of the corresponding spinal segment; and the repercussive method, when the peloid is applied on the contralateral intact extremity, and the metameral reflex produces the expected positive changes in the affected joints. [13]. For therapeutic peloid applications, a mixture of peat of plastic consistency with a water content of 80-85% is used. It is heated or used cold. Peloid poultices are also used, for which linen bags are filled with peloid (at 45-55 °C) and applied to the affected joints for 15-30 minutes. The method of rubbing with peloid is also used, when the peloid heated to 38-42 °C is applied to the joints and rubbed in with brushes (for 5-10 minutes) [46].

**Hydrotherapy is one of the most commonly used and valuable physiotherapeutic methods used in rehabilitation of patients with joint disease. The main physiological effect of hydrotherapy is the improvement of circulation and the reduction in pain and muscle spasm. By reducing the weight of the submerged body part, the water facilitates the use of the elements of exercise therapy, which would be otherwise difficult to perform.**

**Rehabilitation physicians may prescribe the baths with rubbing the submerged joints with a hot mud pack, when there is a close contact of the diffusing peloid solution with the skin [24]. The bath may be prepared with fresh or mineral water (dissolve 0.5 kg of table salt per 100 liters of water). Favorable results have been obtained with using estuary mud according to the Egyptian method, which consists in peloid applications on the surface of the joints and letting them dry in the sunlight for 45 minutes. Some authors suggest using combinations of mud baths with infrared and ultraviolet irradiation of the trunk and with helium neon laser treatment of the affected joints [13].**

When using mud treatments, the successful treatment of diseases of the musculoskeletal system depends on the technique of peloid therapy, its appropriateness to the clinical and laboratory manifestations of the abnormal process, and on the functional status of the adaptive systems in the body that define its responses [38]. Improvement of inflammation in the joint in a setting of systemic hyper-reactivity is occurring via primary activation of lipid peroxidation and stress-inducing reactions followed by increased antioxidant activity [46]. When peloid is applied to the lumbosacral region (where the adrenal glands and sympathetic nodes are located) or to the cervical region (where the thyroid and thymus glands are located), there is an increased excitability of exteroceptors, enhanced capillary circulation and improved reflex and neurohumoral processes, increased synthesis of corticosteroid hormones, thickening of cell membranes, reduction of the exudative component of inflammation and increased suppressor effects. As a result of improved steroid metabolism, there is lower intensity of immune inflammation and improved clinical course of the disease. A similar effect is observed when using naftalan, naftalan mastic and bischofite [24].

As for balneotherapy, effective modalities include baths with sulfide- (50-100 mg/l) and radon-containing water (1.5 kBq/l, every other day, for 7-12 minutes, combined with inductothermy on the area of adrenal glands and massage therapy) or air radon baths (10-20 nCi/l) [13].

**Radon therapy increases the permeability of vascular walls in increased migration of polymorphonuclear white blood cells to the site of inflammation with release of collagenase and other enzymes, which justifies the use of radon therapy in a setting of hyporeactivity. This contributes to resorption of sclerotic foci in the synovial membranes. The clinical effect of using dry air radon mixtures is accompanied by positive time-dependent changes in collagenolytic and elastolytic activity of the serum and by decreases of DNase, RNase, cathepsin D, collagenase and oxyproline (total, free and bound) in the blood [41].**

Sulfide baths improve trophism in articular tissues due to inhibited progression of metabolic disorders, as evidenced by decrease in the level of diene conjugates, medium molecular weight peptides and acid mucopolysaccharides in the blood, as well as by activation of antioxidant systems (a carry-over effect) [46].

After the use of contrast baths, regression of inflammation in the joints is observed along with improvement of patient well-being. The treatment is accompanied by reduction in ESR, C-reactive protein levels, as well as the levels of hexoses and ceruloplasmin in the blood. The general contrast baths are performed with two adjacent pools with fresh water. At first, the patient is immersed into warm water (38 °C) for 3 minutes, then goes to the pool with cool water (28 °C) for 1 minute, while performing certain exercises. During the session, patient changes the pools 3 times, finishing in cool water. By the end of treatment course, the temperature of cool water is decreased to 20-22 °C, and the temperature of warm water is increased to 40-42 °C; the temperature gradient between the baths is increased from 10 °C to 20 °C. The procedures are performed daily 5 times a week, a total of 10-15 per course [24].

Peloid therapy and balneotherapy procedures are not indicated in patients with subacute stage in exacerbation of chronic course of disease, in severe damage to visceral organs and in concomitant cardiovascular disease (including rhythm disturbances) [46].

In a resort setting, it is more expedient to alternate peloid therapy with baths (sea baths, brine baths, etc.) in absence of pronounced activity of the disease. The optimal concentration is 20-30-40 g/l of sodium chloride. Sodium chloride baths improve hemodynamics, reduce microcirculatory changes, relieve muscle spasms and reduce muscle contractures, improve the functional state of the muscles, enhance the locomotor function of the joints, and stimulate metabolism and trophic processes [13].

Sodium chloride baths are not indicated in RA patients with disease activity above minimal, with involvement of visceral organs, as well as with concomitant chronic thrombophlebitis prone to exacerbations, and with circulatory failure worse than Stage I. Radon baths are used in combination with drug therapy or inductothermy. Radon therapy is indicated in patients with a minimal degree of disease activity or with RA in an inactive phase. The metabolic and anti-inflammatory effects are exerted by sulfide waters provided as general baths, local 2-chamber and 4-chamber baths [46]. The optimal concentrations of hydrogen sulfide are 50-100-150 mg/l. Hydrogen sulfide has pharmacodynamic effects on cellular structures and leads to changes in cellular metabolism. In low (up to 100 mg/l) and moderate (100-150 mg/l) concentrations, sulfide waters enhance cellular metabolism. The treatment with sulfide baths is indicated in patients with RA in the stage of remission or in minimal disease activity. In serious circulatory disorders, when the baths are contraindicated, daily rubbing of the body with water at 37-38°C is used [13].

At the final stage of RA treatment and in favorable course of disease, various cold exposure training methods are used in the patients. To this end, air and sun treatments (aero-heliotherapy) are used. Air baths can be conducted either alone or before or after sun baths. It is best to do them in the morning, 30 minutes after a light breakfast, at air temperature of 20–25 °C, absence of wind and relative humidity of 50–70%. Depending on the patient's general fitness and endurance, the initial duration of the procedure is 10–15 minutes; with every day the duration of the procedure is increased by 15 minutes, up to a maximal duration of 2–3 hours per day [46]. After the air bath, the patient proceeds to cool shower, affusions, rubbing with wet towel or swimming. Patients with prolonged history of disease and frequently ill and/or debilitated individuals should have their therapeutic exposure to fresh air in large, well-ventilated rooms and on open sun lounges and porches. In summer, provided the patients are wearing light clothes and are well muffled up, they may spend there a few hours each day, and even the whole night if the weather is warm and calm. In winter, this procedure is conducted with patients in warm beds, with open windows without drafts [24].

**Sunbathing is an active cold exposure training procedure, which ensures the therapeutic strain on thermoregulatory and cardiocirculatory mechanisms. Sun baths are conducted at air temperature of 20-24°C and light breeze to prevent overheating. The radiation time is divided into 3 parts: one part on the chest and the back and 1/2 part on each side. In gentle mode, the irradiation is started with 4-5 minutes per day, adding 1-1.5 minutes each day. Therefore, by Day 30 the duration of the sun bath will be 40 minutes per day (gentle mode), 60 minutes in moderate mode (by adding 2 minutes each day) and up to 120 minutes in enhanced mode (by adding 3 minutes each day). After the end of the procedure, the patients will need to stay in the shade for 10-15 minutes, and then they may take a cool shower or swim. Sun baths may be taken every day. Bathing in the sea, in the river or an outdoor pool is best carried out in the morning at a water temperature of not less than 21–22 °C after a 5-10-minute air bath. When in the water, the patients should be recommended to swim or move continuously. The duration of bathing should be from 5 to 10-15 minutes every day; the course is up to 30 procedures [46].**

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## CHAPTER 3.

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### THE SPECIFICS OF ORGANIZATION OF NURSING PROCESS IN RHEUMATOID ARTHRITIS

A properly organized care for patients with RA is an important constituent within the overall system of therapeutic interventions [2]. The care for patients with RA is based on the principles of medical deontology, a science of professional conduct of healthcare personnel when treating the patient [33].

The system of nursing care for patients with RA has special characteristics of its own [48]. The main role in organization and delivery of patient care belongs to nursing personnel [34]. The nurse is responsible for timely and correct fulfillment of physician's orders concerning the following: dietary schedule, physical activity and rest schedule, administration of drugs; preparation of the patients to additional imaging and laboratory tests, exercise therapy and physical therapy [48]. The nurse monitors the adverse effects of treatment, educates the patient about the importance of adequate physical activity, regular exercise therapy, as well as the importance of physical therapy treatments and rehabilitation interventions to preserve and expand functional capacities [45].

#### **3.1. Definition and constituents of nursing process.**

*Nursing process* is a systemic targeted plan of nursing actions oriented on maximal response to all patient needs when treating the specific disease [34].

*The advantages of the nursing process include the following:* [45]:

- 1) systematic support of individual and system-based approaches to its implementation;
- 2) the versatility and universal applicability of this method;
- 3) wide use of professional standards;
- 4) providing for a high-quality care and high levels of nursing professionalism;
- 5) ensuring the safety and reliability of health services;

6) encouraging the patient themselves and their family to be involved in care; training them in fundamental care principles.

*A standard model of a nursing process consists of the following classic five steps [34]:*

- 1) Nursing assessment of the patient;
- 2) Making a nursing diagnosis;
- 3) Planning of nursing actions (nursing interventions);
- 4) Implementation (realization) of the nursing plan;
- 5) Evaluating the quality and efficacy of nursing care.

### **3.2. Nursing assessment of the patient.**

The goal of this stage is to collect patient information by conducting subjective and objective examination [34].

The subjective examination includes interviewing the patient and/or their significant others and a review of medical records [39]. In order to obtain unbiased and complete information when communicating with the patient, the nurse should adhere to the following principles [50]:

- 1) the patient should feel reassured that healthcare team is genuinely concerned about their problems;
- 2) the nurse should have a kind attitude towards the patient and use active listening;
- 3) the nurse should prepare his/her questions in advance, preferably in writing; this will facilitate communication;

4) during the conversation, the nurse will need to keep records in order not to forget any important information.

During the interview, the nurse will collect the patient's complaints, namely: on pain of various nature (paroxysmal, continuous, migrating, morning, with movements) in one or more joints, on joint deformities, on changes in periarticular

tissues, on limited range of motion in the joints, on morning stiffness in the joints, as well as the complaints on elevated body temperature, limited ability to work and excessive fatigue [48].

The nurse shall clarify the history of present disease (from which symptoms and when did it start, how the patient's health status changed with time as the disease progressed; what drugs and treatments were used and how effective they have been), the patient's past medical history (food habits, lifestyle, past health problems, allergic history, hereditary factors, social habits and chronic disease) [50]. The nurse will also review any available medical records the patient may have [39].

When performing objective examination (i.e. physical examination), the nurse shall assess the general condition and appearance of the patient, conduct the assessment of organs and systems in the body and measure vital signs and other functional parameters as applicable [34].

The plan of the patient's physical examination includes the following steps [11]:

- 1) external visual inspection (general condition of the patient, their facial expression and level of consciousness, patient's position in the bed (active, passive, dependent position), the condition of the skin and the mucous membranes (color, dryness, humidity, the presence of rash or neoplasms), the presence of edema (local, generalized) and the tension of soft tissue;

- 2) measurement of the patient's height and body weight;

- 3) measurement of pulse rate and evaluation of pulse characteristics; measurement of blood pressure on both hands; if the patient has edema, measurement of daily urine output and fluid balance;

- 4) measurement of respiratory rate; assessment of the rhythm and amplitude of breathing;

- 5) the nurse will need to document the main symptoms that characterize the status of the following organs and systems:

- a) the cardiovascular system (any chest pain and change in heart rate and blood pressure);

- b) the respiratory system (cough, the presence of sputum and dyspnea);



- c) the organs of the gastrointestinal tract (the oral cavity, indigestion, abdominal pain and examination of bowel movements);
- d) the organs of the urinary system (changes in appearance and amount of urine; the presence of renal colic and lumbar pain);
- e) determine the mental condition of the patient (sanity, communication, mood, attitude to their disease, and the presence of hypochondria/psychasthenia).

During visual inspection, the nurse determines whether there are deformities of the joints and extremities, if there is any swelling with skin hyperemia, and takes a closer look at the patient's gait (whether any lameness is seen) and posture [37]. It is assessed whether the patient is capable of independent movements in the joints and range of motion is measured. The nurse determines if there is any limited range of motion in the joints up to complete absence (ankylosis) and/or weakness/atrophy of muscles adjacent to the affected joint. Using palpation, the nurse assesses for crepitation in the joints with movement and determines whether the joints are painful to palpation. The nurse inspects the skin, the mucous membranes, the lymph nodes and the eyes, which may be affected in a setting of systemic disease of the joints [48]. Complementary methods include laboratory tests, instrumental tests, and radiological and ultrasound imaging studies [16]. The final stage of the first step of nursing process includes generalization and documenting the information obtained and creating the database concerning the patient [45].

### **3.3. Making a nursing diagnosis.**

At this step, the nurse identifies the physiological, psychological and social problems of the patient (actual and potential problems, with identification of higher priority problems), and makes a nursing diagnosis [1]. The plan for assessment of problems of the patient includes the following [11]:

- 1) determination of actual (currently present) and potential problems of the patient;
- 2) identification of the factors, which have caused the actual problems or are contributing to emergence of potential problems;
- 3) definition of the higher-priority problems of the patient;

4) identification of the patient's strengths, which may help them cope with actual problems and prevent potential problems.

In RA, the patients may face the following problems: pain, deformity, joint swelling, joint rigidity, limited range of motions in the joints, limited ability to work and self-care deficits, elevated body temperature and sleep disorders [33].

The following impaired patient needs are possible in RA [48]:

1) impaired patient need for mobility: pain and limited range of motion in the joints due to inflammation and deformity;

2) impaired patient need to maintain normal body temperature: body temperature is elevated as a result of inflammation in the joints;

3) impaired patient need for self-care: due to deformities and restricted range of motions in the affected joints;

4) impaired patient need for labor: the fear of losing a job due to joint rigidity and restricted range of motions in the affected joints.

After the nurse has identified the problems in the patient, he/she will need to prioritize them.

Since in most cases patients are found to have several actual health-related problems, in order to solve these problems and provide effective care to the patient, the nurse will need to find out the priority levels of individual problems [51]. The problem may be a first-, a second- or an intermediate-priority problem. A first-priority problem requires an urgent and immediate solution. A problem with intermediate priority is not associated with a life-threatening condition and does not call for an immediate response. A second-priority problem is not associated with the specific disease and does not affect its prognosis [48].

The next step is to make a nursing diagnosis. The objective of nursing diagnosis is not to diagnose the disease, but rather to identify the patient's responses to their disease. The nursing diagnosis (in contrast to the physician's diagnosis) is constantly changing depending on the patient's response to the disease [1].

### **3.4. Planning of nursing actions (nursing interventions).**

The objective of nursing interventions is to prevent complications of the disease and to provide for rehabilitation and social readjustment of the patient. Planning of nursing actions (nursing interventions) has specific goals [51]:

- 1) provides a proper sequence of all essential patient care interventions;
- 2) coordinates the work of the entire nursing team;
- 3) helps maintain a close connection to other specialists and health services;
- 4) help determine financial expenditures associated with treatment and care (the planning specifies the materials and equipment required to carry out nursing care activities);
- 5) provides legal documentation to the quality of nursing care;
- 6) helps with subsequent evaluation of the results of nursing interventions.

This step of the nursing process includes the following four successive stages [1]:

- 1) identification of priorities and determining the optimal sequence in which the patient's problems will be addressed;
- 2) elaboration of expected outcomes. The outcomes: i.e., the results to be achieved by cooperation between the nurse and the patient. Expected outcomes result from meeting the following objectives of nursing care: solving health-related problems of the patient; reducing the severity of unavoidable problems; preventing potential problems; optimizing patient's self-care capacity or the options of assistance by the patient's family and/or significant others;
- 3) elaboration of nursing interventions. It is determined in what way the nurse may help the patient reach the expected outcomes. Of the list of possible interventions, the nurse will select those that will help reach the stated objective. For each of the interventions, the nurse should specify the place, the time and the method of execution;
- 4) entering the plan into the documentation and discussing it with other members of the nursing team. Each nursing interventions plan should have a date of completion and should be certified by the signature of the person who has drafted the document.

It is important that all nursing interventions be evidence-based and be harmonized with therapeutic solutions for the specific patient. They should use opportunities for patient education and encourage active patient involvement [49]. At this stage, the nurse will need to assess the patient's need for a caregiver, to identify the motivation of nursing interventions, and then introduce the patient to the main objectives of nursing care [39].

**Table 2. Motivation of nursing interventions**

<b>Nursing interventions</b>	<b>Motivation</b>
1. Provide the patient with psychoemotional and physical rest, and monitor the patient's physical activity.	To reduce physical stress and pain in the joints.
2. Help the patient assume a comfortable position; put pillows and rollers under the affected joints.	To immobilize the joints and to reduce pain.
3. Timely and correct fulfillment of physician's orders.	For effective treatment of the patient.
4. To ensure monitoring of the patient's general health, pulse rate and blood pressure.	Monitoring of the patient's health.
5. Ensure preparation of the patient to additional tests.	For conducting the tests correctly and for accurate diagnosis.
6. Ensure exercise therapy and physical therapy are conducted as ordered.	To improve the function of the affected joints.
7. To ensure monitoring of adverse effects of drug therapy.	For adjustment of treatment as prescribed by the physician.

### **3.5. Implementation (realization) of the nursing plan.**

At this stage of nursing process, nursing interventions are performed in close collaboration with other health professionals. An important part of nursing interventions is fulfilling physician's orders. The actions of the nurse should be synchronized with the actions of the patient and other health professionals, as well as with the actions of the patient's family; the plans and the capacities of all parties involved should be taken into consideration [19].

Depending on how the physician is involved, nursing interventions can be divided into the following types [45]:

1) ***independent interventions*** include the actions on the nurse's own initiative, without any preliminary coordination with the physician (examples include self-assessment and self-care education of the patient and caregiver education of the patient's family members);

2) ***dependent interventions*** are performed according to written instructions by the physician, e.g. in the medication administration record, and under the physician's supervision (making injections, interventions and preparing the patient to diagnostic tests). Nurses are not expected to fulfill the doctor's orders in an unquestioning manner. Rather, they should think through all their actions in advance. Should the nurse have any reason to question the physician's order, he/she should contact the physician immediately and alert the physician to what seems to be an objectionable order;

3) ***interdependent interventions*** involve collaboration of the nurse, the physician and other health specialists.

The care being provided to the patient may include [34]:

- 1) permanent care, which is required throughout the entire life of the patient;
- 2) temporary care, which is provided in short-term self-care incapacity of the patient;
- 3) rehabilitation care (a combination of exercise therapy, therapeutic massage and physical therapy procedures).

The plan of nursing interventions is implemented in the following three stages [19]:

- 1) preparation (review) of nursing interventions established during the planning; analysis of nursing knowledge and skills; identification of possible complications associated with nursing interventions and procurement of required resources; preparation of equipment;
- 2) implementation of the planned interventions;
- 3) filling out the predefined records (complete and accurate recording of the actions performed in the appropriate forms).

### **3.6. Evaluating the quality and efficacy of nursing care.**

The objective of this step is to evaluate the quality and the efficacy of nursing care and to review the results. The quality and the efficacy of nursing care shall be evaluated by the patient, by the patient's family and by the nurse who has performed the interventions, as well as by the nurse's superiors [45]. Evaluation of nursing interventions shall be performed continuously, on every stage. The efficacy of nursing care is determined after the stated objectives have been reached. In the patient's nursing record, the nurse is documenting the implementation of the care plan, the patient's opinion of the care provided, the adverse effects and the unexpected outcomes during implementation of nursing interventions and the efficacy of the latter [34].

In RA, the attaining of goals is usually a long-term prospect. This is why the patient may develop new problems associated with such factors as prolonged bed rest, sleep disorders, impaired gait, inability to wear shoes due to joint deformity and inability to carry out the usual work [48].

The results at this stage include identification of positive and negative aspects of the nurse's professional activity, as well as review and adjustment of the patient's plan of required interventions [11].

### **3.7. The specifics of nursing process in rheumatoid arthritis.**

Nursing care is playing an important role in the program of treatment of patients with RA [16]. The nurse is fulfilling all of the physician's orders and monitors whether the patient is compliant with their treatment. Whenever the patient may have questions, the nurse may advise the patient within the scope of his/her professional competence [34]. The nurse has a right to teach the patient how to take medications correctly, how to use physical therapy procedures and additional treatment methods [40]. The nurse may tell the patient about the effects of the prescribed drugs, and when and how to take them correctly, and what the patient should do after taking the drugs [34]. When advising the patient about therapeutic diet, the nurse should explain its principles to the patient so that the patient could understand the importance of the diet [41].

The psychological work with the patient and their family is of great importance [12]. It is important to tell them about the causes and manifestations of the disease and the methods of its treatment; this will make their emotional state more stable [28]. When working with the patient's family, the nurse will need to thoroughly educate them about RA and teach them how to care for and monitor their patient as necessary. They need to know what the patient can and cannot do. Subsequently, it will be relatives and significant others who will monitor the patient and help them implement the prescribed treatment [39].

The nurse may also teach the patient the correct use of orthopedic products, such as elastic bandages, special foot orthoses, knee pads, etc. It is recommended to use subcalcaneal heel orthoses with a thickened surface of the outer lateral side. During conversations with patients, the nurse may provide recommendations concerning the daily load (after coordinating with the physician) [33].

Nursing care is an integral part of RA treatment, since the nurses are responsible for the following duties [48]:

- Addressing the knowledge deficit concerning the prescribed diet/physical therapy;
- Patient education in correct administration of medications;
- Discussing prevention of exacerbations of the disease;
- Monitoring the patient's treatment compliance;
- Psychological work with the patients (the nurse is the health professional of first contact with the patient; the patients are often more willing to share their problems/concerns with the nurse).

While working with these patients, the nurse may succeed at convincing them that although RA is not curable, it is quite manageable and that proper treatment and rehabilitation compliance may significantly improve the quality of life and delay potential complications [42].

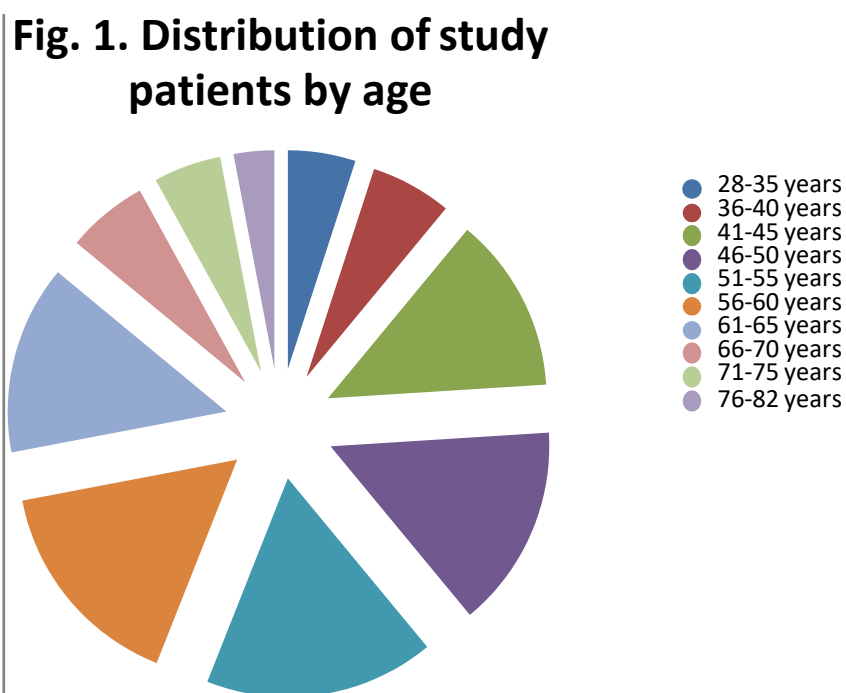
## CHAPTER 4.

### THE OBJECT OF RESEARCH AND METHODS OF STUDY

#### 4.1. The object of research.

*The object* of research included 100 outpatients aged 28 to 82 years diagnosed with RA (with different variants of disease progression and at different stages). The control group enrolled 100 age- and gender-matched healthy subjects with no statistically significant demographic differences from the main group.

1. *The distribution of study patients by age was as follows:* 28-35 years: 5 pts. (5%); 36-40 years: 6 pts. (6%); 41-45 years: 13 pts. (13%); 46-50 years: 15 pts. (15%); 51-55 years: 17 pts. (17%); 56-60 years: 16 pts. (16%); 61-65 years: 14 pts. (14%); 66-70 years: 6 pts. (6%); 71-75 years: 5 pts. (5%); 76-82 years: 3 pts. (3%) (Fig. 1).

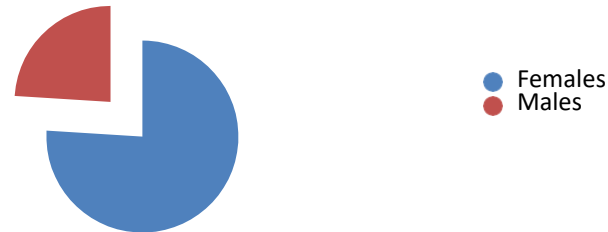


2. *The distribution of study patients by gender was as follows:* Among 100 study subjects, there were 76 females (76%) and 24 males (24%) (Fig. 2).



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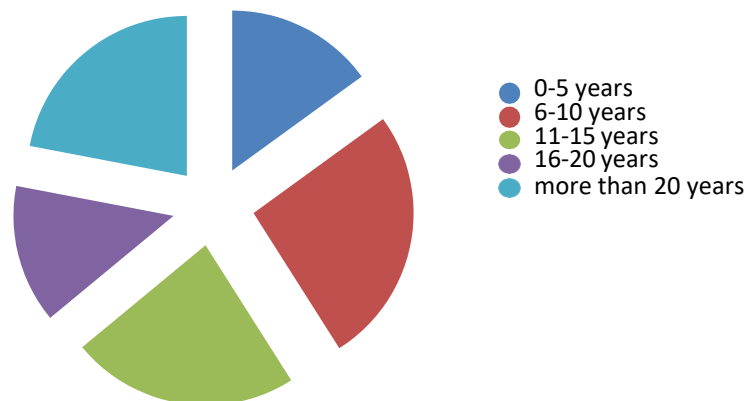
**Fig 2.**  
**Distribution**  
**of study**  
**patients by**  
**gender**



3. *The distribution of study patients by the duration of the disease was as follows:* 0-5 years: 15 pts. (15%); 6-10 years: 26 pts. (26%); 11 to 15 years: 23 pts. (23%); 16-20 years: 14 pts. (14%); over 20 years: 22 pts. (22%) (Fig. 3).

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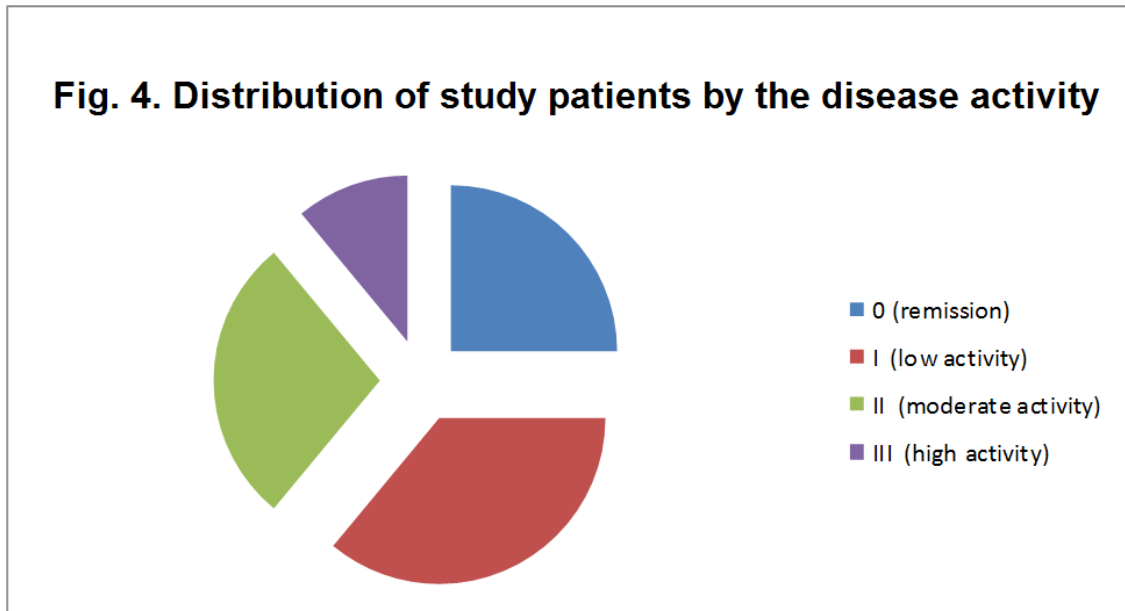
**Fig. 3. Distribution**  
**of study patients by**  
**the duration of the**  
**disease**



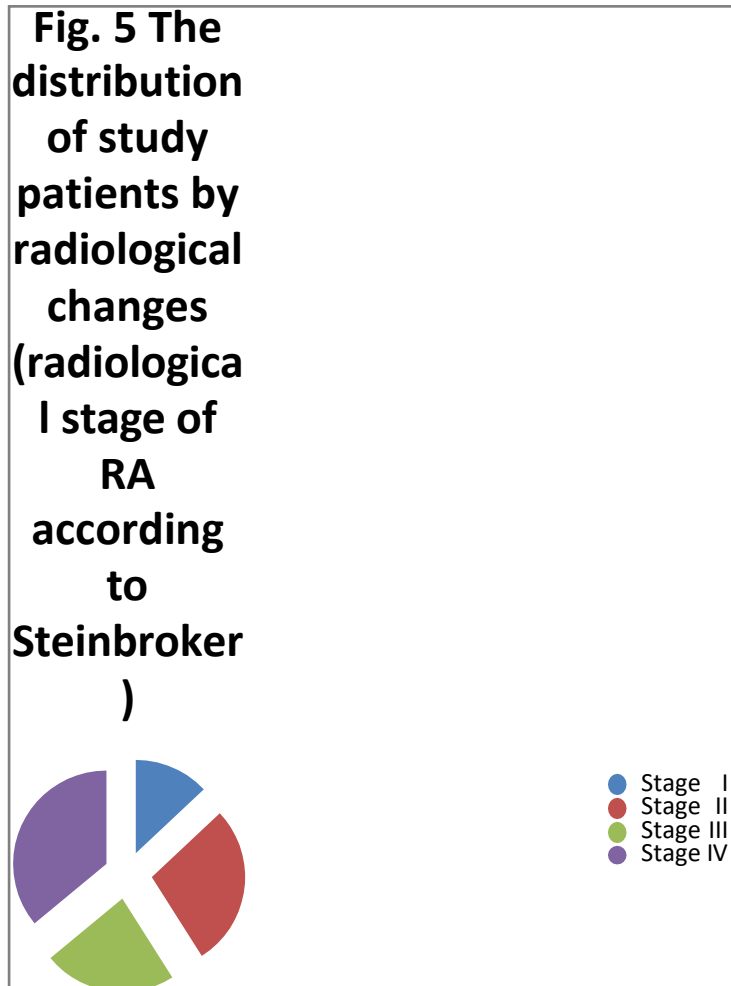
4. *The distribution of study patients by the activity of the disease was as follows:* 0 (remission): 25 pts. (25%); I (low activity): 36 pts. (36%); II (moderate activity): 28 pts. (28%); III (high activity): 11 pts. (11%) (Fig. 4).

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**Fig. 4. Distribution of study patients by the disease activity**



**5. The distribution of study patients by radiological changes (radiological stage of RA according to Steinbroker):** I (periarticular osteoporosis): 13 pts. (13%); II (osteoporosis + narrowing of the joint space (isolated attritions may be present): 28 pts. (28%); III (same as Stage II + multiple attritions): 23 pts. (23%); IV (same as Stage III + bone ankylosis): 36 pts. (36%) (Fig. 5).



**6. The distribution of study patients by functional classes (FC):** FC I (preserved capacity for self care and non-professional/professional activities): 16 pts. (16%); FC II (preserved capacity for self care and non-professional activities; impaired professional activities): 28 pts. (28%); FC III (preserved capacity for self care; impaired capacity for professional and non-professional activities): 20 pts. (20%); FC IV (all types of activities are impaired): 36 pts. (36%) (Fig. 6).

**Fig. 6. The distribution of study patients by functional classes (FC)**



#### **4.2. The quality of life questionnaire, MOS SF-36 (Medical Outcomes Study 36-item Short Form Health Survey).**

A non-specific questionnaire, MOS SF-36 (Medical Outcomes Study 36-item Short Form Health Survey) was used to assess the quality of life of patients with RA. MOS SF-36 was developed in the Medical Outcome Study in 1992. The 36 items of the questionnaire are grouped into the following eight scales [7]: PF (physical functioning); RP (physical role functioning); BP (bodily pain); GH (general health perceptions); VT (vitality); SF (social role functioning); RE (emotional role functioning); MH (mental health).

The first four domains describe physical health and the next four domains describe mental health. The values in each domain range between 0 and 100, where 100 stands for perfect health. The results are given as point-based scores in 8 sections, where the lower the score, the lower the quality of life (the more disability) and the higher the score, the higher the quality of life (the less disability). For each quantitative study parameter, sample mean ( $M$ ) and standard deviation ( $\sigma$ ) have been calculated. The assessment of mean differences for the study parameters in independent groups was performed using the Mann-Whitney nonparametric test.

## THE RESULTS OF THE STUDY AND THEIR ANALYSIS

The objective of our study was evaluating the quality of life in patients with RA, identifying the problems in these patients, organizing their nursing care and evaluating the efficacy of nursing care.

### **5.1. Quality of life assessment using the MOS SF-36 questionnaire (Medical Outcomes Study 36-item Short Form Health Survey).**

Independent answers to the questions in the SF-36 questionnaire were given by 100 patients with RA and by 100 healthy respondents. The mean quality of life scores in RA patients were distributed in the following manner:

#### *1) The parameters that characterize physical health:*

**PF** (physical functioning):  $46.1 \pm 1.1$ ;

**RP** (physical role functioning):  $45.3 \pm 1.1$ ;

**BP** (bodily pain):  $53.1 \pm 1.1$ ;

**GH** (general health perceptions):  $65.5 \pm 1.2$ ;

#### *2) The parameters that characterize mental health:*

**VT** (vitality):  $61.8 \pm 1.1$ ;

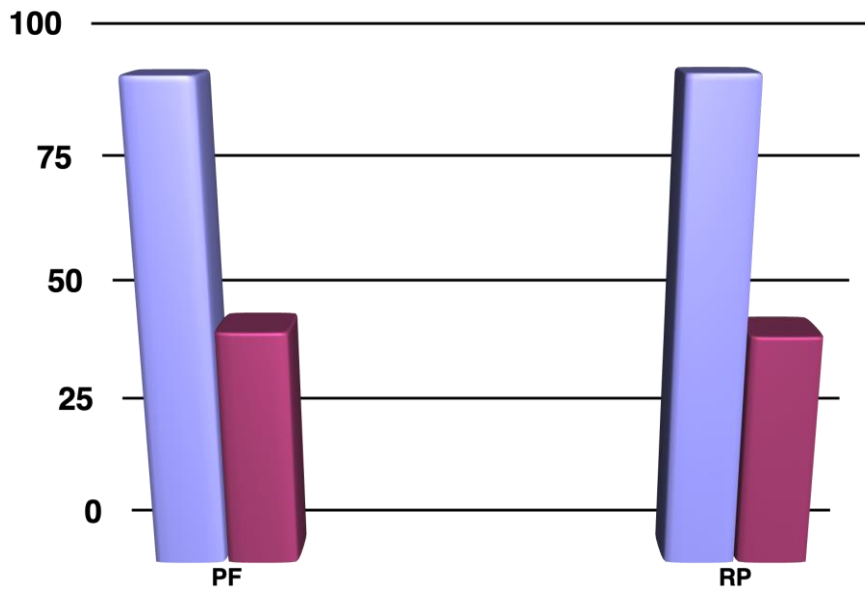
**SF** (social role functioning):  $73.7 \pm 1.2$ ;

**RE** (emotional role functioning):  $74.5 \pm 1.1$ ;

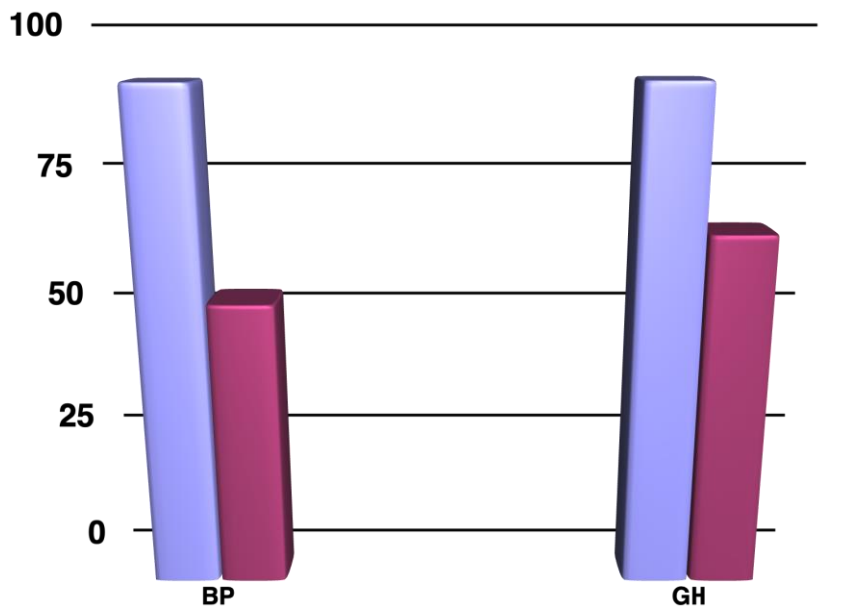
**MH** (mental health):  $85.4 \pm 1.1$ .

As can be seen from the diagram (Fig. 7), a particularly distinctive reduction in the group of RA patients has been documented in the following domains: **RP** (physical role functioning):  $45.3 \pm 1.1$ ; **PF** (physical functioning):  $46.1 \pm 1.1$ ; **BP** (bodily pain):  $53.1 \pm 1.1$ ; **VT** (vitality):  $61.8 \pm 1.1$ ; **GH** (general health perceptions):  $65.5 \pm 1.2$ , which suggests limited physical activity.

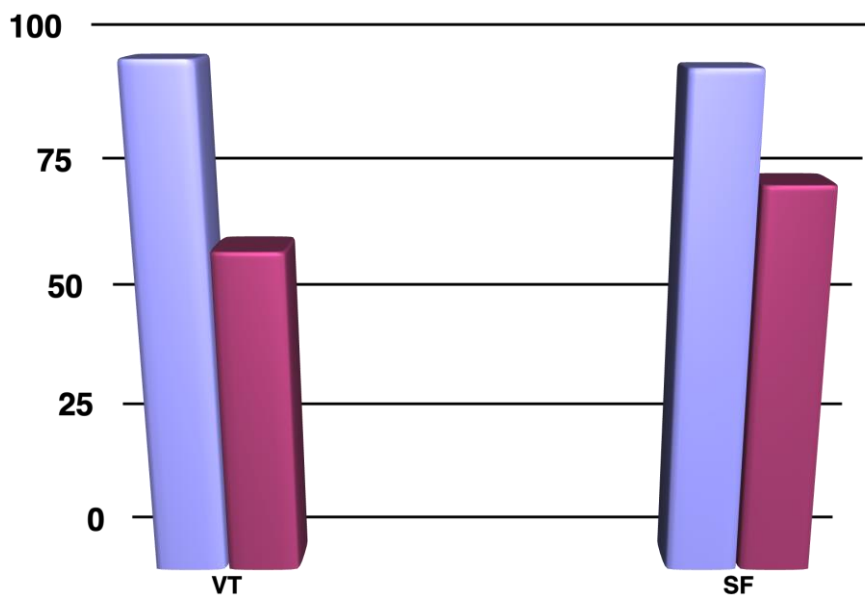
There also was a reduction in mental health indicators, which suggests the presence of concomitant emotional problems and reduced levels of social and emotional communication: **SF** (social role functioning):  $73.7 \pm 1.2$ ; **RE** (emotional role functioning):  $74.5 \pm 1.1$ ; **MH** (mental health):  $85.4 \pm 1.1$ .



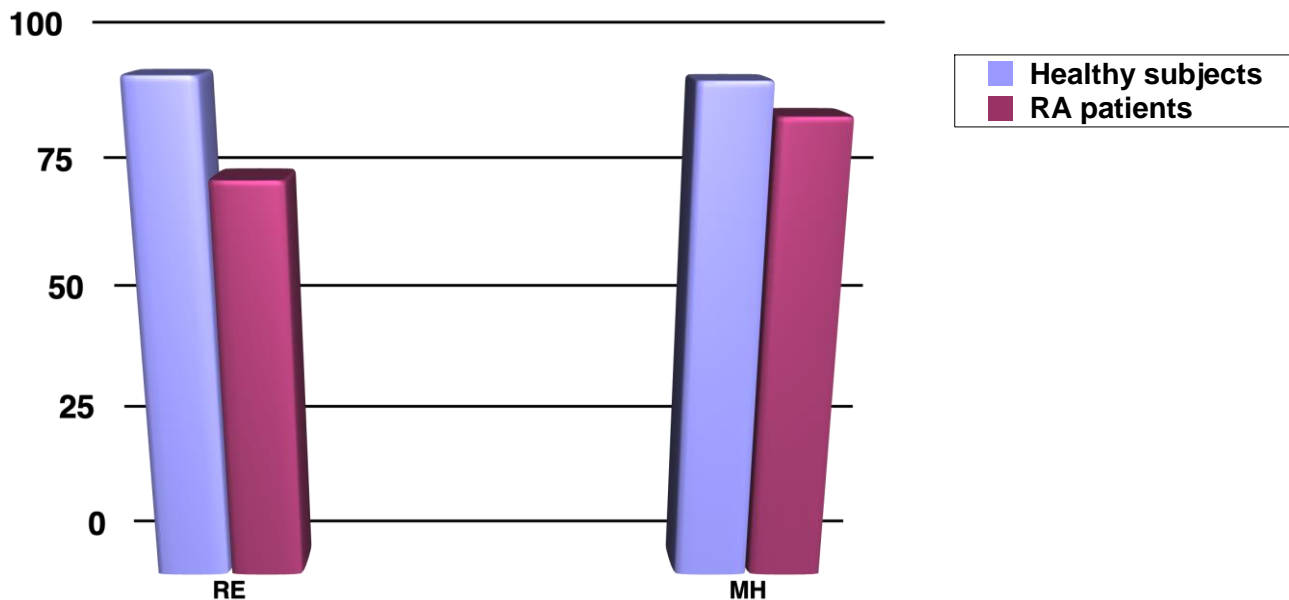
Healthy subjects  
RA patients



Healthy subjects  
RA patients



Healthy subjects  
RA patients



**Fig. 7. The quality of life scores (according to the MOS SF-36 questionnaire) in the groups of patients with RA and healthy respondents (the level of statistical significance of differences,  $p < 0.001$  across all domains)**

## **52. Identification of problems in patients with rheumatoid arthritis and implementation and efficacy of nursing interventions.**

Nursing diagnosis was performed as part of nursing care and was based on interviews, observations and physical examinations conducted over an 8-week period.

The main problems in the patients and their caregivers included the following:

- Deformity and swelling of the affected joints;
- Arthralgia;
- Joint rigidity, limited range of motions in the joints;
- Elevated body temperature;
- Skin changes (rheumatoid nodules, thickening and hypotrophy, vasculitis and livedo reticularis);
- Mental changes (emotional lability, anxiety and depression);
- Insomnia;
- Limited ability to work and self-care deficits.

The following *nursing diagnoses* were established in the patients:

No.	Main nursing diagnoses	Total
1.	Reduced and limited physical activity, related to deformities of joints and extremities and arthralgia	96 pts. (96%)
2.	Arthralgia	99 pts. (99%)
3.	Fear, being concerned/restless, anxiety and emotional lability, related to limited mobility and decreased ability to work	85 pts. (85%)
4.	Sleep disorders, arthralgia-related	72 pts. (72%)
5.	Elevated body temperature, synovitis-related	32 pts. (32%)
6.	Discomfort, skin changes-related	23 pts. (23%)

A list of intended nursing interventions was made, which included the following items:

1. Making sure the patient is on a diet that adequately meets his/her physiological needs.
2. Ensuring psychoemotional and physical rest; monitoring the patient's physical activity.
3. Creating a comfortable microclimate in the room, which is beneficial for sleep.
4. Fulfilling physician's orders.
5. Monitoring body temperature during exacerbation.
6. Ensuring preparation to additional assessments.
7. Preservation of work activity and social contacts.

Planning	Implementation
Making sure the patient is on a diet that adequately meets his/her physiological needs	<ol style="list-style-type: none"> <li>1. Creating a quiet and favorable environment during the mealtime.</li> <li>2. The use of foods rich in calcium (dairy products) and vitamin D. is recommended.</li> <li>3. The diet should contain plenty of fruits and vegetables.</li> <li>4. Mediterranean diet (fish, seafood, legumes and soybeans, walnuts, vegetable oil).</li> </ol>



<p>E n s u r i n g psychoemotional and p h y s i c a l r e s t ; m o n i t o r i n g t h e p a t i e n t ' s p h y s i c a l a c t i v i t y</p>	<ol style="list-style-type: none"> <li>1. Educating the patient about the causes of their complaints and condition.</li> <li>2. Explaining the objectives and the course of the prospective treatment/procedures and why these are important.</li> <li>3. Help the patient assume a comfortable position; put pillows and rollers under the affected joints to immobilize the joint and reduce the pain.</li> <li>4. Provide exercise therapy to improve the function of the joints. After the acute period subsides, the nurse should teach the patient how to perform exercise therapy and self-massage.</li> <li>5. As necessary, provide the patient with walking crutches or other devices.</li> <li>6. Resting at frequent/regular intervals to recuperate.</li> </ol>
<p>C r e a t i n g a c o m f o r t a b l e m i c r o c l i m a t e i n t h e r o o m , w h i c h i s b e n e f i c i a l f o r s l e e p</p>	<ol style="list-style-type: none"> <li>1. Providing the patient with comfort in the bed and in the room, i.e. ensuring an optimal height of the bed, a convenient quality mattress, enough pillows and bedclothes; sufficiently frequent air change.</li> </ol>
<p>F u l f i l l i n g p h y s i c i a n ' s o r d e r s</p>	<p>According to Medication Administration Record:</p> <ol style="list-style-type: none"> <li>1. Monitoring of the patient's health.</li> <li>2. Measuring body temperature two times a day.</li> <li>3. Monitoring respiratory rate, blood pressure and pulse rate.</li> <li>4. Administration of medications.</li> <li>5. Monitoring the patient's compliance with medication schedule.</li> <li>6. Diagnosis of complications potentially occurring with administration of drugs.</li> <li>7. Advising the patient to seek medical attention immediately if any side effects are observed.</li> </ol>
<p>M o n i t o r i n g b o d y t e m p e r a t u r e d u r i n g t h e e x a c e r b a t i o n p e r i o d</p>	<ol style="list-style-type: none"> <li>1. Providing for normal temperature and fresh air in the patient's room.</li> <li>2. Arranging for warming the patient.</li> <li>3. Perform local (above the joint) physician-appointed procedures, such as immobilization for the acute period and local heat treatment.</li> <li>4. Educate the patient in self-care methods while encouraging the patient to carry out self-care independently as much as possible.</li> </ol>
<p>E n s u r i n g p r e p a r a t i o n t o a d d i t i o n a l a s s e s s m e n t s</p>	<ol style="list-style-type: none"> <li>1. Explain to the patient the importance of additional diagnostic assessments and why they are safe.</li> <li>2. Accompany the patient to the tests.</li> <li>3. Provide psychological support during the assessment.</li> </ol>

<p>Preservation of work activity and social contacts</p>	<ol style="list-style-type: none"> <li>1. Encouraging the patient to socialize with other people outside his/her household.</li> <li>2. Discuss the possibilities for complete restoration of range of motions in the joints with the patient.</li> <li>3. Reassure the patient that with the help of their family its is possible to find new job opportunities.</li> <li>4. Whenever possible, involve a psychologist to solve the problems in the patient.</li> <li>5. Provide relaxation to the patient by using sedatives as prescribed by the physician.</li> </ol>
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Nursing care is an integral part of RA treatment, since it is the nurses who are responsible for such duties as [48]:

- Patient education in correct administration of medications;
- Discussing prevention of exacerbations of the disease;
- Addressing the knowledge deficit concerning the prescribed diet/exercise therapy;
- Monitoring the patient's treatment compliance;
- Psychological work with the patients (it is the nurse to have the first contact with the patient; the patients are often more willing to share their problems/concerns with the nurse).

***The outcomes and the efficacy of nursing interventions.*** In course of observation and implementation of nursing care (over the course of 8 weeks), the majority of patients reported the following:

- Improved physical activity (in 62 pts., 62.0%);
- Reduced severity of arthralgia (in 58 pts., 58.0%);
- Improved sleep (in 42 pts., 42.0%);
- Body temperature returned to normal (in 18 pts., 18.0%);
- Improved mental and emotional well-being (in 61 pts., 61.0%);
- Improved overall health (77 pts., 77.0%);

The above findings suggest a high professional level of nursing staff and their correct attitude to professional duties, as well as the high quality of their work. Therefore, a properly organized nursing care is playing an important role in care for patients with RA.



## CONCLUSIONS

1. The study has investigated the etiological factors and the pathogenesis of rheumatoid arthritis. The etiology of RA includes the following three major factors (referred to as the rheumatological triad): 1. genetic predisposition (hereditary susceptibility to autoimmune reactions in carriers of a particular MHC class II antigen: HLA – DR1, DR4); 2. infectious factor: hypothetical triggers of rheumatic disease (Paramyxoviridae, Hepadnaviridae; Herpesviridae; Retroviruses); 3. external trigger (hypothermia, hyperinsolation, intoxication, mutagenic drugs, endocrinopathies, stress). RA is an autoimmune disease. The angiogenesis and proliferation of active fibroblasts and synoviocytes lead to the formation of pannus, an aggressive tissue with tumor-like growth properties, which is capable of penetration into the cartilage and the articular surface of the bone (thereby forming erosions), and into the ligamentous apparatus. RA is manifest as polyarthritis, mono- or oligoarthritis. The articular syndrome is characterized by the presence of morning stiffness lasting more than 30 minutes and similar manifestations of “tight gloves” and “body slimmer” later in the day, and by continuous and spontaneous joint pain that gets worse with active movements. The articular syndrome in RA is characterized by its monotonous course, substantial duration and persistence of residual phenomena after treatment. Other symptoms may include fatigue, the so-called “asthenovegetative syndrome”, morning stiffness, muscle pain, loss of appetite, depression, weight loss, anemia, and impaired function of salivary and lacrimal glands. Extra-articular manifestations are not infrequent in RA, which may include cardiovascular manifestations: pericarditis, vasculitis, granulomatous valve disease and atherosclerosis; respiratory manifestations: pleurisy, interstitial disease; skin changes: rheumatoid nodules, thickening and hypotrophy, vasculitis and livedo reticularis; involvement of nervous system: compression neuropathy, sensorimotor neuropathy, multiple mononeuritis and cervical myelitis; on the part of the organ of vision: dry keratoconjunctivitis, episcleritis, scleritis, peripheral ulcerative keratopathy; renal impairment: amyloidosis, vasculitis and nephritis. The diagnostic criteria of RA include the following: morning stiffness for 1 hour and longer that lasts more than 6 weeks; swelling of 3 and more joints that lasts for at least 6 weeks; hand

arthritis that lasts for at least 6 weeks; symmetrical arthritis that lasts for at least 6 weeks; rheumatoid nodules, subcutaneous nodules on prominences of bones, extensor surfaces, or around the joints, as detected by the physician; RF-positive serum detected with any available method, where the positive result in the control group of healthy individuals is  $< 5\%$ ; typical radiological changes. The diagnosis of RA is considered veritable when no less than 4 criteria are present. Systemic pharmacological therapy includes the use of four classes of drugs: symptomatic treatments, i.e. nonsteroidal anti-inflammatory drugs and glucocorticosteroids; disease-modifying (basic) anti-rheumatic drugs, genetically engineered biologicals (disease-modifying biologic agents) and cytostatic immunosuppressants. An important constituent of treatment is exercise therapy aimed at maintaining maximum range of motion in the joints and maintaining muscle mass. Physiotherapeutic procedures and health resort treatment are of auxiliary importance and are only used when the arthritis is mild in severity.

2. This work has established the main goals, the structure and the methods of nursing process when working with patients with rheumatoid arthritis. A standard model of a nursing process consists of the following classic five steps: 1) Nursing assessment of the patient; 2) Making a nursing diagnosis; 3) Planning of nursing actions (nursing interventions); 4) Implementation (realization) of the nursing plan; 5) Evaluating the quality and efficacy of nursing care. The nurse is responsible for timely and correct fulfillment of physician's orders concerning the following: dietary schedule, physical activity and rest schedule, administration of drugs; preparation of the patients to additional imaging and laboratory tests, exercise therapy and physical therapy. The nurse monitors the adverse effects of treatment, educates the patient about the importance of adequate physical activity, regular exercise therapy, as well as the importance of physical therapy treatments and rehabilitation interventions to preserve and expand functional capacities.

3. This work has defined typical problems in patients with rheumatoid arthritis, evaluated the quality of their life as one of the most important efficacy variables of healthcare services and nursing care, in order to improve the strategies and the tactics of increasing the efficacy of healthcare services in patients with this disease. Quality of life assessment was performed using the MOS Short-Form 36-Item (MOS SF-36)

questionnaire. A particularly distinctive reduction in the group of patients with RA has been documented in the following domains: RP (physical role functioning):  $45.3 \pm 1.1$ ; PF (physical functioning):  $46.1 \pm 1.1$ ; BP (bodily pain):  $53.1 \pm 1.1$ ; VT (vitality):  $61.8 \pm 1.1$ ; GH (general health perceptions):  $65.5 \pm 1.2$ , which suggests a limited physical activity. There also was a reduction in mental health indicators, which suggests the presence of concomitant emotional problems and reduced levels of social and emotional communication: SF (social role functioning):  $73.7 \pm 1.2$ ; RE (emotional role functioning):  $74.5 \pm 1.1$ ; MH (mental health):  $85.4 \pm 1.1$ . Nursing diagnosis was performed as part of nursing care and was based on interviews, observations and physical examinations conducted over an 8-week period. The main problems both in the patient and in their significant others and caregivers included the following: deformities, swelling of the affected joints; arthralgia; joint stiffness, limited range of motions in the joints; hyperthermia; skin changes (rheumatoid nodules, thickening and hypotrophy, vasculitis and livedo reticularis); mental changes (emotional lability, anxiety, depression); insomnia; limited ability to work and self-care deficits. The patients had the following nursing diagnoses: arthralgia in 99 pts. (99%); reduced and limited physical activity, related to deformities of joints and extremities and arthralgia in 96 pts. (96%); fear, being concerned/restless, anxiety and emotional lability, related to limited mobility and decreased ability to work in 85 pts. (85%); sleep disorders, arthralgia-related in 72 pts. (72%); elevated body temperature, synovitis-related in 32 pts. (32%); discomfort, skin changes-related in 23 pts. (23%). A list of intended nursing interventions was made, which included the following items: making sure the patient is on a diet that adequately meets his/her physiological needs; ensuring psychoemotional and physical rest, monitoring the patient's physical activity; creating a comfortable microclimate in the room, which is beneficial for sleep; fulfilling physician's orders; monitoring body temperature during the exacerbation period; ensuring preparation to additional assessments; preservation of work activity and social contacts. In course of observation and implementation of nursing care (over an 8-week period) the majority of patients reported the following: improved physical activity (in 62 pts. – 62.0%); reduced severity of arthralgia (y 58 pts. – 58.0 %); improved sleep (in 42 pts. – 42.0%); body temperature returned to normal (in 18 pts. – 18.0%); improved mental

and emotional well-being (in 61 pts. – 61.0%); improved overall health (in 77 pts. – 77.0%). The above findings suggest a high professional level of nursing staff and their correct attitude to professional duties, as well as the high quality of their work. Therefore, a properly organized nursing care is playing an important role in care for patients with RA.

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