



# PHYSICAL ACTIVITY GUIDE FOR ADULTS WITH CHRONIC DISEASES



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***PHYSICAL ACTIVITY GUIDE  
FOR ADULTS WITH  
CHRONIC DISEASES***

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*(Authors are written in alphabetical order by surname)*

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# P RESENTATION

Increase of chronic diseases and prolongation of life both in developed and developing countries across the world have become the most important cause of mortality and morbidity. The need to develop national policies and long term strategies has emerged on fight against the risk factors which cause chronic diseases.

Chronic diseases are defined as “prolonged states that are not fully curable and do not show improvement”. Chronic illnesses with rapidly increasing frequency are the most important causes of deaths and disabilities in the world. 36 million out of 57 million death worldwide, namely about two-third, in 2008; are result of non-communicable diseases including cardiovascular diseases, cancers, diabetes and chronic lung diseases. Similar to the situation in the world, the frequency of chronic diseases and risk factors is increasing in Turkey.

Physical inactivity, one of the common risk factors for chronic diseases, ranks fourth in the list of risk factors that cause death worldwide. According to the World Health Organization (WHO) 2008 Report, 31% of adults aged 15 years and over are not active enough. According to the “Chronic Disease Risk Factor Survey” conducted by the Ministry of Health in 2011, it is determined that 87% of women and 77% of men do not perform sufficient physical activity across Turkey. Inadequate physical activity is considered to be one of the important reasons for increasing chronic diseases. Inactive lifestyle and inadequate physical activity is an important public health issue in Turkey.

The World Health Organization and experts recommend that children should have at least 60 minutes of physical activity each day. Turkish Physical Activity Guidelines created by T.R. Ministry of Health was prepared in line with recommendations of the World Health Organization, including the physical activity recommendations for each age group.

Therefore, “Turkey Healthy Nutrition and Active Life Program” is conducted which was published as a Mandate of the Prime Ministry in the Official Gazette dated 29.09.2010 and No 27714 in order for the society to enhance the level of knowledge on struggle with obesity and to encourage gaining the habits of sufficient and balanced nutrition and regular physical activity. 30% of program activities involve physical activity.

I would like to thank the academicians and health workers who contributed knowledge and experience to the preparation of this country-wide guide, which includes recommendations and practices for increasing the quality of life of individuals with chronic diseases through the protection of health and increasing physical activity.

***General Directorate of Public Health***



# PREFACE

Today's technological developments have facilitated living conditions; however, created societies consisting of individuals who embrace a more stressful and sedentary life-style. In the light of concrete data offered by science for the human of the 21st century who is in expectation of a long and healthy life, a conscious effort should be made to quickly implement the universal education efforts that serve to bring the fact that the protective approach is of great importance to society. To this end, international scientific organizations are trying to reach individuals with various strategies and projects in terms of changing consumption habits and adopting healthy lifestyles. Governments need to be decisive and exhibit their long term efforts in education and health policies in order for these measures to be adopted by every part of society and healthy lifestyles to be promoted.

Health education is a combination of the learning process that prepares the individual to be healthy, makes it possible to be healthy and strengthens it. One of the main aims in health education is to gain the consciousness of movement to individuals. Individuals with consciousness of mobility are the basis for creating a healthy society. Physical activity protects the body from cardiac diseases, high blood pressure, obesity, osteoporosis and diabetes. It is now known that the long-term benefits of regular physical activity in children and adolescents play an important role in the protection of these diseases in adulthood. By looking at the principle of preventing the diseases before occurrence, which is among the important goals of the health policy, it is now extremely important to reach the physical activity to the optimum level and keep it at that level, to encourage persons for doing daily living activities with enjoyment and desire by increasing the quality of life.

Physical activity and exercise; is the sum of movements that improve the health of the individual as an instrument of the preventive health approach, maintain the wellbeing state and increase resistance to fatigue and disease. Lack of exercise and low level of physical fitness are very important risk factors for disease and premature death. The moderate level of exercise provides a major benefit for health. Increased levels of physical fitness of individuals in a community will lead to a significant improvement in the overall health level of that community.

Furthermore, for elderly population who retire into their shell due to inactive living conditions and their psychological fear after a certain age, appropriate exercise and sports branches and recreational activities should be benefited in order for elderly population to get rid of these behaviors, to be a group enjoying their lives. Physical activities recommended for elders do not increase the length of life, however, increase the living standard, increase the quality of life, support psychologically, and increase physical fitness by contributing to communication with social environment.

There are some points to preoccupy experts on exercise. The World Health Organization notably states that the programs to be given to the patients and those who will apply these programs should have adequate training and practice on the risk factors of the patients and should be trained to control and evaluate the risk factors (stress, hypertension, obesity, sedentary life, smoking, etc.) of the patients.

*Editors*





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## ABBREVIATIONS

ACD	Atherosclerotic Cardiac Disease
ACE	Angiotensin-Converting Enzyme
ACOG	American College of Obstetricians and Gynecologists
ACSM	American College of Sports Medicine
AHA	American Heart Association
AIDS	Acquired Immunodeficiency Syndrome
ALCAPA	Anomalous Origin of the Left Coronary Artery from the Pulmonary Artery,
ARB	Angiotensin Receptor Blockers
ARCAPA	Anomalous Right Coronary Artery from the Pulmonary Artery
ART	Antiretroviral Treatment
ARVD	Arrhythmogenic Right Ventricular Dysplasia
AS	Ankylosing Spondylitis
AS	Ankylosing Spondylitis
Asqol	Ankylosing Spondylitis Quality of Life Scale
AV	Atrioventricular
AV	Atrioventricular
BD	Behcet's Disease
BDI	Beck Depression Inventory
BMD	Bone Mineral Density
BMD	Bone Mineral Density
BMI	Body Mass Index
BP	Blood Pressure
BPPV	Benign Paroxysmal Positional Vertigo
BSSI	Beck Scale for Suicidal Ideation
CD	Crohn's Disease
CHF	Congestive Heart Failure
COPD	Chronic Obstructive Pulmonary Disease
CPVT	Catecholaminergic Polymorphic Ventricular Tachycardia
CPVT	Catecholaminergic Polymorphic Ventricular Tachycardia
CRD	Chronic Renal Disease
CREDIT	Chronic Renal Disease in Turkey Study
CRP	C-Reactive Protein
CVD	Cardiovascular Disease
CVS	Cardiovascular System
DALY	Disability-Adjusted Life Year
DEXA	Dual X-Ray Absorptiometry
DLA	Daily living activity



DM	Diabetes Mellitus
ECG	Electrocardiography
EF	Ejection Fraction
ESC	European Society of Cardiology
ESRF	End-Stage Renal Failure
FMF	Familial Mediterranean Fever
FPG	Fasting Plasma Glucose
GDM	Gestational Diabetes Mellitus
GER	Gastroesophageal Reflux
GERD	Gastroesophageal Reflux Disease
GFR	Glomerular Filtration Rate
GRD	Global Disease Burden
HAD	Hospital Anxiety and Depression
HAPPY	Heart Failure Prevalence and Predictors in Turkey
Hba1c	Glycosylated Hemoglobin A1c
HBV	Hepatitis B Virus
HDL	High Density Lipoprotein (HDL Cholesterol)
HIV	Human Immunodeficiency Virus
HPA	Hypothalamo-Pituitary-Adrenal Axis
HPV	Human Papilloma Virus
HR	Heart Rate
HRR	Heart Rate Reserve
HRR	Heart Rate Reserve
HRT	Hormone Replacement Therapy
IASP	International Association for the Study of Pain
IBD	Inflammatory Bowel Diseases
IC	Indeterminate Colitis
ICD	Implantable Cardiac Device
ICF	International Classification of Functioning Disability and Health
IDF	International Diabetes Federation
IGF-1	Insulin-Like Growth Factor
IL	Interleukin
ILD	Interstitial Lung Disease
IMT	Inspiratory Muscle Training
ISWT	Incremental Shuttle Walking Test
LDL	Low Density Lipoprotein (LDL Cholesterol)
LES	Lower Esophagus Sphincter
MCP	Metacarpophalangeal

MET	Metabolic Equivalent
MET	Metabolic Equivalent of Task-Metabolic Equivalence
MHR	Maximum Heart Rate
MI	Myocardial Infarction
MI	Myocardium Infarction
MIP	Maximal Inspiratory Pressure
MNA-SFMini-	Nutritional Assessment-Short Form
MS	Multiple Sclerosis
MSS	Multiple Sclerosis
NAFLD	Non Alcoholic Fatty Liver Disease
NYHA	New York Heart Association
NYHA	New York Heart Association
NYHA	New York Heart Association
OA	Osteoarthritis
OA	Osteoarthritis
OGTT	Oral Glucose Tolerance Test
PA	Physical Activity
PEG	Percutaneous Endoscopic Gastrostomy
PFMT	Pelvic Floor Muscle Training
PIP	Proximal Interphalangeal
Pmp	Per Million Population
PR	Pulmonary Rehabilitation
PTCA	Percutaneous Transluminal Coronary Angioplasty
QT	QT Interval in ECG
QT Q-T	Interval in ECG
Qtc	Corrected QT Interval in ECG
RA	Rheumatoid Arthritis
RA	Rheumatoid Arthritis
Raqol	Rheumatoid Arthritis Quality of Life Scale
RM	Repeat Maximum
RRT	Renal Replacement Therapy
SALTURK	Salt Consumption Study in Turkish Society
SBP	Systolic Blood Pressure
SCI	Spinal Cord Injury
SCI	Spinal Cord Injury
SD	Standard Deviation
SLE	Systemic Lupus Erythematosus
SRD	Stress Related Diseases
ST	ST Segmentation in ECG

TNA	Turkish Nephrology Association
TURDEP	Turkey Diabetes Epidemiology Study
TURKSTAT	Turkey Statistical Institute
UC	Ulcerative Colitis
UNAIDS	United Nations Programme on HIV and AIDS
UV	Ultraviolet
VO2	Volume Oxygen 2
VO2	Volume Oxygen 2
WHO	World Health Organization
WHO	World Health Organization
WOMAC	Western Ontario and McMaster Universities Osteoarthritis Index
WPW	Wolf-Parkinson-White
WPW	Wolff-Parkinson-White Syndrome

# SECTION 1

## PHYSICAL ACTIVITY AND EXERCISE IN PULMONARY DISEASES

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## **A**BSTRACT

Chronic lung diseases in children should be surveyed under two main categories: obstructive and restrictive. Pulmonary rehabilitation (PR) approaches are also applied in pulmonary diseases with drug treatments. PR programs are important approaches to prevent disease progression and exacerbation, to reduce the frequency of hospital admission, and to increase the exercise capacity and physical activity levels of patients.

Exercise training is the most basic, important and effective component of PR. Studies in which the effects of exercise training are investigated in the literature were mostly done with COPD cases. In a large number of surveys in recent years, exercise training was shown to reduce symptoms, improve exercise capacity and the quality of life in cases with non-COPD lung disease. Exercise intolerance in chronic respiratory diseases may be seen as result of ventilatory restraints, pulmonary gas exchange abnormalities, peripheral and respiratory muscle weakness, cardiac dysfunction and any combination of those. In order for exercise training to be effective, exercise capacity should be assessed with reliable, valid methods, and training should be patient specific. To increase cardiorespiratory endurance, strength and/or flexibility, various types of exercise training are required; endurance education, strengthening, flexibility training. In PR programs, dyspnea positions, breathing control and respiratory exercises, which loosen the auxiliary respiratory muscles, are used to reduce dyspnea in chronic airway diseases, and it is taught to use these exercises during physical activities. Patients with chronic airway disease should be encouraged to be physically active.

## INTRODUCTION

Chronic lung diseases in children should be surveyed under two main categories: obstructive and restrictive. While chronic obstructive pulmonary disease (COPD), asthma, non-cystic fibrosis bronchiectasis are the most common obstructive lung diseases, diffuse parenchymal lung diseases, neuromuscular diseases, thoracic deformities are among the most common restrictive lung diseases.

PR approaches are also applied in lung diseases with drug treatments. PR programs are important approaches to prevent disease progression and exacerbation, to reduce the frequency of hospital admission, and to increase the exercise capacity and physical activity levels of patients.

Exercise training is the most basic, important and effective component of PR. Studies in which the effects of exercise training are investigated in the literature were mostly done patients with COPD. In a large number of recent studies, exercise training was shown to reduce symptoms, increase exercise capacity and improve the quality of life in patients with interstitial lung disease (ILD), bronchiectasis, cystic fibrosis, asthma, pulmonary hypertension, lung cancer, volume reduction surgery and lung transplantation. Exercise intolerance in chronic respiratory diseases may be seen as result of ventilatory restraints, pulmonary gas exchange abnormalities, peripheral and respiratory muscle weakness, cardiac dysfunction and any combination of those. In order for exercise training to be effective, exercise capacity should be assessed with reliable, valid methods, and training should be patient specific. Various types of exercise training are required to increase cardiorespiratory endurance, strength and/or flexibility. Those are endurance training, strengthening and flexibility training. Those are endurance exercise training, resistance/ strength training and flexibility exercise training.

In PR programs, dyspnea positions, respiratory control and respiratory exercises, which loosen the accessory respiratory muscles, are used to reduce dyspnea in chronic airway diseases, and it is taught to use these exercises during physical activities. Patients with chronic airway disease should be encouraged to be physically active. The activities to be done with the adult patient family and friends should be planned and an active and mobile lifestyle development should be provided.

Since asthma and COPD are the most common among chronic airway diseases and on which some studies were made related to physical exercise, they will be explained under two main titles.

**COPD****Definition**

Chronic Obstructive Pulmonary Disease (COPD) is a common, preventable and treatable disease which is associated with airways and increased chronic inflammatory response of lung against harmful gases and particles and characterized with persistent permanent airstream restriction with progressive characteristic generally. Exacerbation and comorbidities (such as cardiovascular diseases, metabolic diseases and lung cancer) contribute to the severity of the disease.

The most common symptoms of the disease are shortness of breath, chronic cough and chronic sputum. Spirometry is necessary for the diagnosis of the disease. Identification of established airflow obstruction (post-bronchodilator FEV1/FVC<70%) as part of spirometric examination in middle-advanced age adults with chronic symptoms and exposure to risk factors history confirms the diagnosis.

Increasing population aging and the gradual decrease of traditional risk factors (malnutrition, polluted water, non-hygienic conditions, domestic pollution etc.), but emergence of new risk factors (tobacco, physical inactivity, obesity, occupational risks, air pollution etc.) also changed patterns of diseases. In this century, globalization, rapid unplanned urbanization, aging of the population and widespread western lifestyle caused the new risk factors (tobacco use, internal and external air pollutants, allergens, occupational exposure, unhealthy diet, obesity and physical inactivity) to emerge.

According to the BOLD study conducted in 12 countries, the prevalence of COPD in the population over 40 years was indicated as 10.1% (11.8% in males, 8.5% in females). The Global Burden of Disease (GBD) Study data (2010) refers COPD as the cause of 2.9 million deaths out of 3.8 million occurred. COPD, which is the third leading cause of death worldwide, accounts for 5.5% of all deaths.

COPD treatment includes four fundamental approaches; patient training, reduction of risk factors, stabilized COPD and pharmacological treatment of exacerbations. In stable COPD cases, pharmacological treatment is inhaled beta-2 agonist, anticholinergic, methylxanthine and phosphodiesterase-4 inhibitors.

The most important approach to reduce symptoms and mortality is to quit smoking at first. It is also important to optimize medical treatment, to train patients and their relatives (definition of disease, definition of attack, inhaler education, vaccination, importance of nutrition), to evaluate indications of oxygen and noninvasive mechanical ventilator and to direct to pulmonary rehabilitation units/centers in necessary cases.



**ASTHMA**

Asthma is a chronic respiratory tract disease, at a frequency of 1-18% among all population, characterized with variable airway obstruction causing wheezing, shortness of breath, chest tightness and coughing attacks. Although it is not known that genetic and environmental factors play a role in asthma development, etiopathogenesis has not yet been fully elucidated. In the development of asthma, personal (genetic, obesity, gender) and environmental factors (allergens, infections, occupational sensitizers, exercise, smoking, domestic and outdoor air pollution) interact and cause the disease to develop.

Anamnesis is very important in the diagnosis of asthma. Common symptoms of asthma are given in Table 1. Positive diagnostic tests support diagnosis.

**Table 1.** Common Symptoms and Features of Asthma

- 
- Incidence of several symptoms in adults particularly (wheezing, shortness of breath, cough, feeling of chest tightness)
  - Increase in symptoms usually at night or early in the morning
  - Variances in symptoms during the day or seasonally
  - Increase in symptoms with triggering factors (such as infections, exercise, allergen exposure, seasonal change, air pollution, smoking)
- 

Asthma is thought to affect about 300 million people across the world. The World Health Organization reported 15 million disability-adjusted life year losses (DALY) annually all the world due to asthma, which corresponds to 1% of all diseases-related losses worldwide. It is estimated that about 250,000 people die of asthma annually across the world.

Drugs used in asthma pharmacological treatment; controlling and relaxing (symptom-relieving) drugs. Controlling drugs are the drugs that are used on daily basis and for a long time to keep asthma under control, often through their anti-inflammatory effects. Relieving drugs are the drugs that restore the bronchoconstriction by rapidly acting, relieve symptoms and are used when necessary. Inhaled steroids are the most effective controlling drugs available today. Rapid-acting inhaler beta 2-agonists are the drugs for eliminating bronchoconstriction and preventing exercise induced bronchoconstriction. Increased use of relaxant drugs and the need for daily use is a warning that asthma is uncontrolled and requires reevaluation of the treatment.

In order for patients with asthma to be treated effectively, the patient must have a good working relationship with the physician. Under the guidance of the physician, the patient is gaining the ability to control his/her condition and to treat himself/herself. Also correcting the variable risk

factors, training of patients and their relatives (cause of disease, description of attack and determination of asthma attack plan, inhaler education, vaccination, importance of nutrition) and directing to pulmonary rehabilitation unit/centers are crucial.

**Pulmonary Rehabilitation (PR)**

PR is a comprehensive set of interdisciplinary practices that aim at improving the physical and emotional states of chronic respiratory patients and providing sustained health promoting behaviors and that include approaches such as individually determined exercise training, training and behavioral change following the patient assessment.

Even clinical efficacy levels (Table-2) are determined by studies with COPD diagnosed cases, PR is recommended for all cases having chronic respiratory problems with affected the quality of life, distinct symptoms and reduced exercise capacity. Table-3 summarizes the diseases and conditions in which PR is recommended to be involved in disease management as a therapeutic component.

**Table 2.** Benefits of Pulmonary Rehabilitation in Patients with COPD Diagnosis

- *Exercise training increases exercise capacity (Evidence A)*
- *It decreases dyspnea (evidence A).*
- *It improves the quality of life (evidence A).*
- *It reduces the number and period of hospitalization (evidence A).*
- *It reduces anxiety and depression associated with COPD (evidence A).*
- *Upper extremity endurance and strength training improves upper extremity functions (evidence B).*
- *Benefits are seen in the early period of training (evidence B).*
- *It prolongs survival (Evidence B).*
- *Respiratory muscle training accompanied by general exercise training may provide benefit (Evidence B).*
- *It accelerates healing after attack that requires admission to a hospital (Evidence A).*

**Table 3.** Indications of Pulmonary Rehabilitation

Obstructive Lung Diseases	Restrictive Lung Diseases	Other
<ul style="list-style-type: none"> <li>• COPD</li> <li>• Asthma</li> <li>• Bronchiectasis</li> <li>• Cystic fibrosis</li> </ul>	<ul style="list-style-type: none"> <li>• Interstitial lung diseases</li> <li>• Chest wall diseases</li> <li>• Neuromuscular diseases</li> </ul>	<ul style="list-style-type: none"> <li>• Lung malignancies</li> <li>• Primer Pulmonary Hypertension</li> <li>• Pre-Post Surgery</li> <li>• Pre-Post Lung Transplantation</li> <li>• Ventilator dependent patient</li> <li>• Obesity related lung disease</li> </ul>

The main components of PR programs are; patient evaluation, exercise training, patient education, program structuring, preservation and continuity of achievements. Bringing these components into action within the framework of individual management strategies in accordance with patient needs is important for enhancing patient compliance. Patient training program components are given in Table-4.

**Table 4.** Components of Patient Training

- 
1. Smoking cessation and avoiding risk factors
  2. Giving basic information about the disease
  3. Principles of drug use and instructing effective inhalation methods
  4. Prevention exacerbations and early noticing
  5. Oxygen treatment
  6. Dyspnea reduction strategies
  7. Proper nutrition, hydration and diet recommendations
  8. Benefits of exercise and maintaining physical activity
  9. Respiratory exercises (diaphragmatic breathing, pursed lip breathing), bronchial hygiene techniques
  10. Energy saving and daily work simplification techniques
  11. Assessment of leisure time and travelling
  12. Ability to cope with chronic disease
  13. Indications to refer to health institutions
  14. Planning the end of life
- 

### **Exercise Training**

Exercise training is the most important component of a comprehensive PR program. Exercise training increases exercise capacity, the quality of life (evidence A). It reduces shortness of breath, anxiety and depression, the length and frequency of hospitalization (evidence A). Thus the patients with chronic respiratory problems are enabled to participate in life more active with structured exercise programs.

### **Effects of Physical Activity**

Involvement in physical activity should be provided for all patients with chronic airway disease. Regular exercise training reduces the risk of cardiovascular disease in healthy individuals, improves physical fitness and reduces the lung function reduction and COPD development risk. This also applies to patients with chronic respiratory problems, provided they exercise regularly and adequately. Lower extremity muscle weakness in chronic diseases such as COPD and cardiac insufficiency, exercise intolerance are independent indicators of mortality.

Physical exercise training programs have positive effects on the respiratory and circulatory systems of chronic airway patients, provide psychological support and contribute to the socialization of patients. For this reason, practices such as PR practices and/or activity counseling that will increase physical activity in the management of the disease are clinically and socially important.

### **Indications/benefits**

Increasing level of physical activity in cases with chronic respiratory problems decreases the deterioration of lung functions and increases survival rates. Exercise training programs improve exercise tolerance. This effect is especially evident in cases with poor physical capacity.

Aerobic and strength exercise training together with pharmacological treatments provides more positive effects for the prognosis of the disease. Exercise training improves ventilatory competence, mucus clearance, improves exercise capacity and rehabilitates psychosocial functions. Strength exercises improve lean body mass, weight gain, muscle strength and bone mineral density. Thus, participation of cases in daily living activities increases by contributing to the reduction of shortness of breath and fatigue. Physical activities such as in-water exercises, swimming, walking and jogging increase the strength and endurance of skeletal and respiratory muscles.

### **Physical Activity Prescription**

In order for the physiological effects of exercise training to emerge, the frequency, severity and duration of the exercise should be customized. Exercise program is affected by age, nutritional and functional status, severity of pulmonary disease, amount of secretion and presence of bronchial hyperactivity and comorbidities. The most appropriate exercise program should be planned according to the clinical condition of the patient, so that the maximum adaption should be ensured. The need for inhale bronchodilator should be assessed prior to exercise training. The exercise session should be started with warming (5-10 min) and ended with cooling (active recovery, 5-10 min). In desaturated patients during exercise, support oxygen delivery as 90% of oxygen saturation provides control of ventilator and cardiovascular burden during exercise.

In cases with chronic respiratory problems and reduced exercise capacity, the key standard in determination of exercise capacity is cardiopulmonary exercise test performed with treadmill or bicycle/arm ergometer. However, field tests (six-minute walking test, shuttle walking test at increased speed and endurance shuttle walking test) that are more practical and easier to use in clinical conditions could be used. According to the exercises tests, exercise prescription is made with the following formulas. Effort perception during exercise is evaluated with the modified Borg Scale (Table 5).

**Exercise intensity:** 50-85% of peak heart rate (HR) reached in cardiopulmonary exercise test according to Karvonen Formula

$(HR_{\text{training}} = HR_{\text{rest}} + 0.50-0.85 \times [HR_{\text{max}} - HR_{\text{rest}}]);$

60-80% of the peak work load,

4-6 according to the modified Borg Scale with 10 points.

80% of the average speed of the six-minute walk test; 80% of peak oxygen consumption ( $VO_2$ ) reached in incremental shuttle walking test (ISWT); (peak  $VO_2$ , mL/kg/min =  $4.19 + 0.025 \times \text{ISWT distance}$ )

Individual exercise intensity, duration, frequency and type in structuring of exercise program [intermittent or continuous. (E.g. walking (free, treadmill), stationary bike, arm exercises, lower-upper extremity strengthening] should be considered (Table 6). In patients that do not fulfill constant aerobic exercise requirements, intermittent exercise training, where exercise and rest intervals are applied alternately, can be used.

**Table 5.** Borg's Scale

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0	: Nothing at all
0.5	: Very,very slight (just noticeable)
1	: Very slight
2	: Slight
3	: Moderate
4	: Somewhat severe
5	: Severe
6	:
7	: Very severe
8	:
9	:
10	: Very, very severe (almost maximal)
•	Maximal

---

**Table 6.** Aerobic Endurance Training

<b>Type of exercise</b>	Including aerobic, isotonic, wide type muscle groups,	Walking on a treadmill, cycling; Continuously, intermittently
<b>Intensity of exercise</b>	Light - Moderate	Heart rate 55-70% VO2 max 50-60% Borg Scale: 4-6 (10-points)
	High intensity	Heart rate 70-80% VO2 max>60-90% Borg Scale: 7-8 (10-points)
<b>The frequency of exercise</b>	3-5 days/week	3 days under observation
<b>Duration</b>	30-40 min/session	At least 8 weeks (24 sessions)
<b>Progression</b>	Must progress gradually	The load must be increased by 5-10% as tolerated
<b>Continuity</b>	Must progress gradually	Control every 3-6 months

It is aimed to activate major locomotor muscles by repetitive movements against resistance by strengthening training. Generally quadriceps femoris, hamstrings, gluteus max/medius, gastrocnemius, soleus muscles in lower extremity; pectoralis major/minor, latissimus dorsi, trapezius, triceps and biceps muscles in upper extremity are trained. The training program is given in Table 7.

**Table 7.** Strengthening Training

<b>Modalities</b>	Free weights, elastic bands, body weight, machines
<b>Intensity of exercise</b>	should be 1 maximum repeat 50-85% 2-4 sets, 6-12 repeats/set 2-3 min rest between sets
<b>The frequency of exercise</b>	2-3 days/week One day break should be given between training sessions.
<b>Type of exercise</b>	Continuous or intermittent training
<b>The speed of exercise</b>	Moderate (1-2 second concentric, 1-2 second eccentric)
<b>Work load progression</b>	2-10% increase Workload is increased if it is achieved 1-2 more than targeted repeat in 2 consecutive training sessions

Components such as flexibility and relaxation, inspiratory muscle training and balance exercises could also be added to the program.

**Flexibility and Relaxation Exercises**

Maintaining the spine flexibility, the longitudinal tension relationship of the pectoral and upper thoracic muscles in chronic respiratory diseases is important for ensuring thoracic activity during respiration. Mobilization, stretching and posture correction exercises for thoracic cage are benefited with the purpose of eliminating negative effects of muscular tightness, loss of elastic retraction and posture changes.

Flexibility and stretching exercises are recommended to be done at the pain-free limit of motion, in the form of static stretching, for 5 to 10 seconds, at least 10 repetitions. During stretching and flexibility exercises, the patient should not hold his/her breath. These exercises can also be added to warm-up and cool-down periods.

**Monitoring the Physical Activity**

Increasing involvement in physical activity requires the use of behavioral change approaches. The level of physical activity can be assessed with accelerometers, questionnaires and activity log. Pedometer and smartphone applications could also be used to monitor the activity levels of the patients.

**Contraindications/risks**

Comorbidities often accompany in those with chronic lung disease. Therefore, the identification of comorbidities (DM, coronary artery disease, hypertension, heart failure, osteoporosis, lung cancer, etc.) is important before the exercise training program is organized. Before and during exercise, symptoms such as blood pressure, ECG, heart rate, saturation, blood sugar, chest pain, dyspnea, excessive sweating, fatigue, syncope should be monitored. For the patients with long-term oxygen therapy and with desaturation during exercise tests, exercise trainings should be given under oxygen support. In patients with a diagnosis of pulmonary hypertension, exercise training with direct surveillance and close monitorization is recommended.

Hypoglycemia and dehydration (polyuria) can occur during long-term exercise in patients observed with diagnosis of Diabetes Mellitus (DM). Additional carbohydrate support may be needed in that case.

In cases with exercise-related asthma diagnosis, bronchodilator use should be recommended prior to exercise and respiratory symptoms that may occur with exercise should be monitored.

**Physical Activity Recommendations:**

- Involvement in physical activity should be encouraged in chronic airway diseases. Optimal medical treatment of patients should be arranged prior to the involvement.
- The exercise program must be specific to the individual. In addition to aerobic exercise training, it should include strength training.
- To improve aerobic exercise tolerance, appropriate home exercises should be structured.
- It should be known that the increase in physical activity provides the self-management skills.
- Cases with direct surveillance or requiring monitorization should be directed to the pulmonary rehabilitation units/centers.
- Definition and content of physical activity and its importance in chronic respiratory diseases; should be included in patient training programs and assessed as part of pulmonary rehabilitation outcome measures.



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# SECTION 2

## PHYSICAL ACTIVITY AND EXERCISE IN ONCOLOGICAL DISEASES

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# A

## BSTRACT

Cancer is a disease caused by unlimited proliferation of a cell mutated due to losing control on mechanisms which enable normal growth and differentiation. It can affect almost every part of the body. The most important reasons that affect functionality and activity performance negatively in cancer patients are the problems caused by side effects of cancers and cancer treatments (surgery, chemotherapy, radiotherapy, etc.) and the limitations of involvement in daily living activities due to these problems. Gaining/improving the maximum physical, social, psychologic and professional functionality level and activity performance of the patients with cancer within the limits determined by the disease and treatments could be provided with a good cooperation of the surgeon, oncologist and radiation oncologist, interdisciplinary rehabilitation team (physiatrist, psychiatrist, physiotherapist, ergotherapist, language therapist, psychologist, physician, nurses, etc.), family and caregivers.

## INTRODUCTION

Cancer is a disease caused by unlimited proliferation of a cell mutated due to losing control on mechanisms which enable normal growth and differentiation. It can affect almost every part of the body. Growths can usually be as metastases around the tissue and in remote areas. More than 30% of cancer deaths could be prevented by changing the risk factors, especially by avoiding tobacco use. Early diagnosis, true diagnosis, effective treatment, pain relief and palliative care increase cancer survival rates. Treatment options include proper use of available resources (appropriate surgery, chemotherapy and radiotherapy) in accordance with tumor stage and type.

Cancers are among the most leading causes of morbidity and mortality across the world with about 14 million new cases per year and 8.2 million cancer-related deaths.

- The five most common cancers diagnosed in men are lung, prostate, colorectal, stomach and liver cancer.
- The five most common cancers diagnosed in women are breast, colorectal, lung, cervical and stomach cancer.
- Risk factors include high body mass index, poor consumption of fruit and vegetable, insufficiency of physical activity and consumption of tobacco and alcohol.
- Tobacco use is the most crucial risk factor leading to about 20% of cancer deaths and 70% of lung cancer deaths worldwide.

30% of cancer deaths could be prevented by changing lifestyle or avoiding risk factors.

### Changeable risk factors

- Tobacco use
- Being overweight or obese
- Poor consumption of fruit and vegetable and unhealthy nutrition
- Lack of physical activity
- Alcohol usage
- Sexually transmitted HPV infection
- HBV infection
- Ionized and non-ionized radiation
- Urban air pollution
- Household use of solid fuels and indoor fumes

There is a significant increase in the incidence of cancer due to many factors such as increased life span, genetic transmission, sedentary lifestyle and environmental exposure all over the world. It is known that 25% of the cancer cases all over the world are caused by sedentary lifestyle and overweight. Current studies suggest that overweight and inactivity should be avoided in the prevention and treatment of cancer. Cancer develops within a complex interaction where many biological mechanisms (environmental and genetic) interact each other. Energy metabolism, level of sex hormones, insulin resistance, prostaglandins, leptin, reactive protein and immunological functions, etc. factors are defined as biological mechanisms affecting physical activity.

### **The Effects of Physical Activity in Individuals with Cancer:**

Physical activity affects cancer development through many biological mechanisms. The effects of these mechanisms are as follows;

1. Effects on cellular level (cell proliferation): Physical activity provides DNA repair and allows the cell to maintain normal development. One of the best examples of this is the intestinal epithelium.
2. Effects on hormones: Physical activity reduces the risk of cancer most of the time with sex hormones in females. Regular activity slows down the estrogen level, delaying the age of menstruation onset, changing the hormonal cycle in the menstrual cycle and reducing estrogen after menopause. In males, it decreases testosterone levels that play a role in prostate cancer.

IGF-1 (insulin-like growth factor), insulin and insulin sensitivity are also factors that are affected by physical activity and pose a risk for different types of cancer. Insulin is associated with many cancer types such as colon, breast, uterus, prostate, pancreas and stomach.

3. Effects on organ functions: Physical activity slows the intestinal passage of nutrients, reduces cell proliferation in the colon and affects the secretion of bile salts. In addition, activity improves lung capacity, shortening the duration of contact with carcinogenic agents.
4. Effects on the immune system: The effects of the immune system on cancer formation are not fully explained, however, some studies showed that treatment and disease-related cytokine changes are effective. Physical activity causes some components to increase in the immune system, leading to strength. Nevertheless, there are no definite findings on the interaction between physical activity and cancer over the immune system.

The studies made in this regard offer strong evidences that physical activity reduces breast and colon cancer risk in particular. For example, in addition to protective effect of moderate intensity activity for a period of 210-420 minutes a day for breast cancer, it was also shown that the risk of cancer reduces as the duration of activity increases. The same study suggests that the activity for 150 minutes per week the duration does not have a significant protective effect so that physical activity at a certain time and intensity could be protective against the cancer. Even though not such forceful, there are evidences that the risk of lung cancer and endometrium cancer in females is reduced by regular exercise. It is also known that regular activity in cancer patients affects the quality of life, physical health and well-being positively.

**Table 8.** Cancer and Physical Activity Biological Mechanisms

<b>Mechanism</b>	<b>Effect</b>	<b>Cancer Type</b>
<b>Energy metabolism</b>	Oil depots, metabolic carcinogenic elements, carcinogens reduce	In all types of cancer
<b>Blood flow</b>	Local and general blood flow increase.	In all types of cancer
<b>Mechanic transition period in stomach and</b>	Transition time of elements is shorten	In stomach and intestinal cancers
<b>Respiration</b>	Accumulation of potential particles	In lung cancer
<b>Temperature/trauma</b>	Cell renewal increases	In all types of cancer
<b>Sex hormones</b>	Cumulative decrease of hormones in all cells affecting growth	In breast, uterus and prostate cancers
<b>Insulin and glucose</b>	Insulin levels decrease, insulin sensitivity increases	In colon, breast, pancreas, esophagus, liver, thyroid and uterus cancers
<b>Inflammation</b>	Affects repair mechanisms of all cells	In all types of cancer
<b>Immune function</b>	Optimization in the cells that macrophages and	In all types of cancer

The most important reasons that affect functionality and activity performance negatively in cancer patients are the problems caused by side effects of cancers and cancer treatments (surgery, chemotherapy, radiotherapy, etc.) such as fatigue, condition and muscular strength losses, ambulation problems, pain, swallowing problems, transfer problems, contractures, lymphedema, sexual dysfunction, communication problems, bladder-bowel dysfunction, cognitive problems and the limitations of involvement in daily living activities due to these problems.

Gaining/improving the maximum physical, social, psychologic and professional functionality level and activity performance of the patients with cancer within the limits determined by the disease and treatments could be provided with a good cooperation of the surgeon, oncologist and radiation oncologist, interdisciplinary rehabilitation team (physiatrist, psychiatrist, physiotherapist, ergotherapist, language therapist, psychologist, physician, nurses, etc.), family and caregivers.

### **International Classification of Functioning Disability and Health (ICF):**

The body structure and functions of individuals with cancer and their activity and disabilities provide a framework for explaining the interaction between environmental and personal factors in the general state of the individual. It is important to use all the data in the ICF model in the evaluation and therapy of individuals with cancer and their families. In a holistic approach, ICF enables to examine problems of the individual with cancer starting from body structures and functions, to identify in which way the malfunctions to emerge affect the activity level and to evaluate the social involvement which is the most important objective of the treatment. During such examination, it is possible to take into account the personal and environmental factors that affect the disorder, activity and involvement. Recent studies emphasized the importance of addition of the quality of life assessment and intervention approaches to assessment and interventions within ICF contexts in patients with cancer.

Physical activity can be restorative, supportive, preventive and palliative in cancer patients. Examples of those are given below.

Restorative physical activity includes the efforts of turning the individual to pre-morbid functional state in case of anticipation of low level loss and activity limitation. For example, in an individual with breast cancer, activities using full shoulder range of motion or activities to improve upper extremity muscle strength may be used. Physical activity for supportive purposes may be used to tolerate cancer survivors' permanent disability resulting from cancer or cancer treatments. Activities involving ambulation after extremity-preserving surgery in bone and soft tissue tumors may help support balance and deep sensory perception. Preventive physical activity may help to reduce the functional morbidity expected of cancer or cancer treatments. Palliative physical activity refers to increase the mobility and independence as far as possible,



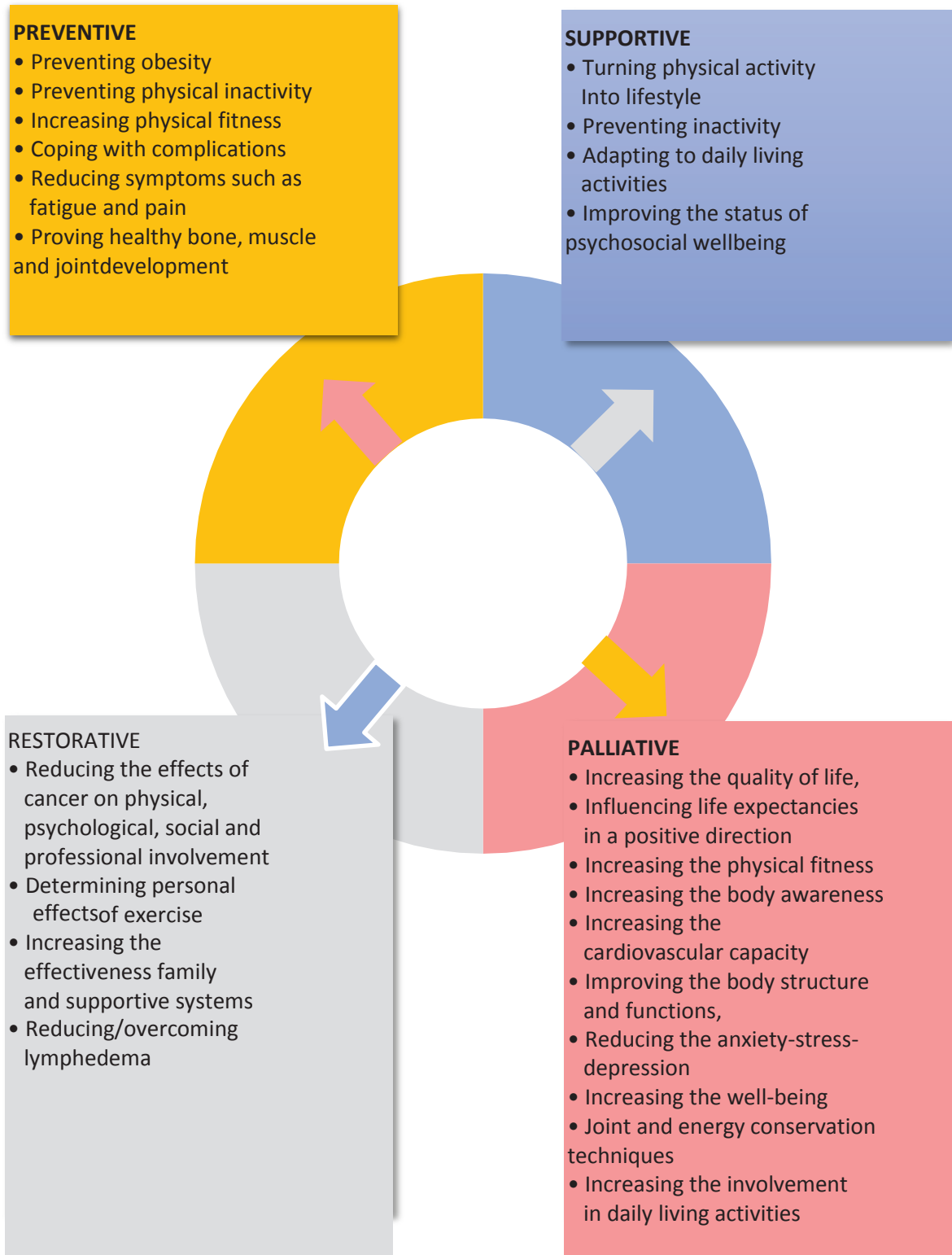
to reduce the feeling of loss and to improve the well-being and the quality of life with psychosocial support (Figure 1).

There are studies that measure physical activity related to cancer through different methods. With surveys studies and recorded data, the parameters such as cardiac rate and physical fitness levels are used in more objective measurements in recent years. The most accurate survey measures measure the type, severity, frequency, duration and reason of physical activity (eg: cycling to work). Day time minute or MET (metabolic equivalent) measurement is used in physical activity. Another important factor of physical activity is that it is related to specific types of cancer in different phases of life.

Physical activity appropriate for individuals with cancer should be determined in accordance with the needs of the individual and should be increased gradually. In line with health status, interests and requests of individuals with cancer, light exercises such as respiratory/relaxation exercises, weight transfer exercises, body awareness exercises; moderate exercises such as aerobic exercises, dancing, biking, canoeing, doing light garden works as pruning and/or irrigating flowers, playing basketball and tennis, using wheelchair and doing arm ergometer exercises; heavy exercises such as fast swimming, brisk walking, dancing fast, biking faster than 15 km/hour, doing heavy garden works as hoeing/dibbling, jumping rope and walking uphill are suitable for their lives.

Physical activity according to accepted guidelines in the world; is defined as activities involving the function of one or more major muscles as part of self-care, productivity or leisure time activities. According to these guidelines, an activity program consisting of aerobic, strengthening and stretching exercises should be applied as a moderate-intensity program for at least 150 minutes per week or as high-intensity programs for 60-70 minutes per week in order to expose the positive effects of physical activities in individuals with cancer aged 18-64 years. All physical activities should not be done on the same day and should spread throughout the whole week. This program should also include strengthening exercises for 2 days a week for major muscle groups (back-abdominal muscles, leg muscles, etc.). When these programs are applied in individuals at the age of 65 and above, comorbid factors should be considered and simplified and the duration should be shortened. Examples of moderate and heavy activity are given in Table 9.

## Effects of Physical Activity in Different Stages of Cancer



**Figure 1.** Effects of Physical Activity in Different Stages of Cancer

**Table 9.** Examples of Moderate and Vigorous Activity

<b>Moderate Activities</b>	<b>Vigorous Activities</b>
<b>I cannot sing while doing these activities but I can talk!</b>	<b>I can say only a few words without holding my breath while doing these activities!</b>
<input type="checkbox"/> Paired dances in slow tempo, <input type="checkbox"/> Biking on a flat surface <input type="checkbox"/> In-water activities <input type="checkbox"/> Playing double tennis <input type="checkbox"/> Light intensity ball games (basketball, volleyball, etc.) <input type="checkbox"/> Light garden works <input type="checkbox"/> Using a wheelchair <input type="checkbox"/> Arm ergometer (arm bike) works <input type="checkbox"/> Brisk Walking	<input type="checkbox"/> Fast paired dances <input type="checkbox"/> Aerobic dance <input type="checkbox"/> Biking (15 km/h) <input type="checkbox"/> Biking on rough surface <input type="checkbox"/> Heavy garden works <input type="checkbox"/> Defense arts <input type="checkbox"/> Sports including running (basketball, football, etc.), fast swimming, style swimming <input type="checkbox"/> Playing single tennis

You Can Reduce Your Cancer Risk by Adding Exercise to Your Daily Living Activities!

- 1) Carry your shopping bags one by one
- 2) Use stairs instead of using elevator
- 3) Prefer standing rather than sitting while working
- 4) Get off the bus one stop early or park your car slightly away from where you will go
- 5) Give small walking breaks while doing your home activities
- 6) Prefer walking while meeting your friends.
- 7) Fill your free time with active-attended hobbies.

**Physical Activity Approaches in Specific Cancers:**

**Physical Activity for the Individuals with Breast Cancer**

21-25% of breast and colon cancers are caused by physical inactivity. According to the results of scientific researches, physically active women have lower risk of contracting cancer than women who are inactive and the risk of cancer for women doing physical activity is 20-80% less. Many scientific investigations suggested that physical activity in pre-menopausal and post-menopausal women reduces the risk of breast cancer, as well as moderate to vigorous physical activity performed during adolescence have protective effect. Although the best results are observed in women doing lifelong heavy physical activity, the physical activity to be started after menopause

is known to reduce the risk of breast cancer. Some studies indicate that the effect of physical activity may vary according to the body mass index level and the best results are seen in women with the body mass index of 25 kg/m<sup>2</sup>. Scientific studies reveal that as the frequency and duration of physical activity increases, the risk of breast cancer decreases. Many studies suggest that moderate-heavy physical activity, which can be 30-60 minutes a day, reduces the cancer risk. Scientists talk about a few biological mechanisms to explain this. It is believed that physical activity provides the control of weight and body mass index by reducing especially postmenopausal women's hormone levels or reducing insulin and insulin-like growth factors and helps to be protected from tumor development by improving immune responses.

#### **Effects of Physical Activity in Breast Cancer;**

1. Affects the patient's expectations in a positive way by increasing the quality of life,
2. Increases physical condition, body awareness and general well-being,
3. Increases cardiovascular capacity,
4. Reduces anxiety-stress-depression and fatigue,
5. Protects the joint's range of motion and reduces muscle mass loss,
6. Reduces sleeping problems
7. Increase the involvement in daily living activities
8. Reduces the risk of lymph edema
9. Increases sensory perception
10. Protects the bone mineral balance
11. Provides weight control and prevents obesity
12. Increases social skills
13. Maintains and enhance physical fitness by increasing durability, balance, coordination, strength and flexibility
14. Provides improvement in disability, activity and participation level
15. Develops cognitive functions
16. Increases the upper extremity function and hand skills

**Indications**

1. Pain
2. Fatigue
3. Posture disorder
4. Loss of upper extremity function
5. Lymphedema
6. Decrease in physical decondition and cardiovascular capacity
7. Stress, anxiety and depression
8. Limitation in daily activities and difficulty in involvement
9. Losses in professional skills - Difficulties in returning to work

**Prescription of Physical Activity for Individuals with Breast Cancer**

Involvement of individuals with breast cancer in physical activity should be carefully planned and practiced. Physical activity in the individual with breast cancer is defined as; daily living activities (personal care, eating, dressing, shopping, etc.), producer activities (work, occupation, housework etc.) and leisure time (sports, entertainment etc.). Physical activity needs to be planned and implemented according to each individual's age, clinical status, cancer stage, influence level, areas of interest, activity level and other accompanying conditions. It is aimed to ensure the highest possible level of involvement in daily living activities of these individuals and to reduce the amount of family/care support as much as possible and to increase physical activity and prevent inactivation. It is important to avoid shoulder flexion for 2 weeks during the physical activities after surgery and to care not to lift weight 4 kg and over for 4-6 weeks. If lymph edema is developed, it is suggested that the individual should be directed to complex discharge treatment without losing time.

**Table 10.** Physical Activity Prescription for Individuals with Breast Cancer

<b>When selecting physical activities, individual differences such as age, gender, and cancer stage should be considered.</b>		
<b>Light Intensity Activities</b>	<b>Moderate Intensity Activities</b>	<b>Vigorous Intensity Activities</b>
<b>Walking</b>	Brisk Walking	Quickstepping
<b>Callisthenic exercises</b>	Swimming	Tempo cycling
<b>Flexibility exercises</b>	Home and garden works	Climbing stairs
<b>Exercises developing normal joint range of motion (Arm abduction - reaching)</b>	Paired dance	Weight lifting
<b>Posture Exercises - Strengthening muscles</b>	Sports involving catching and throwing	Tennis
<b>Daily living activities (face washing-eating, etc.)</b>	Virtual reality applications	Modified paddling and modified tennis exercise

**Contraindications**

Excessive pain, active malignancy and infection, severe cardiac insufficiency

**Physical Activity for the Individuals with Prostate Cancer**

Prostate cancer is the most common cancer in males over the age of 50. In addition, it is the second most common cause of cancer-related deaths after lung cancer. Prostate cancer develops due to abnormal proliferation of prostate tissue cells. It usually progresses very slowly and begins to grow faster while it was local at first: spreading to neighboring organs first; then spreading to remote organs such as lymph nodes, bones, lungs, etc. (making metastases) through blood and lymph. It is also important to increase the quality of life together with early diagnosis because of the increase in the survival period and the frequency of this cancer in line with the developments.

Prostate cancer treatments cause some problems such as loss of muscle mass and bone tissues, weight gain, urinary incontinence, fatigue, lymphedema, peripheral neuropathy, cognitive disorders, increased risk of cardiovascular disease/metabolic syndrome, scar tissue formation and impairment in sexual functions. Anxiety and depression also affect the involvement of the individuals in this group in activity within the diagnosis and treatment process in a negative way. Physical activity is known to play an important role in reducing these side effects.

The effects of physical activity in prostate cancer:

1. Provides weight control and prevents obesity
2. Helps to prevent incontinence and similar urinary system complications
3. Protects the joint's range of motion and reduces muscle mass loss
4. Protects the bone mineral balance
5. Maintains and enhances physical fitness by increasing durability, balance, coordination, strength and flexibility
6. Reduces cancer-related fatigue
7. Reduces the risk of lymph edema
8. Develops cognitive functions
9. Increases physical condition, body awareness and general well-being,
10. Increases cardiovascular capacity,
11. Reduces anxiety-stress-depression and fatigue,
12. Supports sexual functions
13. Increases the involvement in daily living activities
14. Increases wellness
15. Affects the patient's expectations in a positive way by increasing the quality of life,

#### **Indications**

1. Inactivity
2. Pain
3. Fatigue
4. Posture disorder,
5. Incontinence
6. Sexual function problems
7. Loss of function
8. Lymphedema
9. Decrease in physical condition and cardiovascular capacity
10. Limitation in daily activities and difficulty in involvement

**Prescription of Physical Activity for Individuals with Prostate Cancer**

Involvement of individuals with prostate cancer in physical activity should be carefully planned and practiced. Physical activity in the individual with prostate cancer is defined as; daily living activities (personal care, eating, dressing, shopping, etc.), producer activities (work, occupation, housework etc.) and leisure time (sports, entertainment etc.). Physical activities need to be planned and implemented according to each individual's age, clinical status, cancer stage, influence level, areas of interest, activity level and other accompanying conditions. It is aimed to ensure the highest possible level of involvement in daily living activities for these individuals and to reduce the amount of family/care support as much as possible and to increase physical activity and prevent inactivation.

Aerobic, strengthening, stretching exercises and relaxation and respiration exercises should be incorporated into the physical activity program for the individuals with prostate cancer. According to these guidelines, an activity program consisting of aerobic, strengthening and stretching exercises should be applied as a moderate-intensity program for at least 150 minutes per week or as high-intensity programs for 60-70 minutes per week in order to expose the positive effects of physical activities in individuals with cancer aged 18-64 years. Relaxation and respiratory exercises should also be incorporated into the program in coping with stress and anxiety. It is important to make the exercise program a habit. Studies on individuals with prostate cancer suggest that the use of exercise bracelet is effective in gaining exercise habits.

**Table 11.** Physical Activity Prescription for Individuals with Prostate Cancer

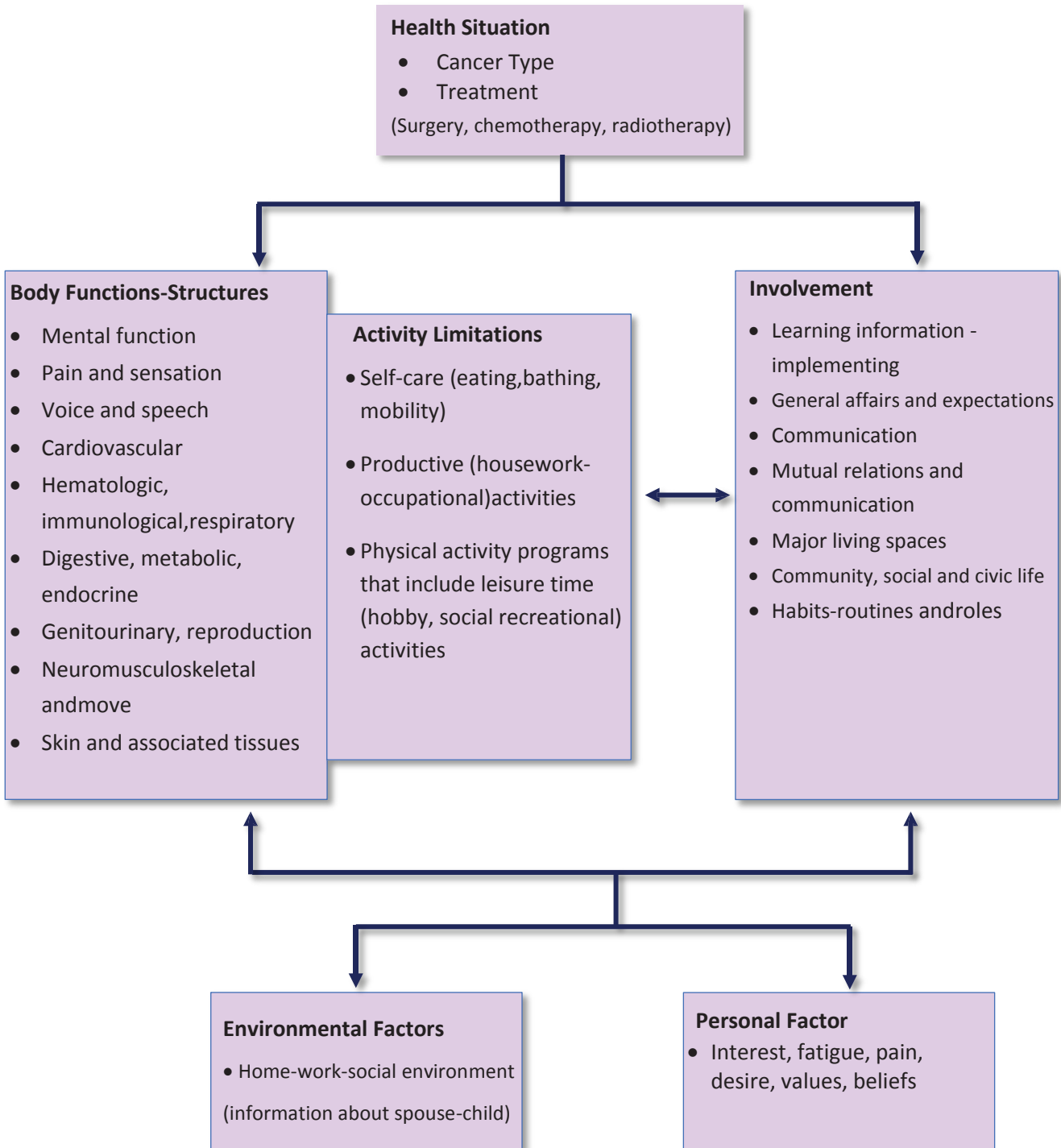
<b>When selecting physical activities, individual differences such as age, gender, and cancer stage should be considered.</b>		
<b>Light Intensity Activities</b>	<b>Moderate Intensity Activities</b>	<b>Vigorous Intensity Activities</b>
Trekking	Brisk Walking	Quickstepping
Yoga, pilates, etc.	Swimming	Collective sports
Relaxation exercises	Home and garden works	Climbing stairs
Aerobic exercises	Paired dance	Weight lifting
Posture Exercises	Sports involving catching and throwing	Tennis
Daily living activities (face washing-eating, etc.)	Virtual reality applications	Modified paddling and tennis exercise

**Contraindications:**

Excessive pain, active malignancy and infection, severe cardiac insufficiency



PHYSICAL ACTIVITY ALGORITHM IN CANCER PATIENTS



**Figure 2.** The ICF's Modified Disability Model Scheme for Oncological Rehabilitation (With the permission of W.H.O. 2001)

**An Example of ICF Algorithm for Individuals with Prostate Cancer****➤ Body Structure and Functions**

- Somatic
- Operational sequelae
- Radiation effects
- Treatment-related hormone deficiency indications
- Urinary incontinence
- Post-treatment pain syndromes
- Cytostatic chemotherapy sequelae (polyneuropathy, etc.)
- Sexual dysfunction

**➤ Psychosocial**

- Overcoming the problems
- Depression
- Fears
- Sleep disorders
- Spousal relations, Fatigue syndrome
- Post-traumatic stress disorders

**➤ Activities**

- Decrease in energy capacity
- Mobility difficulties due to edema-incontinence-bone pain
- Social withdrawn

**➤ Involvement**

- Problems in social relations
- Cultural-social life involvement problems (incontinence)

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# SECTION 3

## PHYSICAL ACTIVITY AND EXERCISE IN HYPERTENSION AND CHRONIC KIDNEY DISEASES

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# A

## ABSTRACT

Hypertension is one of the most common chronic diseases and is a global public health issue. Standard measurements made by the physicians in adults define hypertension as systolic blood pressure (BP)  $\geq 140$  mmHg and/or diastolic BP  $\geq 90$  mmHg. Aerobic physical activity has a role both in the prevention and treatment of hypertension; thus reducing cardiovascular morbidity and mortality rates.

Chronic renal disease (CRD) refers to the signs of damage (protein in urine, blood in urine, cyst in kidneys, etc.) which is present for longer than 3 months and which is associated with reduced kidney filtration functions or a risk of progressive renal disease in the kidney. Regular physical activity was shown to be positive contributions to the CRD process. There is no definitive data on whether regular exercise can prevent CRD development as primer, however, it was shown to improve cardiovascular markers, increase muscle strength and aerobic capacity, and reduce depressive symptoms.

**HYPERTENSION****INTRODUCTION**

Hypertension; is one of the most common chronic diseases and is a global public health problem. Hypertension is associated with heart disease, stroke, kidney disease, premature death and disability, and is an important burden on health and economics. However, hypertension is a preventable and treatable disease. Physical activity is very important in the prevention and treatment of hypertension development.

**a) Definition and Classification**

Hypertension (High BP) is described as the systolic BP $\geq$ 140 mmHg and/or diastolic BP $\geq$ 90 mmHg in adults (>18 years). The classification of hypertension according to the BP level in the general population is shown in Table 12.

**Table 12.** Hypertension Classification According to Blood Pressures

Category	Systolic		Diastolic
High normal	130-139	and/or	85-99
Stage 1 hypertension	140-159	and/or	90-99
Stage 2 hypertension	160-179	and/or	100-109
Stage 3 hypertension	$\geq$ 180	and/or	$\geq$ 110
Isolated systolic hypertension	$\geq$ 140	and	<90

In adults, the BP should be measured absolutely on every clinical examination and the pulse should be taken not shorter than 30 seconds. Furthermore, in order to determine the risk factors of the patient and to question the causes of the secondary hypertension, a detailed medical history and systemic physical examination and necessary laboratory measurements should be investigated.

Patients with hypertension should be questioned for previous BP measurements, past and/or accompanying diseases, familial history of cardiovascular disease, drugs used/being used for treatment of hypertension, causes of secondary hypertension and signs of organ damage.

Patients who have BP over 140/90 mmHg on initial assessment should definitely be referred to the second examination to confirm the diagnosis. The patients should be given verbal or even written information, if necessary, so that they can recognize the importance of the disease. During the period until the second examination, if possible, patients' home or ambulatory BP measurements should be done to achieve more accurate diagnosis. In patients with an average of several measurements done in the clinic at the Stage 3 hypertension level, antihypertensive medication should be started immediately after that clinical examination, without recommending home or ambulatory BP measurement. If there are clinical clues in terms of target organ damage in patients, treatment should be started as soon as possible.

**b) Prevalence and Incidence:**

The prevalence of hypertension was found as 31.8% (36.1% for females and 27.5% for males) as part of an epidemiological study carried out in Turkey, 2003 and representing adult population. As part of the hypertension incidence study, in which the cohort of 2003 was reevaluated in 2007, the 4-year incidence rate was found to be 21.4% in general and 43.3% in the group over the age of 65. It was detected that 32.2% of the people screened in these studies never performed BP measurements before. In the study conducted in 2012, this rate was found as 21.9%. While 40.7% of those with hypertension were aware of the disease in 2003, this rate was 54.7% in 2012. While the proportion of those receiving medication in 2003 was 31.1%, it increased to 47.4% and BP increased to 28.7% from 8.1% as of 2012. These data indicate that the prevalence of hypertension in Turkey is high and the awareness, diagnosis and treatment rates are not sufficient.

**c) Causes/Risks**

95% of hypertensive patients have primer (essential) hypertension and 5% have secondary hypertension due to parenchymal renal disease, renal artery stenosis, excessive aldosterone release, pheochromocytoma, sleep apnea and medications. Hypertension is the leading risk factor for deaths both in Turkey and in the world. Complications of hypertension cause 9.4 million deaths annually across the world. Hypertension is responsible for 45% of heart-related deaths and 51% of stroke-related deaths and is also the second most common cause of renal failure.

**d) Treatment:**

The first step to prevent and treat hypertension is making behavioral life style management. In terms of community health, appropriate lifestyle changes should be recommended for the adult regardless of the stage of his/her BP. If the individual's BP is at high normal level (systolic 130-



139 mmHg, diastolic 85-89 mmHg), these recommendations should be emphasized and the implementation of these recommendations should be encouraged more strongly.

The recommended lifestyle changes in hypertension are:

- **Ideal body weight:** According to the Turkish Ministry of Health, it is reported that 64.9% of adult population in Turkey is above normal body weight (34.6% overweight, 30.3% obese). If the patient is overweight, he/she should be recommended to be at appropriate weight or encouraged to lose weight at least (at least 5-10% of current body weight).
- **Salt restriction:** Daily sodium consumption should be limited to 2-2.4 g (5-6 g salt). SALTURK studies done in the general population in Turkey indicated a quite high consumption of salt on daily basis (15-16 g/day) and its relation with hypertension.
- **Healthy diet:** Diet of hypertension patients should mainly include vegetables and fruits, low-fat foods, whole grain, vegetable protein and fish at least twice a week. Consumption of fast consuming processed and excess fat, refined sugar and salt-containing foods should be avoided.
- **Smoking cessation:** Hypertensive patients should be recommended and encouraged not to smoke and, if current smoker, to give up smoking. Smoking cessation is one of the most effective factors in reducing cardiovascular risk. It is reported that the smoking cessation practices, which started with the Law No. 4207 on the Prevention and Control of Hazards of Tobacco Products in Turkey, have a decreasing effect on the consumption, however, the smoking frequency is still high. According to the Ministry of Health 31.2% (approximately 16 million people) of adults aged  $\geq 15$  are still smoking. The frequency of smoking is higher in males (47.9%) than in females (15.2%).
- **Alcohol restriction:** Alcohol consumption is not recommended for hypertensive patients. If they use it, it is advisable not to use more than 20-30 g/day ethanol for males and no more than 10-20 g/day ethanol for females.
- **Active life:** Hypertensive patients are recommended to do regular activities or sports in accordance with their ages and capacities. In general, the physical activity recommended should be at least 5 times a week, not less than 30 minutes. Moreover, an active life should be recommended throughout the day. The subject will be discussed in more detail in this guide.
- **Suggestions on stress management (regulation of behavior and relaxation techniques)** should be given.

To start antihypertensive medication treatment, risk factors and comorbidities should be considered along with the BP value. In the general population, the threshold value for initiation of treatment is systolic BP  $\geq 140$  mmHg or diastolic BP  $\geq 90$  mmHg, while those at the age  $\geq 80$  gave a threshold systolic BP  $\geq 160$  mmHg. When hypertension is diagnosed, medication should be started

immediately in patients with Stage 3 and Stage 2 hypertension. In stage 1 hypertension, medication should be started immediately in case patients have diabetes mellitus, chronic kidney disease and coronary artery disease. Lifestyle changes are recommended when these diseases and risks are absent. Medication is started if BP is still in Stage 1 after one-three months. However, antihypertensive medication may be started sooner if symptoms related to hypertension affect the quality of life of the patient.

In the treatment of antihypertensive medication, any of five groups of drugs [diuretics, beta blockers, calcium channel blockers, angiotensin converting enzyme (ACE) inhibitors and angiotensin receptor blockers (ARB) respectively on chronological order on the basis of development] are preferred. Antihypertensive drug therapy can be started with one or combination of several of these 5 drug groups. If the treatment is started with a single medication, if the BP does not reach the target level, a second medication is added to the treatment. If, at first, systolic BP is 20 mmHg higher than the target and the diastolic KB is 10 mmHg higher than the target (e.g. Hypertension at Stage 2 and above), direct combination therapy may be initiated. If more than one drug is used, it is recommended to give at least one of them at the evening hours. Further information on medication and patient follow-up could be obtained from relevant sources.

### **Effects of Physical Activity**

Lack of physical activity is an important risk factor for the development of hypertension. Physical inactivity alone is thought to be responsible for 5% to 13% of hypertension.

Epidemiological studies indicate that aerobic physical activities have roles both in prevention and treatment of hypertension; thus reducing cardiovascular morbidity and mortality rates. Meta-analyzes of randomized controlled studies showed that aerobic exercises result in a mean systolic/diastolic blood pressure decrease of 3.0/2.4 mmHg in the general population; this decrease reaches 6.9/4.9 mmHg in hypertensive individuals.

### **Indications**

Regular physical activity is indicated throughout life for the prevention of hypertension. According to primer protection studies related to hypertension, regular physical activity reduces the risk of developing hypertension by 50% when applied in conjunction with other lifestyle changes.

Regular physical activity is one of the first lifestyle changes in the treatment of hypertension. Lifestyle changes including physical activity in the treatment of individuals with stage 1 hypertension and low cardiovascular risk are the first treatment options. All patients using medication for blood pressure elevation should be recommended regular physical activity even if blood pressure is not under control (provided that it will not be above >180/110 mmHg).

### Physical Activity Prescription

In order to determine the appropriate activity measure in hypertensive patients, first the risk analysis of the patients and the exercise tests should be done to determine the functional capacities. For primary and secondary protection of these patients, dynamic endurance training, such as aerobic fitness, walking, swimming and cycling, and low-resistance strengthening trainings (1 maximum repeat 40-50% is defined as moderate strengthening training) could be recommended as multi-repetitive. Studies refer that heavy aerobic exercise trainings (maximal oxygen consumption >90%) can increase blood pressure, light to moderate exercise trainings at 40-70% of maximal oxygen consumption or 50-85% of maximal heart rate are more appropriate exercises to lower blood pressure. Even simple activities such as walking may be useful for reducing blood pressure of inactive hypertensive patients. It is recommended that the duration of the exercise be based on the age and physical fitness of the individual. Even 3-20 minutes of physical activity can reduce blood pressure. In the light of works done, the period of physical exercise should be totally 30-45 minutes, intermittently or continuously, 5-7 days a week other than the period allocated for daily warm-up and cooling exercises in order to decrease blood pressure more and have continuing effect. It is recommended that the exercise period be 30-45 minutes in total for each 5-7 days in a week, apart from the training for the daily warm-up and cool-down exercises. Attention should be paid to the duration of the exercise not to be too long in terms of the continuity of the exercise, as it was reported that the frequency of stopping the exercise in programs more than one hour is increased. If the patients show little resistance to exercise, it is thought that short-term, repeated activities within the same day are has positive effects as long-term activities. In other words, a 10-minute brisk walking, 4 times a day, (50% of maximal oxygen consumption) could be as effective as a 40-minute walk once a day, to lower the blood pressure. The total time that the patient is active throughout a day is also important as daily doses. In studies conducted on sedentary people with hypertension, it was observed that the period of 60-90 minutes activity throughout 8 weeks achieved more decrease in blood pressure compared to the period of 30-40 minutes activity per week.

The initial effect of regular physical activity occurs within 10 days, with a maximum effect occurring 4-6 months later. If exercise is ceased, blood pressure returns to the level before onset of the exercise. In order to maintain the decrease in blood pressure thanks to regular physical activity for a long-term in patients with hypertension, the regular exercises should be integrated into the daily lives of the patients.

Strengthening trainings: while hypertensive middle-aged individuals are recommended strengthening exercises 2-3 times per week, as 3 sets and 8-15 repeats, including 8-10 muscle groups for large muscle groups, elder individuals are recommended exercises 2-3 times per week, as 1 set and 8-15 repeats, including 8-10 muscle groups for large muscle groups. Exercise should be started with 40-50% (medium severity) of a given maximum repetition weight and should be gradually increased.

**Contraindications/risks**

It is often unexpected that physical activity is harmful to a hypertensive individual's health. However, it should not be forgotten that especially severe and heavy exercises may be harmful under certain conditions.

For individuals with systolic blood pressure above 200 mmHg or diastolic blood pressure above 115 mmHg, exercise is contraindicated until blood pressure is controlled and stabilized. Exercise is not recommended in individuals with/over blood pressure of 180/110 mmHg so long as the pressure is decreased below this value. As noted above, hypertensive individuals are not recommended to do excessive resistance exercises.

Vigorous or very vigorous exercises may lead to sudden blood pressure elevation, antihypertensive drug interactions (sometimes with extreme hypotension, electrolyte disturbances, dehydration) and even a small risk of sudden death in hypertensive individuals.

**KIDNEY DISEASES**

**INTRODUCTION**

Kidney diseases are a very comprehensive concept. This section will only include physical activity recommendations in patients with chronic renal disease (CRD), which have an important place in the list of chronic diseases. CRD is an important public health problem that became epidemic in the world and in Turkey. Although it is often preventable or its progression could be delayed if detected early, it is not possible in many cases since its awareness and early diagnosis is low. Studies in various parts of the world refer that awareness of the disease is less than 10%. Even in patients with 2-4 clinical indicator of CRD, the awareness rate does not exceed 10%. In Turkey, the level of awareness is lower. According to the Chronic Renal Disease in Turkey Study (CREDIT) by Turkish Nephrology Association (TNA), the awareness of CRD is under 2%. So the diagnosis of CRD is usually delayed; the chance of preventing or regression of disease in patients is gradually diminishing. Due to low awareness, the disease progresses to End Stage Renal Failure (ESRF), it seriously threatens the patient health with high morbidity and mortality rates and poor quality of life and health budget with high cost dialysis and kidney transplant treatments to be applied. Currently, over 2.5 million people worldwide are living with dialysis and kidney transplant treatments.

**Definition and Classification**

Chronic renal disease (CRD) refers to the signs of damage (protein in urine, blood in urine, cyst in kidneys, etc.) which is present for longer than 3 months and which is associated with reduced kidney filtration functions (glomerular filtration rate <60 ml/min) or a risk of progressive renal disease in the kidney.

Chronic renal disease is divided into 5 basic stages based on glomerular filtration rate (GFR) (Table 13). Since the patients in dialysis treatment or kidney transplant patients are the patients that reached end stage renal failure (Stage 5), it is true to consider them as Stage 5.

**Table 13.** Staging of Chronic Kidney Disease on GFR Basis

Stage	Definition	GFR (ml/min/1.73m2)
1	Kidney damage symptoms with normal or increased GFR	≥ 120
2	Slight GFR reduction* kidney damage symptoms	60-89
3	3A Mild-moderately reduced GFR	45-59
	3B Moderate-extremely reduced GFR	30-44
4	Extremely reduced GFR	15-29
5	Renal insufficiency	<15

\* May be compatible with age

**Prevalence and Incidence:**

Since early and middle stages of chronic kidney disease are usually asymptomatic, it is difficult to determine the incidence and prevalence of the disease without population-based studies. According to epidemiological studies conducted in various countries, the rate of CRD in the world varies between 10-16% and the microalbuminuria rate between 6-14%. As a result, over 500 million people in the world are estimated to have CRD. In other words, it is generally thought that one in every 9-10 adults has different level of renal diseases.

CRD prevalence and incidence of accompanying comorbid cases in Turkey were detected through CREDIT study conducted by the Turkish Nephrology Association (TND). The prevalence of CRD in the general adult population is 15.7 percent in Turkey. According to this, one out of every 6-7 adults has renal disease in various stages in Turkey. The rate of patients with low GFR (<60 ml/min) is 5.1%, suggesting that one person in every 20 adults has a critical level of CRD. According to these rates, it is estimated that CRD affects approximately 7.3 million adults in Turkey and 2.4 million of them have GFR (stage 3-5) below 60 ml/min.

It is known that the incidence of chronic renal disease is increasing due to risk factors such as diabetes and hypertension. In this respect, it is obvious that we will encounter more patients with CRD in the forthcoming years.

The ESRF incidence indicates the number of new patients who began to take Renal Replacement Therapy (RRT) (dialysis and renal transplantation) at a specified time interval (often 1 year), the prevalence indicates all patients at any time interval (usually as of the last day of the year) and described as the number of patients per million population (pmp). According to the TNA Kidney Registry System, the prevalence of ESRF is increasing in Turkey. In Turkey, the number of patients with ESRF, which were 314 persons per million population in 2001, increased by more than 2.5 times in approximately 10 years, reaching 816 persons in 2012. The ESRF incidence is 139 per million population as of 2012. The most important two reasons for the increase in ESRF frequency are; the increasing average age of the population and the diabetes becoming epidemic in Turkey.

**Causes/Risks**

Diabetes, hypertension and glomerulonephritis are respectively the first 3 causes leading to CRD in Turkey and in the world. Apart from this, advanced age, cardiovascular diseases, urological causes, genetic kidney diseases, acute renal failure are among the causes of CRD.

CRD is usually a progressive disease. CRD stages progresses as the patient's GFR value decreases; with this progress, the risk of morbidity, hospital admission, cardiovascular event and mortality rate and end-stage renal failure risk increases and the quality of life decreases. Patients with CRD continue their life with dialysis treatments or kidney transplantation if they are in the end stage of renal failure.

## Treatment

CRD is usually a progressive disease. If the disease is detected earlier, it may be possible to stop or reverse the disease progression with disease-specific therapies (e.g., specific treatments of glomerulonephritis). However, a significant proportion of patients apply to the hospitals in advanced stages due to the low rate of disease awareness. It is unlikely to reverse the disease for the patients in the mid and late stages. The most successful treatments in these stages are those that slow or stop the progression of the disease. Priority in treatment of CRD is lifestyle changes. The recommended lifestyle changes for hypertension control should also be recommended to the patients with CRD and they should be supported by encouraging them. The most important cause of this is hypertension in a significant proportion of patients with CRD, as well as high risk of cardiovascular disease in these patients. In addition to lifestyle changes, effective hypertension control, treatments to reduce the amount of urine protein and adequate glucose control in diabetic patients are the basis of CRD therapy. Treatment of complications (such as anemia, mineral and bone disorders) that develop as CRD progresses, treatment of morbidities accompanying to CRD, prevention/treatment of acute renal failure of CRD patients and prevention of cardiovascular diseases and treatment, if necessary, are other steps in CRD treatment. Renal transplantation or dialysis therapies called as renal replacement therapy should be applied for the patients with progressive CRD and reaching ESRF despite all treatment interventions. Among these options, renal transplantation is the recommended therapy in terms of the quality of life, morbidity and mortality rates. Hemodialysis or peritoneal dialysis treatments, which can be performed at home or at health centers, should be recommended for patients that transportation could not be done.

## Effects of Physical Activity

In addition to the occurrence of diabetes and hypertension, which are among the most important causes of CRD, the lack of physical activity has an important role. Physical inactivity is an important risk factor for CRD risk shown in different epidemiologic studies.

It is shown that aerobic capacity, muscular strength, and endurance of patients with CRD or patients who undergo dialysis treatment or have renal transplantation are in fact similar to their peers. However, it is known that this condition can only be maintained by regular and continuous exercise for the patients with CRD; otherwise, they will lose muscle strength due to catabolic states due to CRD. The presence of renal anemia in these patients is a factor that reduces exercise capacity. However, treatments such as erythropoietin reduce the effect of this factor.

Regular physical activity is a positive contributor to the CRD process.

**Indications**

There is no definitive data on whether regular exercise can prevent CRD development primary. However, as mentioned above, it would be possible that the development of CRD can be prevented if regular exercise can prevent the development of diabetes and/or hypertension.

In patients with CRD, there is no data on whether regular physical activity has an effect on CRD progression. However, regular exercise improves cardiovascular markers, increases muscle strength and aerobic capacity, and reduces depressive symptoms.

**Physical Activity Prescription**

In chronic renal patients, muscle strength, cardiovascular and aerobic capacity decrease. In the majority of these patient's muscle fatigue is a limiting factor. Therefore, the goals of the rehabilitation program should be to improve muscle strength, cardiovascular and aerobic capacity.

In patients with CRD, physical activity recommendation should be made considering the age of the patient, CRD stage and other comorbid diseases. Since most of the patients with CRD have cardiovascular diseases, it is necessary to do risk analysis of the patients before the exercise recommendation, to determine the functional capacities by doing exercise tests and to make sure that the individuals are stable in terms of cardiovascular. Programs that include aerobic and strengthening exercises should be organized for patients in line with the outcome measures and relaxation exercises should be included in the program at each stage. For these patients, aerobic fitness training such as walking and cycling is recommended for 3 days a week for 60 minutes, including warm-up and cooling periods at the level of 70% of maximal oxygen consumption and at moderate intensity. Strengthening trainings are given 3 times a week, as 1-2 sets, with 8-10 repetitions, at a load 80% of 1 maximum repeat, with attaching weights to wrists; muscle endurance trainings are given 3 times a week, at a load 50% of 1 maximum repeat, with attaching weights to the wrists. In addition, functional training including walking, balance and coordination trainings (walking on treadmill or balance mats, bending knees, going down and up the stairs, walking up, standing up from sitting position) is recommended 3 days a week.

Since patients with CRD have a high risk of spontaneous tendonitis, there should be a good warming and cooling period before and after exercise and stretching and flexion exercises should be added to these periods. The CRD patients with a polycystic kidney disease should avoid sports that increase abdominal pressure. Likewise, patients with functional single kidneys (which may be congenital or after kidney transplant) should avoid sports including the possibility of beat on abdomen. If the central dialysis catheter is placed on the head and chest in patients under hemodialysis treatment, the patients should avoid lifting their arms over their heads and moving their necks to avoid problems with the catheter.



In patients receiving peritoneal dialysis, dialysis solution should be drained from abdominal cavity prior to exercise. If dialysis solution remains in the abdominal cavity, there may be a risk of hernia and/or damage in the pelvic floor muscles.

**Contraindications/Risks**

Exercise is inconvenient in case of uncontrolled severe blood pressure elevation (>180/110 mmHg), acute infection, unstable angina, severe cardiac arrhythmias, uncontrolled diabetes or hyperkalemia.

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# SECTION 4

## PHYSICAL ACTIVITY AND EXERCISE IN CHRONIC CARDIOVASCULAR DISEASES

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## **A**BSTRACT

Cardiovascular diseases are the leading cause of death worldwide. Sedentary life does not play a role just in development of cardiovascular diseases, but also many diseases such as obesity, metabolic syndrome, and diabetes. It is thought that lifestyle changes may prevent 80% of cardiovascular diseases. Regular physical activity not only reduces the risk of cardiovascular disease, but also it has some effects such as accelerating healing, increasing quality of life, slowing the progression of the disease after the disease occurred. Physically active lifestyle that is tailored to the level of the disease by a specialist physician to all individuals with a stable cardiovascular disease is recommended.

## **CARDIOVASCULAR DISEASE (CVD)**

The diseases that are the leading cause of death in the world in recent years are cardiovascular diseases. Approximately 30% of all deaths are cardiovascular. The effects of this preventable epidemic are seen in many areas: besides individual mortality and morbidity, they affect families and an increasing economic burden arises both from the loss of productive and due to the costs of diagnosis and treatment.

Preventive health policies are of great importance for reducing the burden of disease. Raising awareness of society on the reducible risk factors and encouraging individuals to do and maintain these changes are the most important step in both primary and secondary care. Sedentary life plays a role not only in cardiovascular diseases but also in the development of many diseases such as obesity, metabolic syndrome, and diabetes. It is thought that lifestyle changes may prevent 80% of cardiovascular diseases.

### **I. Atherosclerotic Cardiovascular Disease**

Atherosclerosis is thickening, hardening and loss of elasticity of arterial walls. The result is a restriction of blood flow to the organs. Atherosclerosis in the heart, carotid arteries, and peripheral arteries leads to the problems both deteriorating the quality of life and creating life-threatening consequences.

#### **Prevalence/Incidence**

Heart attack takes the first place with 20% proportion among the causes of death according to the data as part of the Chronic Renal Disease and Risk Factors Incidence in Turkey Study.

Cardiovascular diseases account for 42% of deaths. Rate of death is 54% due to cardiovascular diseases for the age group at the age of 65 and above.

#### **Reason**

Atherosclerotic cardiac disease (ACD) occurs with arteriosclerosis of the walls of at least one of the coronary arteries, it is the most common cause of acute myocardial infarction or unstable angina.

#### **Risk Factors**

Age, male sex, hereditary factors for CVD, sedentary lifestyle, smoking, high blood pressure, obesity, diabetes and elevated cholesterol increase the risk of ACD development.

### Pathophysiological Mechanisms

Atherosclerosis affects the intima layer consisting of endothelial cells, which is the innermost layer of the arterial wall. The accumulation of lipids in the endothelial cells causes the macrophages, which are inflammatory cells, to come into the region. Macrophages that ingest lipids turn into foam cells. A fibrotic mass emerges around the foam cells and forms the atherosclerotic plaque.

### Symptoms

Chest pain is a dominant symptom in both unstable angina and acute MI. Angina pectoris is a chest pain felt in the chest and adjacent areas, which is associated with secondary myocardial ischemia. Patients describe this feeling as "pressure", "pressure feeling", "compressive" feeling. In some individuals, this feeling is more ambiguous. It is perceived as a feeling of stress or a slight pressure. Angina is usually heard behind the sternum (retrosternal). It often spreads to the left arm, but the spread to the right arm, arms, the back, the shoulders and the lower jaw are described. In some patients, angina is not observed, but other symptoms occur during myocardial ischemia. These can be dyspnea, fainting, fatigue, distress, nausea and are usually seen in elderly patients.

Typically, angina starts lightly and aggravated and peaked within minutes. It weakens with relaxation and/or sublingual nitrate quickly dissipates within minutes. Angina pectoris is not expected to worsen in the seconds.

If chest pain does not disappear within 5-10 minutes despite the preparation of the sublingual nitrate, this complaint is either not related to myocardial ischemia or a very severe ischemia is in question. In this case, patients should apply to the hospital as soon as possible. Similarly, in case of increase in chest pain in terms of frequency, duration or with effort, patients have to apply to the hospital.

### Diagnosis

The diagnosis is done according to medical history, physical examination, ECG and biochemical indicators of myocardial damage. Echocardiography, effort testing, or coronary imaging may be necessary. When an acute event is suspected, the patient is hospitalized and treated.

### Treatment

In case of acute coronary events, the treatment should be initiated as soon as possible after symptoms occur. Treatment is performed with percutaneous coronary interventions or antithrombotic drugs. The aim is to pharmacologically remove the obstruction in the coronary artery mechanically or by fibrinolytic drugs using a balloon or stent. In some cases, coronary artery bypass surgery may be required.

Acetylsalicylic acid, beta blockers, nitrates and calcium antagonists are used in pharmacological treatment in order to prevent ischemia.



**Effects of Physical Activity**

Physical inactivity leads to the progression of coronary atherosclerosis. Physical activity is very effective both in reducing ACD risks and accelerating the healing process after the disease occurred, reducing the risks of recurrent events and improving quality of life. Cardiac rehabilitation reduces the total mortality by 20% and cardiac mortality by 26%. The patients have to be included in mobilization exercise programs as soon as possible in order to decrease length of hospital stay. Physical activity may begin one week after an uncomplicated myocardial infarction or percutaneous coronary intervention. At late-onset cardiac rehabilitation (after 30 days), less improvement is observed in exercise performance.

Regular physical activity has antiatherogenic, antiinflammatory, antiischemic, antithrombotic and antiarrhythmic effects (Table 14).

**Contraindications**

Exercise is not recommended if the patient has signs or symptoms of ischemia associated with physical activity. Patients with an unstable angina should avoid physical activity. Hypoglycemia, uncontrolled diabetes, uncontrolled hypertension are situations where exercise is not recommended.

The functional capacity and clinical status of each individual should be measured by a health care specialist before the physical activity is initiated. Under the drugs the patient is taking, a stress test with ECG monitorization should be performed.

**Table 14.** Potential Heart Protective Effects of Physical Activity, Exercise and Cardiorespiratory Fitness

<b>Anti-inflammatory</b>	Decrease in CRP level
<b>Antithrombotic</b>	Decrease in platelet aggregation Increase in fibrinolytic activity
<b>Anti-arrhythmic</b>	Improvement in cardiac autonomic function Vagal tonus increase, sympathetic activity decrease
<b>Antiatherogenic</b>	Increase in nitric oxide synthesis and release Improvement in ACD risk factors Improvement of endothelial function
<b>Improvement in ACD risk factors</b>	Decrease in total cholesterol, LDL and triglycerides Increase in HDL Decrease in blood pressure Increase in insulin sensitivity
<b>Anti-ischemic</b>	Body weight loss Recovery in myocardial perfusion Increase in ischemic threshold Ischemic preconditioning in myocardium

## II. Peripheral Artery Disease

Peripheral artery disease occurs as result of atherosclerosis formation in the arteries toward the lower extremities. It is characterized by pain in leg muscles when effort is exerted (e.g. walking). Resting for a few minutes stops the pain.

Walking distance is significantly increased with physical activity. This is thought to be caused by increase in collateral circulation, changes in muscle metabolism, improvement in cardiopulmonary functions and psychological factors.

The best results are obtained with physical exercise (so severe that it may lead to pain) at least 3 days a week, for 30-60 minutes.

## III. Heart Failure

Heart failure is a clinical syndrome characterized by typical symptoms (shortness of breath, swelling of the legs, weakness) and findings (neck venous fullness, lung rales, and peripheral edema). As result of structural or functional abnormalities in the heart, decrease in cardiac output and/or increase in intracardiac pressures are observed.

### Reason

Heart failure may develop as a result of coronary artery disease, as well as it may be due to several causes such as valvular heart diseases, hypertension and metabolic diseases.

### Prevalence/Incidence

Over 2 million people have to live with heart failure (HF) according to the HAPPY research in Turkey. The American Heart Association estimates an increase of about 46% in HF from 2012 to 2030; it is predicted that more than 8 million people (5.8 million people as of 2011) over the age of 18 will have HF in the US.

Although there is no exact cure for heart failure, the disease progression can be prevented and most patients could be effectively treated so as to improve their quality of life and survivals in many cases.

### Pathophysiology

Heart failure, as it can be observed in many cardiac diseases, is a clinical condition that could also be observed in some diseases in which the heart is completely normal. The first step in heart failure is the development of an event that causes normal circulatory system functions to deteriorate. This may be an acute event, such as myocardial infarction, or a long-term event such as the effects of long-term hypertension.

The disruption of normal circulation after such an event has many adaptive consequences in the heart. These mechanisms, initially addressing the problem of circulatory system, lead to further deterioration of cardiac functions in the long term, leading to the development or aggravation of symptoms, signs and complications of heart failure.

In heart failure, many neuroendocrine systems are activated, primarily the sympathetic nervous system and the renin-angiotensin-aldosterone system. These systems initially aim to compensate for the disorder developed in the circulatory system. However, these compensatory mechanisms gradually aggravate the condition of the patient over time.

### Symptoms

Patients with heart failure may apply to a physician with a wide variety of symptoms. Some patients may be completely asymptomatic. Each patient applies with various combinations of the symptoms mentioned below according to the etiology of heart failure, the mechanisms causing insufficiency and the precipitating factors.

- Respiratory distress: Dyspnea or shortness of breath is the most common symptom. These symptoms may occur in different ways:
  - Effort dyspnea: Shortness of breath caused by effort is among the earliest symptoms. Healthy individuals also suffer from shortness of breath after heavy exercises. The difference of effort dyspnea in heart failure from this is the amount of exercise that develops shortness of breath. Patients with heart failure feel that breathlessness increases with less and less effort.
  - Orthopnea: It refers to the occurrence of shortness of breath when patient is lying down and relaxation when sitting.
  - Paroxysmal nocturnal dyspnea: Some patients wake up with breathlessness after 1-2 hours of sleeping. They relax after a while by sitting or standing up.
  - Dyspnea in resting: Some patients may have shortness of breath at rest.
  - Acute pulmonary edema: It is a very serious sign that may result in death if not treated as soon as possible. Patients are highly dyspneic and in sitting position.
- Decrease in exercise capacity
- Weakness and fatigue
- Urinary symptoms: In parallel with the diminished sympathetic activity at nights, renal blood flow increases and causes nocturia in patients.

- Cerebral symptoms: These patients may have cerebral symptoms such as confusion, memory disorders, anxiety, headache, nightmares and even psychosis, depending on decrease in the cardiac output and cerebral blood flow.
- Right upper quadrant fullness: Liver congestion and hepatomegaly resulting from systemic venous lake may give patients this feeling.
- Jaundice: Congestion may impair liver functions.
- Anorexia: It may develop due to the intestinal system or the venous congestion in the liver. In addition, increased tumor necrosis factor in heart failure may cause anorexia and cachexia in later periods.
- Dyspepsia: It is secondary especially to the congestion in the portal system.

### Diagnosis

The diagnosis usually based on medical history, physical examination, ECG and echocardiography. In some cases, biochemical markers may also be needed.

### Treatment

Drugs used in treatment are ACE inhibitors, diuretics, beta blockers, mineralocorticoids receptor antagonists. Targeted maximum cardiac rate during exercise should also be determined for the patients taking beta blockers slowing the cardiac rhythm.

### Effects of Physical Activity

Regular physical activity in a patient with heart failure leads to increase in heart volume and output and thus decrease in shortness of breath and muscle weakness. As the duration of the walk increases and the patients' quality of life improve.

Regular physical activity is recommended in Stable NYHA I-II and III patients with heart failure.

### Contraindications

Contraindications are decompensated cardiac insufficiency, blood pressure decrease during exercise, severe arrhythmia, and ischemia during exercise. The functional capacity and clinical status of each individual should be measured by a health care specialist before starting physical activity.

**Special cases**

Individuals with hypertrophic cardiomyopathy, severe valve diseases, active myocarditis, congenital and genetic transitional heart diseases should be evaluated by a health care specialist and their physical activities should be organized in the light of relevant guidelines.

**IV. Rhythm Disorders**

It applies to the problems that arise in the generation and/or transmission of electrical stimuli. It is the case that the heart rhythm may be slower or faster, regular or irregular than the normal. Some of the various types of rhythm disorders do not have any symptoms and do not lead to any problem, while some others may threaten life.

Atrial fibrillation is one of the most common arrhythmia seen in adulthood. It is observed in 1% of the whole population and the rate is 10% in the people over the age of 80. Atrial fibrillation is an arrhythmia that disrupts the quality of life, as well as causes material and moral losses due to complications. Physical activity planning is recommended after heart rate control is achieved. It was observed as part of the researches that the performance capacity increases, heart rate regulation improves and the quality of life develops after a 2-month aerobic and resistance exercise training.

**Reason**

Rhythm disturbances may be caused by fibrosis and deformation in myocardium due to structural heart diseases or operations. The most typical examples are atrial fibrillation and flutter. Arrhythmias arising from genetic transition ion channel defects in myocardial cells are rare, however, may lead to life-threatening rhythm disturbances. Long QT syndrome and Brugada syndrome are in this group. There may be arrhythmias arising from anomalies that occur in electrical conduction pathways during embryogenesis. As examples of such arrhythmias, Wolf-Parkinson-White syndrome and congenital AV block could be counted.

Ventricular arrhythmias may be triggered by exercise in some of the genetic transition arrhythmia syndromes. Patients with these diagnoses should absolutely consult an expert before beginning physical activity.

**Pathophysiology**

In case of abnormality in generation and conduction of electrical stimulation, heart rate decreases. If the rhythm is slow so that organ perfusion could not be ensured, a permanent cardiac pacemaker is required.

As to tachycardia, a myocardial band, which normally does not produce a stimulus, starts to produce automatic activity or an electrical loop happens formed by anatomical and physiological barriers. A large part of the tachycardia could be treated with medications or by a method for removing tissue vitality with hot/cold application, which is defined as ablation.

### **Symptoms**

Palpitations are the most common symptom of rhythm disturbances. However, not every palpitation is a rhythm disturbance. The increase in normal heart rate is also felt as palpitations. Sudden palpitations are more characteristic for rhythm disturbances. Accompanying shortness of breath, fainting, syncope, chest pain could be seen. If the person has another underlying disease, the scenario will be very different. For example, the development of atrial fibrillation in a patient with severe mitral stenosis results in a table of acute pulmonary edema.

Bradycardias appear mostly with fatigue, dizziness, exhausting quickly, fainting and drop attack.

### **Diagnosis**

Pulse palpation, counting of heart apex beat and ECG usually provide enough information for diagnosis. ECG monitorization with holter in order to catch the moment of complaint is very helpful for diagnosis. Stress test has limited or no diagnostic value

### **Treatment**

Medication and ablation could be applied after the true diagnosis for the tachycardia. Beta blocker and diltiazem, verapamil could be used as well as special rhythm regulating drugs. In addition to the ablation and medication for ventricular origin tachyarrhythmia, implantable cardioversion-defibrillation devices could be implanted.

If the number of heart rate in bradycardia is insufficient to sustain life or if it is unreliable, a permanent pacemaker is inserted.

Medication is regulated in case of the arrhythmias due to the drugs used.

### **Patients with Permanent Pacemaker-ICD**

For the patients with permanent pacemaker, the pacemaker is adjusted according to the planned exercise limits so that the heart rate increases to the exercise level appropriate for the age and clinical condition of the person. Arrhythmia recognition parameters in patients with ICD should be set so as to prevent the patient from receiving unnecessary shock. Patients with ICD should also be assessed for their primary diseases.

Patients with permanent cardiac pacemaker or ICD should avoid sports which have risk of contact and may damage to the battery. Within the first month after implantation of pacemaker or ICD, patients have to avoid upper extremity strenuous activities.

### **Effects of Physical Activity**

Regular physical activity acts on the autonomic nervous system by increasing vagal activity and suppressing sympathetic activity. An increase in vagal activity may cause a sinus pause and AV block, especially during sleep. It is not prognostically valuable for a person, who is physically fit, to have these rhythm disturbances during sleep. No further research is needed if the heart rate of the person is rising to the expected level during physical activity.

Decreased heart rate variability after myocardial infarction is associated with arrhythmia-related deaths. It was proved that aerobic exercise increases heart rate variability in patients with heart failure or atherosclerotic heart disease. This is thought to cause reduction in risk of arrhythmia.

### **Risks**

If rhythm disturbance occurs during physical activity, the activity should be ended. Supraventricular tachycardia due to exercise usually do not pose a life threat. However, it could be dangerous if supraventricular tachycardia in WPW patients be degenerative to atrial fibrillation.

Hypotension may develop during physical activity. Dehydration, electrolyte disturbances, coronary ischemia may cause this.

The functional capacity and clinical status of each individual should be measured by a health care specialist before initiation of physical activity.

### **Contraindications**

Physical activity should be avoided in case of exercise-induced ventricular arrhythmias and atrial arrhythmias with high ventricular rate (>180-200 beats/min) and in case of newly started, unspecified arrhythmias.

### **Cardiovascular Diseases and Physical Activity**

All individuals with cardiovascular disease benefit unless there is any contraindication. Regular physical activity involving large muscle groups (e.g. walking, cycling, and swimming) should be integrated into the treatment of cardiac disease. Physical activity improves symptoms, increases functional capacity, mental health and the quality of life and decreases blood pressure, insulin resistance, obesity, hyperlipidemia, reducing the risk of cardiovascular diseases.

Light to moderate physical activities are recommended under supervision of trained health professionals.

### **Risk and Precautions**

The incidence of cardiac mortality or morbidity in cardiac patients participating in a supervised cardiac rehabilitation program is very low. The incidence of fatal cardiac events is 1 in 750,000 attendance hours. Those with a low physical activity or a higher level of physical activity than the recommended level possibly encounter some cardiac events. Making medical and physical examinations of patients before physical activity consulting reduces the rate of cardiac risks. The physical activity schedule should be planned considering the individual patient needs, comorbidities, functional deficiencies resulting from prolonged immobilization, reduced muscle strength and volume, balance and sensory problems.

### **Evaluation of Physical Activity**

Evaluation of physical activity could be done by variety of methods. Usually direct (activity monitors) and indirect methods (scales) are used. Nowadays, scales based on patients' statements were abandoned and the use of more objective methods (pedometers, accelerometers) became widespread for the evaluation of physical activity.

1. Criteria methods: has some disadvantages; hard to apply in larger populations, is an expensive method, inability to distinguish the characteristics of activities
2. Objective methods
  - Pedometer
  - Accelerometers
  - Heart rate monitorization

Physical activity monitors that is among the objective methods measure the type, duration, severity, symptom of physical activity and performance during the physical activity. Activity monitors and pedometers are portable, small, lightweight devices.

#### 3. Subjective Methods

- Daily
- Register
- Surveys are frequently used in epidemiological and clinical trials because their use is easy and cheaper.



### Classification of Physical Activity Level

Physical activity levels are classified according to the number of step as; <5000 steps/day inactive, 5000-7499 steps/day less active, 7500-9999 steps/day slightly active, ≥10000 steps/day active, <12500 steps/day highly active.

The level of physical activity according to the individual's MET (Metabolic Equivalence); <1.5 MET inactive, 1.6-2.9 MET less active, 3-5.9 MET moderately active and >6 MET very active.

Guidelines developed in order to obtain a sufficient level of health gain in patients with heart diseases are recommended physical activity as given below:

- 150 min/week moderate intensity physical activity; requiring 8.3 METs/hour/week energy consumption (moderate physical activity)
- 150 min/week vigorous intensity or 300 min/week moderate intensity physical activity; requiring 16.7 METs/hr/week energy consumption (vigorous physical activity).

Performing moderate/vigorous intensity physical activity decreases acute cardiac mortality by 11.2-21.2% and cardiovascular disease by 9.3-17.9%.

The physical activities that could be recommended for the patient should be organized depending on the level of aerobic training, the activity of concern and the needs. Patients' needs and interest should better be taken in consideration like swimming, jogging, cycling, swimming and in-water exercises, skiing, dancing and ball games in order to recommend aerobic exercises. Physical activity is generally recommended as three times a week, 30-45 minutes each. In cases where it is not possible to perform such special activities, it may be sufficient to carry out activities such as walking or stair climbing at least 30 minutes on a regular basis during the day.

### Physical Activity Prescription in Cardiovascular Diseases

Regular, multidisciplinary trainings which are carried out for optimizing the physical, psychological and social functions of persons with cardiovascular (CVD) disease; stabilizing, slowing down or even reversing the underlying arteriosclerotic process and finally reducing the mortality and morbidity are called as cardiac rehabilitation.

Physical activity counseling and exercise training are the most important elements of cardiac rehabilitation for reducing the risk of CVD, supporting the manner of healthy behavior, reducing disability and involving them into an active life. With the exercise programs given in CVD diseases, the overall and CVD mortality rate is reduced by 13% and 26%, respectively, for one year and longer, and hospitalizations are reduced by 31% in short term; does not reduce the risk of MI, coronary artery bypass grafting or percutaneous coronary intervention. Exercises applied to the patients with CVD are defined as repetitive exercises or regular physical activities aimed at increasing the capacity of CVD (aerobic exercises) and musculoskeletal (resistant exercises).

People with CVD are frequently recommended aerobic and resistant exercises. However, breathing exercises should be added to the exercise program as CVD diseases may have ventilation-perfusion abnormalities. Flexibility, relaxation and balance coordination exercises should also be prescribed. Before exercise prescription, it should be determined whether there is a condition to cause contraindication (Table 15).

**Table 15.** Absolute Contraindications of Exercise Training

Unstable angina pectoris	Uncontrolled diabetes
Dangerous arrhythmias	Severe systemic disease
Abdominal heart failure	Dissection aneurysm
Severe aortic stenosis	Uncontrolled hypertension
Acute myocarditis or pericarditis	Advanced AV block
Intracardiac thrombus	New onset atrial fibrillation/flutter
MI overcome within 3 weeks	Resting heart rate > 120 beats/min

Aerobic exercises are the exercises that mainly enhance CVD endurance, where larger muscles are rhythmically and dynamically contracted, increase heart rate and blood pressure. Activities such as walking, running, swimming, cycling, dancing are examples of aerobic exercises. The general objective of exercise in CVD diseases is to increase the aerobic capacity. For this purpose, prescription of aerobic exercise should include the following parameters;

**Aerobic Exercise in Heart Patients**

Aerobic exercises are the exercises that mainly enhance CVD endurance, where larger muscles are rhythmically and dynamically contracted, increase heart rate and blood pressure. Activities such as walking, running, swimming, cycling, dancing are examples of aerobic exercises. The general objective of exercise in CVD diseases is to increase the aerobic capacity. For this purpose, prescription of aerobic exercise should include the following parameters;

1. Exercise intensity
2. Exercise duration
3. Exercise frequency
4. Progression speed.

Exercise intensity is expressed as absolute (Watt) or relative (exercise capacity). It is not necessary to work at maximum exercise intensity to increase aerobic capacity. Generally, 40-85% of the exercise capacity (submaximal exercise level) is studied. Exercise severity is determined using  $O_2$  consumption, METs level, heart rate, the degree of perceived exertion

Maximum  $VO_2$  or Peak  $VO_2$  is the gold standard for determining exercise intensity. Maximum and peak  $VO_2$  consumption is obtained in bicycle and treadmill tests. These tests are complicated and expensive and used in comprehensive centers.

The maximal heart rate is determined by the 220-age formula and is run at 55-90% of this value. However, the values were observed low in elder individuals in the calculations made with this method. In these situations, the Karvonen formula is used where resting and maximum heart rate are used. The target heart rate found with this formula is closer to the heart rate measured with maximum  $O_2$  consumption.

If the person could talk to the person next to him/her in talking test despite the increased heart rate and respiration rate during the brisk walking, this refers that the person is doing submaximal exercise. However, the intensity of the exercise is low if the person is able to sing and high if the person has difficulty to speak.

The Borg's exertion scale is used to determine exercise intensity if the heart rate could not be followed or if the drugs that affect heart rate, such as beta blockers. Borg's scale is demonstrated in Table 17.

**Table 16.** The Risk Classification for Exercise Training

Class	Clinical features	Recommendations
Class A	<ul style="list-style-type: none"> <li>• Healthy people who do not show an increase in risk of CVD for exercise</li> <li>• Child, adolescent, &lt;45 year-old male, &lt;55 year-old female</li> <li>• Carrying 1-2 major risk &gt;45 year-old male, &gt;55 year-old female</li> </ul>	<ul style="list-style-type: none"> <li>• No need to supervise</li> <li>• No activity restrictions</li> <li>• No need for monitorization</li> </ul>
Class B	<ul style="list-style-type: none"> <li>• Clinically stable patients with coronary heart disease</li> <li>• CHF, valve disease, congenital heart disease, cardiomyopathy (EF≤30%)</li> <li>• Those under NYHA 1 or 2 class</li> <li>• Exercise capacity ≤6 METs</li> <li>• Those without heart failure</li> <li>• No ischemia or ventricular tachycardia during rest and light exercise</li> <li>• Appropriate blood pressure response to exercise</li> <li>• Good adaptioonto exercise</li> </ul>	<ul style="list-style-type: none"> <li>• Individually tailored exercise and physical activity prescription.</li> <li>• Exercise training should be under control of health professionals.</li> <li>• Supervision during first 6-8 sessions, Screening ECG and BP should be made.</li> </ul>
Class C	<ul style="list-style-type: none"> <li>• Individuals with moderate-high risk of cardiac complications during exercise</li> <li>• CHF, valve disease, congenital heart disease, cardiomyopathy (EF &lt;30%)</li> <li>• Not under controlled complex ventricular arrhythmias</li> <li>• Those in NYHA 3 or 4 class</li> <li>• Exercise capacity&lt;6 METs</li> <li>• Those with drops in SBP during exercise</li> <li>• Any life-threatening situation</li> </ul>	<ul style="list-style-type: none"> <li>• Individual exercise prescription physical activity should be written out</li> <li>• Exercise training should be under supervision staff</li> <li>• At least supervised 12 sessions sessions, Screening ECG and BP should be continued.</li> </ul>
Class D	<ul style="list-style-type: none"> <li>• Individuals with unstable heart disease for whom activity restriction is necessary and exercise is contraindicated.</li> <li>• Unstable ischemia</li> <li>• Severe valve failure/shortness</li> <li>• Congenital heart disease</li> <li>• Non-compensated cardiac failure</li> <li>• Uncontrolled arrhythmia</li> <li>• Other health problems induced by exercise</li> </ul>	<ul style="list-style-type: none"> <li>• Exercise training for Improvement of cardiovascular endurance is not recommended</li> <li>• The patient should be treated in order to promote to class C</li> <li>• ADL should be planned individually.</li> </ul>

**Table 17.** Borg's Perceived Exertion Scale

Score Exertion level
6
7 Extremely light
8
9 Very light
10
11 Light
12
13 Somewhat hard
14
15
16
17 Very hard
18
19 Extremely hard
20

- <12: corresponds to 40-60% of MHR\*
- 12-13: corresponds to 60-75% of MHR
- 14-16: corresponds to 75-90% of MHR.

1 METs (Metabolic Equivalent) is the energy consumption at ml/kg/min when sitting relaxed. 1 METs amounts to 3.5 ml/kg/min for an average adult. Table 18 shows O<sub>2</sub> consumption (METs) of some physical activities.

\*MHR (Maximum Heart Rate)

**Table 18.** METs Levels Required by Some Activities

Activity	MET
Resting in bed	1
Sitting	1-1.5
Desk job	1.5-2.5
Light house work	2-4
Eating	1.5
Standing	1.5-2
Walking (1.5 km/h)	2
Walking (3 km/h)	3.5
Cycling	1-2.5
Dancing	2-8
Driving	1.5-2.5
Taking shower	3.5
Running (8 km/h)	8

Exercise intensity ratings are given in Table 19.

**Table 19.** Exercise Intensity Ratings

	HRR %	peak VO <sub>2</sub> %	peak HR %	Borg's perceive d exertion scale
Extremely light	<20	<25	<35	<10
Light	20-39	25-44	35-54	10-11
Moderate	40-59	45-59	55-69	12-13
Hard	60-84	60-84	70-89	14-16
Very Hard	≥85	≥85	≥90	17-19
Maximum	100	100	100	20

HRR: Heart rate reserve, HR: Heart rate

The exercises should be done at least three sessions per week to increase the CVS endurance. Each session should last 15-60 minutes, except for 10 minutes of warm-up and cool-down periods. Sessions may be continuously or intermittently according to patients' needs. In continuous exercises, the same type of exercise is continued at the same intensity throughout the session. Intermittent exercise is usually done in two ways. Resting periods are given between short exercise periods in the first. Later which is more widespread, 3-4 minutes of maximum intensity exercises are given and 3-4 minutes of low intensity exercises between. Exercise intensities may be started at 40-60% in the beginning, the exercise duration extended 5 minutes per week.

### **Resistant Exercises in Heart Diseases**

Resistant exercises are given to heart patients in order to increase muscle strength and endurance and physical capacity.

#### **Indications of Resistant Exercises for Patients with Cardiovascular Diseases**

- Patients with moderate -good left ventricular function
- Good cardiac performance capacity (1.4 w/kg or greater than 5-6 MET)
- Patients with no chest pain or ST segment depression with medical treatment.
- Applicable after MI or to PTCA patients 2-3 weeks later.
- Upper extremity resistance exercises are contraindicated for 1,5 month after cardiac operation until wound completely heals.
- It is applicable at least 2 weeks after anticoagulation therapy is started in patients with thrombophlebitis.
- It is applicable with caution to those with diabetic neuropathy.
- It is generally contraindicated in patients with hypertrophic cardiomyopathy, however, could be recommended to selected patients using light intensity loadings
- Upper extremity exercises should be avoided in patients with pacemakers and defibrillators.
- Patients who never exercised and with very low capacity should better be started resistant exercise training after following aerobic exercise training for 2-4 weeks.
- It should be given with care since there are not enough studies on high-risk patients, female patients and elderly patients. Those who are over the age of 65 are considered to be in the class C for resistant exercises in terms of exercise-related risk.

In resistant exercise, the intensity of exercise is determined using 1 maximum repetition (1RM). 1 RM is determined by calculating the maximum weight that can be lifted by completing the movement along a range of motion. Exercise machines, rollers, free weights are used during exercise. Exercise intensity is set to 65-75% of 1RM. 3-9 muscle groups could be selected in an exercise program. Exercises consist of 1-3 sets, each set 8-10 repeats. Rest is given between sets for 2 minutes. The weight should be lifted without causing pain and discomfort, and the Borg exertion scale should be below 15 (12-13) points. When lifting, Valsalva maneuver should not be made by holding breath. Exercises should last 15-30 minutes. There should be a 10-minute of warm-up period including walking, callisthenics, stretching exercises before the exercise. It could be done 2-3 times a week. As the patient adapts to the program and the exercises begin to be light, the number of sets, at first, and then number of repeats could be increased. A sample exercise prescription in coronary heart patients is shown in Table 20.

**Table 20.** Exercise Prescription in Coronary Heart Diseases

Exercise Type	Intensity	Borg's scale	Incidence	Duration
Aerobic exercise	VO <sub>2</sub> max 50-80%	12-15	3-5 weeks	40-60 min
Resistant exercise	65-75% of 1 RM 8-10 repeats 1-3 sets	13-16	2-3 weeks	15-30 min

**Exercise Prescription for Patients with Heart Failure**

Decrease in exercise capacity is more evident in patients with **heart failure** due to ventilation, perfusion or both abnormalities. Exercise and physical function capacities of the patients with **heart failure increase** after respiratory exercises. In addition to aerobic exercises, some significant improvements were observed in diaphragmatic breathing, seven days a week, 1-3 times a day for 10-20 minutes, and exercises that increase respiratory muscle strength with devices such as diaphragmatic breathing, pursed lip respiration and exercises increasing respiratory muscle strength with devices such as IMT and peak VO<sub>2</sub> (oxygen consumption), HRR (heart rate reserve), MIP (maximal inspiratory pressure) and 6-minute walk test.

Aerobic exercises such as walking, land or water exercises and cycling, peripheral muscles training with resistant bands and weights are appropriate exercises for the patients with **heart failure**. For these patients, light to moderate effort and light to moderate shortness of breath are the optimal loading thresholds. Patients with stable heart failure with predominant systolic dysfunction [New York Heart Association (NYHA) class (I-II-III)] are suitable for exercise. The exercise capacity of patients should be evaluated before physical activity training is given. According to this evaluation, an appropriate training program should be designed.

An exemplary exercise prescription for the patients with cardiac insufficiency is shown in Table 21.



**Table 21.** The Exercise Prescription in Patients with Stable Heart Failure

Exercise type	Intensity	Incidence	Duration
Aerobic Exercise	VO <sub>2</sub> max 40-80% HRR 40-70% Borgperceived exertion scale 10-15	3-5 days a week	20-60 min
Peripheral muscle training	35-80% of 1 RM  Borg perceived exertion scale 13-15	Once a day  2 times a week	15-60 min
Combined aerobic and peripheral muscle training	VO <sub>2</sub> max 60-80%  60-80% of 1 RM	3 times a week	45-60 min
Hydrotherapy HRR 40-80%, 3 times a week, 45 min			
Respiratory muscle training MIP 30%, 3 times a day, 30-60 min			

Studies on cardiovascular diseases showed although most patients benefit from exercise programs to a large extent, women and elderly people are not sufficiently benefit from these programs. Therefore, these groups of patients should be encouraged and involved in exercise training programs.

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# SECTION 5

## PHYSICAL ACTIVITY AND EXERCISE IN NEUROLOGICAL DISORDERS AND ANESTHESIA

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## **A** BSTRACT

Adults with chronic neurological disease are less active. Physical activity contributes to the general health status and has positive effects on treatment of the disease. Patients should be assessed by experienced specialists to identify potential contraindications for physical activity and potential risks should be revealed. Physical activities should be planned individually by assessing the functional status of the patient and the severity of the disease. Appropriate environmental conditions and safety should be ensured. The duration, severity, type of physical activity should be determined, appropriate resting intervals should be given, and termination criteria should be determined according to individual tolerance.

## INTRODUCTION

Physical activity recommendations will be given for the following diseases:

1. Stroke
2. Parkinson's Disease
3. Multiple Sclerosis
4. Spinal Cord Injury
5. Peripheral Vestibular Disorders
6. Pain

### STROKE

#### Definition

Stroke is a clinical syndrome characterized by symptoms and signs related to loss of focal cerebral function associated with vascular causes. According to the affected brain region, motor, sensory, speech, visual, vestibular, cognitive symptoms are seen.

#### Prevalence/Incidence

Stroke is one of the leading causes of mortality and morbidity in the world. According to the World Health Organization (WHO), 6.7 million deaths are related to stroke in 2012. Considering the distribution in urban and rural areas of cerebrovascular disease in Turkey, cerebrovascular diseases cause death in urban areas among males at the age group of 15-59 by 10.7%, while it is 7.3% among females; this rate increases to 20.8% among males over the age of 60 and to 20.2% among females. Cerebrovascular diseases are cause of death in rural areas by 14.5% among males and 16.2% among females.

#### Causes

Reasons for stroke are divided into 3 sub-types: unchangeable risk factors, changeable risk factors having a certain relation with stroke and uncertainly changeable risk factors having an uncertain relation with stroke. Risk factors that could not be changed are age, sex, family history of stroke, race and low birth weight. Changeable risk factors having a certain relation with stroke include hypertension, heart disease, smoking, diabetes, high blood lipids and cholesterol, diet-obesity-physical inactivity, postmenopausal hormone therapy, sickle cell anemia and asymptomatic carotid stenosis. Risk factors having an uncertain relation with stroke include metabolic syndrome, hyperhomocysteinemia, alcohol use, substance use, oral contraceptive use, hypercoagulability, elevated lipoprotein A, inflammatory processes, migraine and sleep apnea.

**Prognosis**

Prognosis is variable and affected by demographic characteristics.

**Treatment**

The first goal in stroke treatment is to stop the neurological damage and heal it if reversible. In addition, symptomatic, medical and surgical treatments are applied to prevent the increase of neurological damage. It is important to combat the complications that will occur with stroke and to start rehabilitation in the early period.

**Effects of Physical Activity**

- Regular physical activity in stroke patients improves muscle function, aerobic fitness and mobility.
- It helps to normalize muscle tonus of the patients and maintains and/or increases endurance.
- It provides weight control and helps prevent obesity.
- It slows down the progress of osteoporosis by protecting the bone mineral density.
- It supports sense, perception and cognitive functions.
- It contributes to the fine motor development.
- It increases psychosocial interaction, reducing depression.
- It increases independence and the quality of life in daily living activities.

**Indications**

Situations such as muscle tonus problems, loss of mobility, postural and balance disorders, sensory problems, muscle weaknesses and vital problems affect involvement in daily living activities and social life and the quality of life worsens. For this reason, it is important to ensure involvement in physical activity.

**Physical Activity Prescription**

Patients should continue their exercise program in the rehabilitation process for the management of symptoms such as muscle weakness, increased muscle tonus, sensory problems, balance disorder, loss of mobility. These exercises are specially designed for each patient and should be furthered with regular controls. In addition, the exercises included in the program could be recommended by adapting to daily living activities.



A special physical activity prescription should be planned by assessing the functional status of the patient. Environmental regulations and activity modification to support the active involvement of the person in the activity should be made. The need for walking aids and assist devices should be evaluated and use of those should be recommended during physical activity.

Physical activities including walking, walking band, stationary bicycle, bicycle ergometer could be selected as type of exercise for patients with stroke. Depending on the patient's physical fitness level, 3-7 days sets, 20-60 minutes (could be 10-minute sets within the day) per set, at 50-80% of maximum heart rate, are recommended. The programs should include periods of warm-up and cool-down and vital signs should be followed during activities.

### **Contraindications and Risks**

Physical activities of patients with cardiovascular instability (such as chest pain, arrhythmia, blood pressure changes), acute respiratory distress and deep venous thrombosis should be ended and physical activity level should be restructured by reassessing the patient by professionals.

When creating a physical activity prescription, the balance disorder and the risk of fall should be assessed, and the probability of trauma should be minimized.

Preventive measures should be taken during physical activities if patients have epileptic seizure history.

**MULTIPLE SCLEROSIS****Definition**

Multiple sclerosis (MS) is the most common demyelinating disease of the central nervous system. It is the most important cause of non-traumatic neurological disability among the young adult population. It requires lifelong management because of its economic and social effects.

**Prevalence/Incidence**

According to the results of WHO's MS atlas, the number of MS patients increased from 2.1 to 2.3 million between 2008 and 2013. The median prevalence in the world is 30 per 100,000; it ranges between 5 and 80 in 100,000 according to the countries. While the highest prevalence is 80 per 100,000 in Europe, it is 0.3 per 100,000 in Africa. Since Turkey was accepted in the eastern Mediterranean region, its estimated prevalence was found 14.9 per 100,000. The median incidence in the world is 2.5 per 100,000.

**Causes**

In MS, the etiology is poorly understood and it is accepted as an autoimmune disease associated with environmental factors in individuals with genetic predisposition.

**Prognosis**

MS attacks are episodes where one or several neurological dysfunctions with acute or subacute onset resulted in complete or partial healing, exceeding 24 hours and lasting frequently for days and weeks. The natural course of MS is quite diverse. In general, walking is affected within 10 years, patients cannot walk without support within 15-20 years; they barely take a few steps within 30 years.

**Treatment**

High-dose methylprednisolone is the accepted treatment method for MS attack treatment. Immunomodulatory and immunosuppressive therapies that slow the progression of their disease are long-term preventive treatments. In addition, new oral immunomodulatory agents and monoclonal antibodies appear to be effective in reducing disability in recent years.

**Effects of Physical Activity (Prevention and Treatment)**

- Regular physical activity in MS patients improves muscle function, aerobic fitness and mobility.
- MS protects and/or increases muscle mass and endurance.
- It provides weight control and helps prevent obesity.

- It slows down the progress of osteoporosis by protecting the bone mineral density.
- It reduces depression by increasing social interaction.
- It increases independence and the quality of life in daily living activities.

### Indications

The patient is referred to specialists in physiotherapy and rehabilitation in order to determine the appropriate dose for physical activity after MS diagnosis and medical treatment is planned. Once the right conditions are met, all MS patients could involve in physical activity.

### Physical Activity Prescription

Patients should continue their exercise program in the rehabilitation process to manage symptoms such as MS-induced muscle weakness, increase in muscle tonus and balance disorders. These exercises are specially designed for each patient and should be furthered with regular controls. In addition, walking, in-water exercises, stationary bicycles and activities in daily life could be recommended to the patients as physical activity.

Physical activity training that may be recommended for MS patients should be planned as 2-3 days a week, 2 times each day, 10-15 minutes each time, or 20-30 minutes if appropriate, at 65-75% of maximal heart rate. The periods of warm-up prior to activities and cool-down after the activities reduce the risk of injury. It is ideal to appropriately ventilate the activity environment and to keep it at approximately 23° C. Activities such as outdoor walking are recommended to be done in the evenings. Recommended water temperature for in-water exercises is between 27-29° C.

MS patients require a longer recovery period than other patient groups following physical activity. For this reason, it is very important to know the individual limits of the patients. During the day, the patients should frequently rest and especially resting in the supine position should be preferred.

As the patient's functional status changes, the patient's physical activity prescription should be assessed by an expert and reconstructed for exercise intensity and duration. For example, the patients at the level of wheelchair could be recommended an activity involving upper extremity exercises (bicycle ergometer, playing dart, puzzles, etc.).

**Contraindications and Risks**

For individuals with fatigue and hot intolerance, the physical activity prescription should be carefully prepared. Physical exercise should be restricted for MS patients or exercise should be avoided as it may worsen the symptoms during attacks. Fatigue in MS patients could make them feel the existing symptoms more intensely and even have an attack if it is extremely felt. For this reason, patients' physical activity prescription should be prepared considering the level of fatigue.

The risk of osteoporosis fracture due to long-term use of cortisone in MS patients is another consideration.

Other accompanying problems and diseases of MS patients should be evaluated to plan physical activities.

In MS patients, infections can trigger attacks. For this reason, the duration and intensity of physical activity should be reduced in cases, which lower body resistance, such as active infection.

## PARKINSON'S DISEASE

### Definition

Movement disorders term is used to identify neurological diseases that volitional movements could not be done at desired speed and size, that automatic movements are lost or that course with involuntary movements. Movement disorders are divided into two groups; the hypokinetic movement disorders with reduced movement and hyperkinetic movement with increased involuntary movements.

Parkinson Disease is the second most common neurodegenerative disease of the central nervous system clinically characterized by bradykinesia, rigidity, resting tremor and postural imbalance.

### Prevalence/Incidence

Parkinson's disease is a neurodegenerative disease that affects 1-2% of people over the age of 60 years old.

### Causes and Risks

Etiopathogenesis is not yet fully elucidated. Possible mechanisms are associated with genetic, environmental factors, mitochondrial dysfunction, oxidative stress and apoptosis.

### Prognosis

The prognosis of the disease is variable and it varies by age, socioeconomic status and patient's compliance to therapy.

### Treatment

A set of symptomatic medication is used for treatment of motor and non-motor findings although there is not a complete cure for Parkinson's disease. Efficacy of the drugs is crucial for the treatment as well as the patient's characteristics.

### Effects of Physical Activity

- Regular physical activity improves muscle function, aerobic fitness and mobility.
- It helps to normalize muscle tonus of the patients and maintains and/or increases endurance.
- It improves motor skills.
- It improves ambulation and walking functions.
- It helps correct the postural disorders.

- It supports the preservation or development of cardiopulmonary capacity.
- It improves balance and coordination, reduces risk of falling.
- It supports sense, perception and cognitive functions.
- It slows down the progress of osteoporosis by protecting the bone mineral density.
- It increases psychosocial interaction, reducing depression.
- It increases independence and the quality of life in daily living activities.

### **Indications**

Situations such as slowing movements, rigidity, pain, posture and balance disorders, perception problems, muscle weakness and shortness of muscles affect the involvement in daily living activities and social participation. For this reason, it is important to ensure involvement in physical activity.

### **Physical Activity Prescription**

Patients should continue the exercise program given to them in the rehabilitation process for the management of symptoms such as rigidity, pain, perception problems, postural disorders, postural instability and loss of mobility. These exercises are specially designed for each patient and should be furthered with regular controls. Physical activity should begin in the early stages of the disease. In addition, the exercises included in the program could be recommended by adapting to daily living activities.

A special physical activity prescription should be planned by assessing the functional status of the patient. Environmental regulations and activity modification to support the active involvement of the person in the activity and to ensure security should be made.

For the patients with Parkinson's disease, physical activities including walking, jogging in place, stationary bicycle, in-water exercise and dance could be selected as exercise type.

### **Contraindications/risks**

The risk of falling increases with age. Orthostatic hypotension should be considered during physical activity. Care should be taken against the development of sudden respiratory distress

## PERIPHERAL VESTIBULAR DISORDERS

### Definition

The balance system is studied in two parts as peripheral and central. The peripheral vestibular system includes sensory receptor structures that perceive the position of head in the space and transforming this sensory stimulant into electrical stimulant and the vestibular piece of the 8. head pair that carries the encoded information to central nervous system (CNS) from the receptors. Three semicircular channels in which sensory receptors are involved and vestibular labyrinth composed of two otolithic organs are responsible for perceiving linear and angular head movements.

The prevalence/incidence, causes, risks, prognosis and treatment of peripheral vestibular disorders according to the frequency are given below.

1. **Benign Paroxysmal Positional Vertigo (BPPV):** It is the most diagnosed peripheral vertigo disease. Although the incidence varies by centers, it ranges between 10.7 and 64 every 100,000. In general, the incidence increases with age. The patients experience severe dizziness associated with altered head position. There is not a definable etiology in most cases. The most common cause is head trauma followed by vestibular neuronitis, infections, prolonged bed rest and surgery (e.g. ear surgery or neuro-otologic surgeons). The maneuvers are made based on the principle of putting the canalithback. In addition, exercises that aim at compensation and habituation after an acute attack are recommended. Efficacy of the treatment reaches 90% for the recurrent maneuvers. Annual recurrence rate is reported as approximately 15%.
2. **Meniere's Disease:** It is a symptomatic, idiopathic inner ear disease. It is characterized as dizziness lasting as independent attacks and at least 20 minutes, hearing loss, ringing in the ears, fullness in the ear and pressure sensation that recur in the seizures, however, stabilize in the further period. Frequency. It is reported to be between 5 and 17 in 100,000. The prevalence is 43/100,000 while the number of new cases per year is 3-4/100,000. The first symptom in meningitis is any age between 20 and 60 years, with a peak incidence of 40-60 years. Bilateral involvement rates were reported between 11 and 35% in various studies. Various mechanisms such as ionic imbalance, genetic factors, viral infections, diet factors, autoimmune reactions, vascular imbalance, and allergic response in etiology are accused in the development of hydrops. The patient is caused to take a rest so as to prevent him/her from falling and to avoid sudden head movements. Pharmacological treatment is used to control dizziness, nausea and vomiting. Chronic stage includes life rehabilitation, vestibular rehabilitation, diuretics, vasodilators, corticosteroids,

immunosuppressive and intratympanic treatment methods. The patients with no response to conservative therapy compose 20% of it. Surgical treatment should be considered for these patients.

3. **Vestibular Neuronitis:** As a disease with severe and sudden onset and lasting 7-10 days, it is caused by viral or postviral inflammatory process that affects the vestibular part of the vestibulocochlear nerve. As part of the histopathological studies on vestibular ganglia, herpes virus type 1 was detected by 60-70%. The healing period of the disease could show wide variations. Symptomatic treatment (dizziness, nausea and vomiting) is the primary treatment in acute period. As with all acute peripheral vestibular losses, early mobilization encourages the patients. Also the exercises aiming at compensation and habituation are recommended.
4. **Chronic Bilateral Vestibulopathy:** It is a disorder with the symptoms of movement-related postural vertigo, unstable balance, difficulty in visual acuity during walking and difficulty in spatial positioning and usually experienced by elderly patients. The incidence is reported as 7.2% for the patients applying with complaint of dizziness. Balance exercise programs are applied with the aim of strengthening compensation in treatment.

#### **Effects of Physical Activity:**

- It increases the functional balance during ambulation process.
- It reduces the feeling of the patient on losing balance.
- It increases the general physical condition and activities of the patient.
- It prevents social isolation by increasing the psychosocially feel-good.
- It affects the quality of life by increasing daily living activities and social involvement.

#### **Indications**

Except for acute attacks, the patients could be referred to special physical activity programs by professionals at any time of the disease period.

#### **Physical Activity Prescription**

The patients in the early post-attack period should be more likely to be directed to physical activity in stationary positions. As the tolerance increases for position changes in the following periods, the patient should be encouraged to involve in daily living activities and physical activities that are more complicated and include diversification in terms of position.



Walking among the physical activity options comes first. Dancing and different kinds of sports (selected by experts) could be recommended as the situation of the patient improves. The targeted gaining could be achieved with physical activity maintained for at least 12 weeks, 7 days a week, 2 times a week and 20-30 minutes of sessions, starting from 10 minutes, could bring targeted objectives. Patient training should be targeted and each physical activity should be adapted to daily living activities.

Physical activities should be done primarily by ensuring the environment safety on fixed grounds. These environments should be chosen so that they do not distract at the outset and do not contain different environmental contexts. As the patient's condition improves, the patients should be caused to overcome stair climbing, walking on ramps and more difficult activities on moving floors.

The choice of physical activity should be planned according to the patient's lifestyle and interests.

**Contraindication/risks:**

If the exercises cause a slight increase in symptoms, the exercises should be slowed down or relieved. In case of;

- A long-standing sharp pain in the neck, ear or head
- A feeling of fullness in the ear, ringing or hearing loss
- Double vision
- Feeling empty
- Feeling weak and weary in the arms and legs
- Blackout

patients should cease their physical activities and consult a physician.

## SPINAL CORD INJURY

### INJURY

#### Definition

At the end of the Spinal Cord Injury (SCI), patients are divided into two main groups by the lesion level. Tetraplegia: It is the loss of motor and/or sensory function in cervical segments of spinal cord due to damage of neural elements in the spinal canal. It creates dysfunction in the head, neck, legs and pelvic organs.

Paraplegia: It is the loss of motor and/or sensory function in the thoracic, lumbar or sacral spinal cord segments beneath the cervical cord. Arm functions are preserved; however, involvement may be in the body, legs and pelvic organs.

#### Incidence-prevalence

In developed countries, the incidence of SCI is reported to be between 10 and 83 per million. Prevalence is between 223 and 755 per million. The incidence in the study on traumatic SCI patients in Turkey is 12.7 per million. It affects young adults and most injuries occur between the ages of 16 and 30. It is four times more in males than females. The ratio of male/female in Turkey is reported as 2.5/1. Traumatic SCI most commonly causes cervical lesions, followed by thoracic and lumbosacral lesions.

#### Causes/Risks

It develops as traumatic and non-traumatic SCI. Among traumatic causes are motor vehicle accidents, high falls, firearm injuries and sporting activities. In Turkey, motor vehicle accidents are in the first place with 48.8%.

Among the non-traumatic causes are; intra and extra medullary tumors, spinal cord infections, transverse myelitis, progressive neurological diseases (amyotrophic lateral sclerosis, multiple sclerosis, etc.), vascular causes, advanced disc hernias.

#### Prognosis

In complete tetraplegics, the motor recovery in the upper extremity occurs in the first 6-9 months, with the greatest amount of change occurring in the first 3 months. Motor recovery time is shorter at first for those with muscle strength, while motor recovery could be observed up to 2 years in those with muscles with 0/5 on first examination. In incomplete tetraplegics, upper extremity motor recovery is two times better than complete ones.

In complete paraplegics, a fair amount of motor recovery may be seen in the proximal muscles of the lower extremities. In 73% of patients, the neurological level changes in the first year after injury. Motor recovery in incomplete paraplegics has good prognosis in terms of ambulation. In the first examination, 85% of muscles with 1-2/5 muscle power reach at least 3/5 within a year. Spinal shock is a poor prognostic indicator.

## Treatment

The treatment begins in the intensive care unit and includes the achievement of medical, physical, social, emotional, recreational, occupational potential and functional healing. Early period rehabilitation; is important in terms of preventing the complications, bladder and bowel training, necessary medical treatment, determination of functional targets, early adaptation, daily living activities, psychological support, ambulation and orthosis, recreational and vocational rehabilitation.

## Effects of Physical Activity:

- It increases the muscle strength of the upper extremity and increases its independence in daily life.
- It helps to normalize muscle tonus of the patients and maintains and/or increases endurance.
- It supports ambulation and walking functions.
- It helps correct the postural disorders.
- It supports the preservation or development of cardiopulmonary capacity.
- It slows down the progress of osteoporosis by protecting the bone mineral density.
- It reduces the development of systemic complications.
- It increases involvement in social life and the quality of life by increasing psychosocial interaction.

## Indications

Conditions such as complex paralysis, muscle weakness, muscle tonus problems, loss of mobility, pain, posture and balance disorders, obesity and pressure injuries affect the involvement in daily living activities and social involvement. In addition, anxiety, depression, decreased self-esteem and increased social isolation are other causes of impairment of the quality of life. The physical activity is therefore of great importance for these patients.

## Physical Activity Prescription

In addition to the physiotherapy program of the patient, a physical activity schedule should be established according to the functional level.

Being active as much as possible in daily lives by taking necessary safety precautions, the use of patients should be as active as they can in daily life, and activities such as wheelchair use, transfer activities, supported standing should be emphasized as physical activity. In addition, leisure time activities should be planned according to the functional situation of the persons and their interests.

In order for the patient to use the upper extremity extremely important. For this reason, physical activities that promote body balance should be used

(ball games, functional reach for purpose, etc.). In cases where the patients can actively use the upper extremities, they could be directed to swimming, wheelchair sports (archery, table tennis, basketball, etc.). Assistive technologies such as computer assistive activities could be used when the upper limb is limitedly used.

It is advisable to walk in the treadwheel and to cycle in the sitting position by supporting the patient's body weight which is suitable for the functional level.

In-water exercises could be used for all patients considering the complications that may occur.

In terms of respiratory functions, it is important for patients to be directed to specialists in this field. Exercises such as balloon inflating, candle blowing may help to improve breathing.

Moderate activities could be done until the person reaches the limit of fatigue. Training, 3-5 times a week, 20-60minutes, at an intensity of 50-80% of maximum heart rate, could be recommended. Strengthening training activities could be done with weights. Each muscle group should be run 3 times a day, 8-10 times per set. Weights that can easily be lifted by the person should be preferred. Strengths could also be carried out with elastic equipment or the machines providing weight.

### **Contraindications/risks**

Autonomic dysreflexia, impaired skin integrity, severe decubitus ulcers, increased muscle tonus, orthostatic hypotension, pulmonary embolism, deep venous thrombus (acute phase), cases requiring joint immobility should be considered and patients should be directed to the appropriate health professional

**PAIN****Definition**

According to the International Association for the Study of Pain (IASP); pain is defined as "An unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage". Pain is always subjective. The pain varies greatly from person to person, because many factors (sex, religion, language, race, socio-cultural environment...) determine response to painful stimulant.

According to mechanics, pain is classified as: Nociceptive pain, Neuropathic pain, Deafferentation pain, Reactive pain and psychosomatic pain.

The pain as the result of lesions or diseases affecting the central somatosensory system is defined as central neuropathic pain.

**Causes of Central Pain**

Cerebral lesions (stroke, brain tumors or abscesses, multiple sclerosis, thalamotomy operations for movement disorders), Spinal cord diseases (syringomyelia, spinal cord injury, anterolateral cordotomy and commissural myelotomy surgery complications), ischemic lesions (anterior spinal artery syndrome), radiation myelopathy, infection and tumor.

**Characteristic of Central Pain**

What distinguishes central neuropathic pain from peripheral pain is the time from the formation of the lesion to the onset of pain. Central pains could often occur a long time after the event that caused the damage in the nerve system or even at the stage that the patient is pulling through the disability. Another difference is that the response to therapy is variable, though it is seen less than peripheral neuropathic pain.

In central neuropathic pain, negative findings such as hypoesthesia that courses with a decrease and/or loss of sense and positive sensory findings such as paresthesia and dysesthesia may be seen. There may be findings in both categories at various levels depending on cause and course of the diseases in central neuropathic pain syndromes.

**Treatment**

Assessment of pain complaints and effective treatment fall short especially in chronic pain conditions. Medication should be assessed with care because of other drugs used in accompanying diseases, drug-drug and drug-disease interactions, side effects of drugs, dose and concentrations. Effective pain management should include both of pharmacological and non-pharmacological strategies.

Nonpharmacological pain management methods include physical and cognitive-behavioral strategies. Non-opioid analgesics, opioid analgesics and adjuvant drugs are part of pharmacological strategies. Interventional (invasive) methods and surgical methods are used.

As quite different from each other, the drugs called secondary, adjuvant or co-analgesics are pharmacologic agents which are known to be useful in some pain syndromes due to their analgesic properties, although they are indeed not used for pain (Table 22). Since there is no analgesic drug with ideal properties, it is a widely used method in chronic pain control to add adjuvant drug into pain therapy in order to reduce the analgesic dose and to achieve less side effects.

These drugs have an effect by increasing the efficacy of analgesics directly or indirectly. They are used alone or in combination between each other or with other analgesics in the treatment of pain.

**Table 22.** Medicines Used in the Treatment of Neuropathic Pain

Antidepressants	Tricyclic antidepressants and SNRI
Anticonvulsants	Carbamazepine / oxcarbazepine, gabapentin / pregabalin
Antiarrhythmics	Lidocaine
Opioids	Tramadol hydrochloride, Fentanyl, oxycodone
Topical agents	Capsaicin, lidocaine cream

*SNRI: Serotonin and norepinephrine reuptake inhibitors*

**Central post-stroke pain (CPSP)**

Central neuropathic pain after stroke is a syndrome characterized by sensory disturbances and neuropathic pain. The pain can be burning, striking, blunt or pinprick. In general, dysesthesia, hyperalgesia or allodynia is also present. The picture is frequently accompanied by the functional disorders such as depression, anxiety and sleep disorders.

It was shown that the onset of central pain symptoms after stroke occurred at different times according to the lesion location. Symptoms usually develop within 6 months after stroke in the majority of patients. Connection of neuropathic pain developed after stroke with age and gender was not detected.

Although its mechanism was not fully explained, it is accepted that the damage in spinothalamic sensory pathways plays a role in the pathogenesis of central neuropathic pain after stroke.

A thorough assessment of the case with sensory deficits should be evaluated prior to treatment. Functional disorders such as depression, anxiety and sleep disorders are important comorbid conditions that accompany post-stroke neuropathic pain and should be considered by the physician.

### **Central Pain in a Patient with Spinal Cord Injury**

It is a neuropathic pain that is caused by the damaged spinal cord due to various causes. Pain following spinal cord injury may include nociceptive, visceral and neuropathic components. Neuropathic pain is classified as above the damage level, at the damage level and below the damage level according to the degree of the damage to the spinal cord. About 65% of patients, who undergo a spinal cord injury (SCI), complain a continuous pain. The incidence of neuropathic pain after spinal cord injury is measured as 40%. The mechanism of the pain is not fully understood. However, it is assumed that its pathophysiology is multifactorial.

The pain associated with spinal cord injury is generally bilateral and in areas where anesthesia is felt below the damage level. The pain could be burning, numbness, tingling, throbbing and hurting. A comprehensive neurological examination and evaluation appropriate for approaching principles in neuropathic pain at the beginning of this guideline is necessary.

A multidisciplinary approach to treatment of neuropathic pain after spinal cord injury is so important. Pharmacological treatments, Physiotherapy modalities, cognitive behavioral and psychological treatments and social support should be part of the approach.

For treatment of neuropathic pain after spinal cord injury, a large number of pharmacological agents such as antidepressants, anticonvulsants, baclofen, non-opioid and opioid analgesics, alpha-adrenergic agonists and ketamine were proposed as options. However, the efficacy is unsatisfactory and side effects limit their use.

Insufficient pain treatment in the above mentioned chronic neurological diseases leads to depression, social isolation and loss of function. This situation also affects the quality of life negatively. It is recommended to continue physical activities after pain management is provided in case of pain.

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# SECTION 6

## PHYSICAL ACTIVITY AND EXERCISE IN ENDOCRINE AND METABOLIC DISEASES

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## **A**BSTRACT

The prevalence of diabetes is 13.7% in Turkey, indicated by 'Turkey Diabetes Epidemiology Study' TURDEP-II which was completed in 2010. Diagnosis of diabetes or prediabetes is made with fasting plasma glucose (FPG), 2-hour oral glucose tolerance test (OGTT) and glycosylated hemoglobin A1c (HbA1c) scales. Lifestyle changes (physical activity, medical nutrition therapy) in all types of diabetes are the basis of treatment. Physical activity/exercise is useful both in type 1 and type 2 diabetes. It is effective in maintaining blood glucose regulation of the diabetic individual, in maintaining HbA1c levels at normal levels and in reducing the incidence of advanced diabetic complications. When physical activity or exercise is planned for a diabetic individual; age of the patient, type and severity of the exercise, metabolic control of the disease, musculoskeletal compliance and cardio-pulmonary compliance should be noticed. It should be kept in mind that insulin sensitivity may raise in muscles and hypoglycemia may develop due to glucose use during exercise.

According to the preliminary study of "Turkey Nutrition and Health Survey-2010" conducted by our Ministry, prevalence of obesity is found to be 20.5% in males and 41.0% in females and 30.3% in total. As the level of obesity increases beginning from the overweight group, the presence and severity of obesity-related problems, diabetes and cardiovascular diseases in particular, are also increasing. Adequate and balanced nutrition and physical activity are two fundamental elements in the prevention and treatment of obesity. A combination of lifelong adequate and balanced nutrition, increased physical activity and behavioral treatments is the essential treatment. Exercise program should be organized after the primary health problems of the obese individual are taken under control. For achievement in weight loss with exercise, it is necessary to gradually increase the intensity of exercise and to focus on doing exercise on a regular basis. The aim should be to be able to do moderate exercises for a period of 30 to 60 minutes most of the days of the week as far as possible by gradually increasing the period and frequency and to maintain it. Cardiovascular evaluation of sedentary individuals should be done before the program. Risks of exercise-related injuries should be paid attention in patients with morbid obesity and weight loss should be targeted before starting the exercise program.

**DIABETES****Definition**

Diabetes is a chronic systemic disorder that is caused by insulin deficiency, insulin resistance or combination of them, characterized by hyperglycemia and elevated glucagon, accompanied by impaired carbohydrate, protein and lipid metabolism and may lead to chronic and acute complications. There are four types of diabetes; type 1, type 2, diabetes with specific causes and pregnancy diabetes (gestational diabetes mellitus). Patients with type 2 diabetes constitute 80-90% of total diabetic patients.

The period in which blood glucose levels are normally high, however, have not reached the levels that would result in diabetes diagnosis are referred to as prediabetes (increased risk for diabetes). This period with high risk for diabetes development is associated with cardiovascular and microvascular complications.

**Prevalence**

The prevalence of type 2 was rapidly increasing in all of the developing and developed societies along with the rapid change in lifestyle. According to the '7. Diabetes Atlas' published by the International Diabetes Federation' (IDF) in 2015, 415 million people in the world in the age group 20-79 years have diabetes and if the measure is not taken, the diabetic population is expected to increase by 55% to 642 million as of 2040. According to data of the World Health Organization (WHO), the prevalence of diabetes increased about 2 times from 1980 to 2014 and the adult diabetes population increased about 4 times. This increase in the prevalence of diabetes is faster in developing countries than in developed countries.

'Turkey Diabetes Epidemiology Study' (TURDEP) I and II are the most comprehensive researches in Turkey through which the prevalence of diabetes in our country were examined. TURDEP-I was held in 540 centers with the participation of 24.788 people over the age of 20 in 1997-1998 and demonstrated that the prevalence of diabetes in society was 7.2% and of impaired glucose tolerance was 6.7%. In the TURDEP-II study, conducted approximately 12 years after this study and completed in 2010, the prevalence of diabetes was shown to increase by 90% reaching to 13.7%. According to TURDEP-II results, the incidence of diabetes was higher in females than in males (17.2% in females, 16.0% in males). Furthermore, according to this study, 28.7% of the population over 20 years living in Turkey is accepted as prediabetes. In other words, the proportion of patients with diabetes and prediabetes is 42.4% in total.

**Causes**

In type-2 diabetes, hyperglycemia usually develops due to inadequate insulin secretion or decreased insulin sensitivity (insulin resistance) or a combination of them. Type 2 diabetes is more common due to obesity and physical inactivity. Insulin resistance that is triggered by lifestyle and gradually increases in genetically predisposed individuals and gradually reducing release of insulin underlies the disease. Type-1 diabetes is characterized by absolute insulin deficiency, usually due to autoimmune injury of pancreatic beta cells. It is thought that genetic predisposition and many environmental factors, not yet clearly revealed, play a role in the pathogenesis of type-1 diabetes.

**Risk Factors**

The following groups have an increased risk for type 2 diabetes;

- Individuals with diabetes in their first and second degree relatives
- Individuals as part of ethnic groups with high prevalence of diabetes
- Women who give birth to big babies or have diagnosis of gestational diabetes
- Hypertensive individuals (blood pressure  $\geq 140/90$  mmHg)
- Dyslipidemics (HDL-cholesterol  $\leq 35$  mg/dl or triglycerides  $\geq 250$  mg/dl)
- Individuals with previously diagnosed impaired fasting glucose or impaired glucose tolerance
- Women with polycystic ovary syndrome
- People with clinical disease or findings related to insulin resistance (acanthosis nigricans, non-alcoholic steatohepatitis)
- Individuals with coronary, peripheral or cerebral vascular disease
- Individuals with low birth weights
- Individuals with sedentary lifestyle or low physical activity
- Individuals having the habits of nutrition, rich in saturated fat and poor in fiber
- Schizophrenic patients and the individuals using atypical antipsychotic drugs
- Patients with solid organ (especially renal) transplantation

**Symptoms**

The most common symptoms of diabetes are polyuria, polydipsia, nocturia, weight loss despite eating a lot, desert mouth, weakness; skin, vulva and urinary tract infections, recurrent fungal infections, itching and blurred vision. Symptoms usually develop rapidly within a few weeks in type 1 diabetes. A significant proportion of type 2 diabetics initially have no symptoms or complaints are much more insignificant than in type 1 diabetes. Some patients attribute their symptoms



to other causes. For this reason, the disease is noticed after years of its actual onset, even the diagnosis is sometimes made by detecting the complications.

### Diagnosis

Diagnosis of diabetes or prediabetes is made with; fasting plasma glucose (FPG), 2-hour oral glucose tolerance test (OGTT) and glycosylated hemoglobin A1c (HbA1c) scales. A fasting plasma glucose level of 126 mg/dL or above measured following, at least, a 8-hour evening fasting; a 2. hour blood glucose level of 200 mg/dL or above with 75 gr OGTT or a plasma glucose level of 200 mg/dL or above measured at any time in a person with diabetic symptoms (polyuria, polydipsia, etc.) implies diabetes diagnosis. Recently, standardized HbA1c  $\geq 6.5\%$  (48 mmol/mol) is among diagnostic criteria for diabetes.

Fasting plasma glucose level of 100-125 mg/dl (impaired fasting glucose), 2. hour blood glucose level of 140-199 mg/dL (impaired glucose tolerance) with 75 gr OGTT and HbA1c value of 5.7-6.4% is diagnostic findings for **prediabetes**.

### Treatment

Lifestyle changes (physical activity, medical nutrition therapy) in all types of diabetes are the basis of treatment. Oral antidiabetics and/or insulin therapy is used in patients with type 2 diabetes that adequate glucose regulation is not provided with lifestyle modification. In Type 1, absolute insulin therapy is necessary.

## PHYSICAL ACTIVITY IN DIABETES TREATMENT

### Physical Activity and Exercise

The concepts of physical activity, exercise and sport are often used interchangeably, while physical activity is an umbrella term that encompasses the other two concepts. Physical activity; defines any activity with muscular movement in the body. Exercise is; a planned, repetitive physical activity in accordance with an objective. Development of the individual's physical fitness and improving durability are expected from physical activity or exercise in a diabetic individual. Physical activity is important not only in the treatment of diabetes, but also in the prevention of diabetes in prediabetic patients. There is no separate title for prediabetes in this section. It should be noted that the information and suggestions for physical activity/exercise are also valid for prediabetes patients in general.

### Effects of Physical Activity/Exercise in Diabetes

It is known that contraction in skeletal muscles increases glucose intake by providing translocation of glucose transporters to the cell membrane independently of insulin. It is thought that intracellular AMPK and calcium level increase are responsible for this effect of exercise.

Physical activity/exercise is useful both in type 1 and type 2 diabetes. It is effective in maintaining blood glucose regulation of the diabetic individual, in maintaining HbA1c levels at normal levels and in reducing the incidence of advanced diabetic complications. It also has positive effects on improvement of blood oil levels, reduction of cardiac risk factors, reduction of body fat, and positive psychological wellbeing. Physical activity needs to be done regularly in order for these effects to occur. Regular exercise reduces oxygen requirement of myocardium, increasing the exercise capacity. Exercise plays a protective role on cardiovascular system by demonstrating positive effects on vascular inflammation and dyslipidemia by reducing fat deposition, diabetes incidence and blood pressure. Exercise is not risk-free in diabetes; however, the benefits are more than the risks.

- Physical activity/exercise has a positive effect on blood sugar control,
- Supports the control of hypertension,
- Contributes to the reduction of blood fat,
- Regular exercises do not only affect overall body fat distribution in a positive way, but also reduce fat in the abdominal area,
- Helps to protect lost weight,
- Contributes to the improvement of general health and mental health,
- Affects the quality of life positively.

### Structuring Physical Activity/Exercise Program for Diabetic Individuals

Diabetics can exercise at any age, anytime. Before the physical activity/exercise program to be recommended for the diabetic individual, the following points should be observed.

1. The individual characteristics and risk factors of the diabetic individual are determined in terms of physical activity/exercise. Physical impairments, obstructive disorders, hip/knee prostheses, degenerative, rheumatic diseases, etc., peripheral arterial disease, walking leg cramps, pulse, blood pressure, diabetic neuropathy, paraplegia, nephropathy, retinopathy, hypoglycemia and physical other conditions that affect the physical activity are assessed.
2. With a 12-week regular walking program, type 2 diabetic physical fitness increases, fat percentage in the abdominal area decreases. However, hyperglycemia should be under control, secondary problems should be minimized; tailor-made exercises that are appropriate for the metabolic condition should be given.

- Type of exercise, duration and severity,
  - Severity of the disease, acute or chronic phase,
  - Another accompanying disease causes the burden of exercise to increase or be perceived more. For this reason, while recommending activity for the person, exercise test findings, climate, environmental conditions, intellectual demands, nutrient intake, mental status should be considered.
3. Exercise program should be introduced. The type, intensity, duration, severity of the exercise should be determined specifically. When physical activity or exercise is planned for a diabetic individual; age of the patient, type and severity of the exercise, metabolic control of the disease, musculoskeletal compliance and cardio-pulmonary compliance should be noticed. If the disease courses without complications in individuals with type 2 diabetes, however, ischemic heart disease, hypertension or increased blood fat is not developed yet; exercise training programs with increasing severity are suitable.
  4. Exercise should ideally be done 1 to 3 hours after the main meal, and proper fluid intake should be provided. Choosing a good foot care and a suitable athletic shoe is important. Body hygiene should be considered in patients.
  5. He/she should learn to follow blood sugar at home before starting physical activity. Blood sugar measurement results allow the diabetic individual to decide whether or not to start exercise and whether or not to take additional carbohydrate before or after exercising. The diabetic individual should assess the effect of physical activity/exercise on blood sugar by measuring blood sugar before, during or after physical activity/exercise. The safe blood sugar level before exercise should be between 100 and 250 mg/dl.
    - If it is below 100 mg/dL, 15 g carbohydrate intake should be provided.
    - If blood glucose is 250 mg/dL and above in type 1 diabetes, 300 mg/dL or over in type 2 diabetes, the ketone test should be made. If ketone is positive, exercise should be postponed until getting normal. If ketone is negative, light exercise could be done without additional carbohydrate intake.
    - As a precautionary measure, food containing carbohydrates (cutting sugar, fruit juice, etc.) should be present during physical activity.
  6. If intensive and prolonged activity is to be performed, carbohydrate should be taken and blood glucose should be monitored during exercise at least every 30 minutes. Depending on the duration and severity of the exercise, it may be necessary to increase food intake 24 hours after exercise to prevent late hypoglycemia after exercise.

7. In diabetics using insulin, physical activity should be done for a selected period of time according to the type of insulin and insulin injection should be made in a suitable muscle that does not participate in exercise. The short- or medium-effect insulin to be administered before exercise should be reduced. The daily insulin profile should be known.

### How should appropriate physical activity be?

#### Aerobic Exercise:

- It's recurrent and long-term exercises including major muscle groups.
- A total of 150 min/week moderate-vigorous aerobic exercise is recommended in diabetic patients so as to not taking a break more than 48 hours, at least three days per week.
- Light intensity should be started with and moderate intensity should be progressed gradually.
- Walking, swimming, cycling exercises are aerobic exercises. It is the most preferred activity because it could be done regularly and easily.
- Each exercise session should;
  - ✓ start with 5-10 min warm-up movements,
  - ✓ be maintained for 20-30 min at an applicable tempo,
  - ✓ be finished with 10-15 min cool-down exercises.

#### Resistance Exercises:

Skeletal muscles constitute about 40% of the human body weight, which is the largest storage of glycogen and the most important tissue that plays a role in the regulation of blood glucose. For these reasons, gaining the skeletal muscle mass or preventing muscle mass reduction depending on the age and inactivity has a distinct role in the prevention of diabetes. In his context, the resistance exercises defined as muscle strengthening exercises performed against a burden or with a specified weight are of great importance.

- Moderate resistance exercise is recommended at least 2-3 times per week in addition to aerobic exercise in diabetic patients.
- In each exercise session, 6-8 different movements involving major muscle groups should be performed as two-three sets with 8-10 repeats.

#### Determination of the Intensity of Exercise

When the intensity of aerobic exercises is determined, the individual maximum heart rate calculation is used. For this, the maximum number of heart rate is obtained by subtracting the age of the patient from the fixed number of 220. Then the number of resting heart rate is subtracted from this figure and the number of heart rate reserve is calculated. For an example, the maximal heart rate of a 50-year-old person with a resting heart rate of 70/min is  $220 - 50 = 170$ .

The number of heart rate would be  $170-70 = 100$ . The exercise intensity to be given to the individual is then given over a certain percentage of the calculated heart rate reserve and the number of heart rate corresponding to the severity that he/she should reach during exercise is calculated by adding the resting heart rate to this figure. Aerobic exercises to be recommended for diabetic patients should be 40-60% of the heart rate reserve. The exercise intensity for the above-mentioned person is obtained by adding the number of 70, which is the resting heart rate, to the number of 40-60, which corresponds to 40-60% of the heart rate reserve. Thus, the recommended exercise for the individual in our example would be an exercise with a heart rate of 110-130 per minute. It is recommended for beginners or inexperienced individuals to start the exercise with low intensity. The number of 110/min heart rate in our example would be an appropriate number for the person to start exercise. With regular physical activity, the patient's tolerance to exercise will improve and his/her physical capacity will increase over time. For this reason, the target heart rate could be increased over time. Thus, as long as no complaints or complications are encountered, it would be possible to gradually increase the number of heart rate to 130 in the following months.

Exercise is adjusted not only by intensity but also by duration and frequency, so that appropriate exercise is organized for the individual. The duration of the exercise at the beginning could be kept shorter. Likewise, the exercises could be divided into different time periods throughout the day. However, it is not recommended to divide aerobic exercises into periods not less than 10 minutes. The recommended daily exercise period for diabetic patients ranges between 20 and 60 minutes. Period for light exercises could be kept long, whereas it could be kept within sub-periods of this time period for lusty and active exercises. It is known that increasing exercise intensity is more effective for blood glucose control. However, achieving and sustaining a moderate exercise in most patients could be considered a safe goal to achieve.

Exercises should be performed every other day at first and then every day. As a conclusion, it would be enough to perform a moderate exercise for a period of 20-60 minutes most days of the week by gradually increasing the intensity, period and frequency of the exercise and sustain it. The time of the patient and what type exercise he/she will appreciate should be taken into consideration during these changes to be made over time in the exercise program. The change should be toward this direction. It should not be forgotten that the best exercise is the exercise that the patient can continue.

**Table 23.** Configuring the Exercise In Patients with Diabetes

Exercise type and frequency	Density	Examples
<p><b>Aerobic Exercise</b> A minimum of 150 minutes/week is recommended, at least 3 days a week, 20-60 minutes each time.</p>	At the range of 40-60% of heart rate reserve	<p>Bicycle Brisk Walking Continuous swimming Dance In-water aerobic exercises Brisk walking with high-speed Jogging Aerobic exercise Hockey Basketball Fast swimming Fast dancing</p>
<p>Resistance exercises 6-8 movements, involving different large muscle groups, 2-3 times a week</p>	<p>A weight or resistance could be chosen so that the person can make 10-15 repeats. These exercises could be done in 8 -10 repeats. 8-10 repeats is progressed until reaching 2-3 sets</p>	<p>Weight machines Weight lifting Resistance band etc. Resistance exercises on shoulder, chest, arm, buttocks, thighs, calf abdomen and back region</p>

Programming under the supervision of a specialist and supervision are recommended during exercises.

**Possible Exercise Risks in Diabetes**

During exercise, hypoglycemia may occur in muscles due to increased insulin sensitivity and glucose use, as well as rapid increase in blood glucose, insulin insufficiency and ketosis. Particularly, because of the risk of hypoglycemia, exercise should never be done alone. It should be noted that vigorous activity may cause hypoglycemia even for a short period of time.

- 1. Hypoglycemia:** If necessary precautions are not taken, even light physical activity may cause hypoglycemia in patients using insulin or insulin releasing medication.

If any, symptoms of hypoglycemia such as sweating, trembling, heart throbbing, faintness/paleness, unconsciousness, speech and co-ordination disorders should be ended, terminated immediately, the patient should be immediately given carbohydrate supplemented liquid or nutritional supplements and if symptoms persist, the patient should be referred to a hospital. The risk of hypoglycemia is very low in patients who are only controlled by lifestyle changes or receive medical treatment other than insulin and/or insulin releasing medication.

Points to note about hypoglycemia are:

- Diabetic individuals are not recommended to exercise on an empty stomach and they should take a snack including carbohydrates half to one hour before the exercise.
- Blood sugar should be measured before, during and after exercise, and additional carbohydrates should be taken, if necessary.
- In the case of prolonged exercise, additional carbohydrate intake is usually required during the activity.
- Hypoglycemia may develop up to 24-36 hours after the activity.
- Insulin requirement may decrease before and after exercise.
- Long-term aerobic activities and high-tempo sports are sports with a high risk of hypoglycemia development (running, cycling, swimming, basketball, etc.).
- Exercise should not encounter the maximal effect time of the previous insulin injection.
- Insulin should not be injected on the skin of the extremity where exercise is effective (running-leg, glass wipe-arm).

**2. Hyperglycemia:** Blood sugar may increase during vigorous exercise. If the blood glucose level measured before exercise is 250 mg/dl or more, a ketone test should be performed in urine. If ketone is positive, exercise should be postponed until becoming normal. If ketone is negative and the person feels well and adequate hydration is achieved, he/she could do exercise even if the blood glucose level is above 300 mg/dL.

**3. Cardiovascular Risks:** Diabetes is associated with increased risk of cardiovascular disease (CVD). In the presence of coronary artery disease, the heart cannot meet the blood volume increasing with exercise. In these patients, ischemic response to exercise, ischemia threshold, whether arrhythmia develops during exercise and left ventricular systolic function should be known. All diabetic patients should be assessed for potential accompanying cardiovascular risk factors before starting an exercise program. However, the place of routine ECG stress test (effort test) in patients is controversial. It is thought that a stress test may not be needed in asymptomatic patients with a low risk of CVD (10-year cardiac event risk <10%). Otherwise, it would be appropriate to

determine if an advanced cardiac evaluation is required before physical activity by considering the clinical findings of other patients by the physician.

- 4. Retinopathy:** Physical activity is thought to have no adverse effects on non-proliferative diabetic retinopathy or macular edema. Challenging activities should be avoided in case of proliferative or severe non-proliferative diabetic retinopathy. Such activities increase the risk of vitreous hemorrhage and retinal detachment. In these patients, high intensity aerobic or resistance exercises that increase intraocular pressure should not be performed (weight lifting etc.).
- 5. Nephropathy:** Exercise increases urinary protein excretion during the acute phase, however, there is no evidence that it causes progression of diabetic kidney disease. For this reason, exercise restraint is not recommended in diabetic nephropathy. Cardiac evaluation, however, should be done more carefully since microalbuminuria and proteinuria are associated with increased risk of CVD.
- 6. Peripheral Neuropathy:** Patients with severe peripheral neuropathy increased risk of skin integrity and infection due to sensory loss. Treadmills, long walking, jogging, step exercises are not suitable for these patients. Other activities that do not impose burden on the feet like swimming, stationary bicycle, paddling, arm exercises should be preferred. In case of light to moderate peripheral neuropathy, there is no need for exercise restraint provided the foot care is made appropriately.
- 7. Autonomic Neuropathy:** Resting tachycardia is common in cardiac autonomic neuropathic patients, orthostatic hypotension, hypertensive and hypotensive response to exercise could be observed. Their thermoregulatory adaptations are difficult and they are affected a lot by environmental heat, hydration condition. For such reasons, cardiac evaluation before exercise should be performed in patients with autonomic neuropathy.



## OBESITY

### Definition

Obesity is defined by the World Health Organization (WHO) as "excessive fat accumulation that presents a risk to health". Averagely 15-20% of body weight in adult males and 25-30% in females consist of fatty tissue. If this rate goes beyond 25% in males and 30% in females, it is described as obesity. Obesity is a multicausal chronic disease that impairs the quality of life and lead to shortening of human life.

### Prevalence

Obesity is a common health problem for all societies and is increasingly becoming a global epidemic. It is known that obesity increased about 2 times in 30 years across the world. In Turkey, the prevalence of obesity is found to be 22.3% by TURDEP I study, while it is 35% according to TURDEP II study.

According to the preliminary report of "Turkey Nutrition and Health Survey-2010" conducted by our Ministry, the prevalence of obesity is 20.5% among males, while it is 41.0% among females and 30.3% in total. The rate of overweight was found to be 34.6%, rate of overweight and obese was found to be 64.9% and the morbid obesity rate is 2.9%.

Although there are various methods, the classification recommended by the World Health Organization and where body mass index is used (Table 24) is the most commonly used classification method for obesity. Body mass index = Body weight (kg)/Length (cm)<sup>2</sup>

**Table 24.** Obesity Classification by Body Mass Index Values (kg/m<sup>2</sup>)

Underweight	< 18.5
Normal	18.5 – 24.9
Overweight	25 – 29.9
Obese	> 30
Obesity Class 1 (light)	30 – 34.9
Obese Class 2 (moderate)	35 – 39.9
Obese Class 3 (heavy = morbid obese)	> 40

**Causes and Risks**

Although the etiology was not fully clarified, it is known that many environmental and genetic factors play a role in the development of obesity. The most common cause of obesity today is easy access to energy intensive food and sedentary lifestyle. If the energy taken is more than the energy consumed, this surplus energy is stored in the form of fat. Inactivity, excessive and malnutrition could be considered as the most important causes. Age, female gender, number of births, educational level, socio-cultural factors, income status, smoking, alcohol use are factors that are effective in developing obesity. Furthermore, hormonal and metabolic factors, genetic predisposition, psychological problems, various drugs can cause obesity.

**Complications**

As the level of obesity increases beginning from the overweight group, the presence and severity of obesity-related problems, diabetes and cardiovascular diseases in particular, are also increasing. Physical and psychological complications that may be caused by obesity are given in Table 25.

**Table 25.** Complications of Obesity

<b>Metabolic complications</b>
Type 2 diabetes, insulin resistance, hyperinsulinemia, dyslipidemia, hypertension, gout,
<b>Cardiovascular System Diseases</b>
Cerebrovascular disease, congestive heart failure, coronary heart disease, hypertension, thromboembolic disease
<b>Respiration System Diseases</b>
Obesity-hypoventilation syndrome, sleep apnea
<b>Digestive system diseases</b>
Gallbladder disease, liver disease
<b>Reproductive system diseases</b>
Stress incontinence, fertility decline, and obstetric comp
<b>Immune system dysfunction</b>
<b>Dermatologic diseases</b>
<b>Cancer</b>
Breast, colon, cervix, endometrium, ovary, bile duct, kidney, prostate
<b>Neurological</b>
Nerve constrictions, sciatica
<b>Mechanical complications</b>
Arthritis, increased intraabdominal pressure
<b>Surgical complications</b>
Preoperative complications, anesthesia, infection, wound complications, hernia
<b>Psychosocial complications</b>
Self-dissatisfaction, depression, anxiety, sleep disturbances, difficulty in finding a job, high life insurance premiums

**Prevention and Treatment**

Adequate and balanced nutrition and physical activity are the two main elements in the prevention and treatment of obesity. A combination of lifelong adequate and balanced nutrition, increased physical activity and behavioral treatments is the essential treatment. Aim of the treatment is to provide weight loss, to preserve this weight after weight loss and to prevent weight gain. Medication is not recommended initially. However, medication could be applied temporarily in selected cases (patients with obesity-related health problems and BMI  $\geq 30$  or BMI  $\geq 27$ ). Surgical treatment of obesity could be considered in selected cases after detailed evaluation and approval by an endocrinologist.

**PHYSICAL ACTIVITY / EXERCISE FOR OBESITY****Effects of Physical Activity on Obesity**

It is known that the regular physical activity/exercise regulates the rate of adiponectin in blood, reduces leptin and increases insulin sensitivity. Recent studies showed that exercise improves the rates of "vascular endothelial growth factor-VEGF", which plays an important role in angiogenesis in abdominal adipose tissue, reduces hepatic fat content, regulates liver function and enzymes, and could reverse obesity-related lymphatic dysfunction by reducing perilymphatic inflammation, local systemic inflammatory cytokines and perilymphatic nitric oxide synthase expression. It could reduce subcutaneous fat tissue and increase lipolysis in the muscles. It also leads to an increase in muscle mass and an improvement in basal metabolic rate.

According to the population studies, BMI of the individuals doing regular physical activity is lower than of the less active individuals. Physical activity provides an additional contribution to weight loss if performed in conjunction with medical nutrition therapy in obese patients. However, the most important effect of physical activity is to prevent regain weight in obese patients who lost weight. Exercise reduces depression and anxiety in obese patients, helping the person feel better and healing the self-perception.

**Structuring Physical Activity/Exercise Program in Obesity**

Exercise program should be organized after the primary health problems of the obese individual are taken under control. For maximum achievement in weight loss with exercise, it is necessary to gradually increase the intensity of exercise and to focus on doing exercise on a regular basis.

Obesity exercise programs include aerobic exercises, resistance exercises and flexibility exercises. Aerobic exercise programs consist of long-term, regular, light, moderate, vigorous physical activities, by which major muscle groups are run. Provided that it is high volumed, aerobic exercise programs could provide weight loss without calorie restriction. Vigorous aerobic exercises

have some beneficial effects on visceral fat, glucose/insulin metabolism and cardiac risk factors compared to moderate exercises, whereas both exercise types have similar effects in terms of weight loss effects.

Isometric exercise and resistance exercises are crucial due to their effects which prevent muscle strength loss and protect bone mineral density by preventing sarcopenia.

Resistance exercises alone have an insignificant effect on weight loss. However, when combined with aerobic exercises, weight loss is much more compared to aerobic exercise programs only. Resistance exercises increase muscle mass, indirectly increasing energy consumption.

In individuals who cannot tolerate the exercise program adequately, the aim is to increase daily living activities.

Long-term moderate exercise programs are recommended for obesity treatment and prevention of regaining weight. Increasing the intensity of the exercise may provide additional benefits, however, the type of exercise to be recommended to the person, the burden on the joints and similar matters should be taken into consideration. 150-250 minutes of moderate physical activity per week may result in a weight loss of over 3% by providing 1200-2000 kcal consumption.

The American College of Sports Medicine (ACSM) recommends 150-250 minutes of physical activity per week to prevent weight gain in adults. The effect of physical activity below 150 minutes per week on weight loss is minimal. Although 150 minutes of physical activity per week may result in weight loss of 2-3 kg, 225-420 minutes of physical activity per week is required for a clinically significant weight loss. It is recommended to do exercise for 200-300 minutes a week as a precaution after weight loss. In this frame, a minimum of 5 days of exercise per week should be recommended, with 30-60 minutes a day.

It would be a more proper approach for avoiding individual differences observed in resting heart rate to directly use the heart rate reserve instead of the maximal heart rate while determining intensity of aerobic exercise. Accordingly, the number of heart rate is obtained by subtracting the patient's age and resting heart rate from the fixed number of 220. Then 40% and 60% of this figure will be added to resting heart rate so that target heart rate, which is desired to be

reached during exercise, will be determined. For example, the heart rate reserve of a 40-year-old person with 60/min resting heart rate is;  $220 - 40 - 60 = 120$ . 40% of 120 is 48, while 60% is 72. Therefore, the intensity of exercise to be recommended to this person will be in the range of 108-132/min, which is reached by adding the number of resting heart rate to these figures according to the physical fitness level of the person. Since it was recommended to do light exercises in the beginning, 108/min heart rate is selected as target for beginners and it is expected that this number will increase gradually to 132 in the following months. You should not be in a hurry to reach this goal. The appropriate intensity, namely 225-420 minutes per week, should be caught step by step by increasing the duration of exercise gradually.

Exercises for sedentary individuals should be performed every other day at first and then every day. It would be enough to be able to do moderate exercises for a period of 30 to 60 minutes most of the days of the week as far as possible by gradually increasing the exercise intensity, period and frequency and to maintain it. The time of the patient and what type exercise he/she will appreciate should be taken into consideration during these changes to be made over time in the exercise program. The change should be toward this direction. It should not be forgotten that the best exercise is the exercise that the patient can continue.

Warm-up and stretching exercises prior to activity should be followed by cooling process at the end of active exercise period.

### **Complications**

Obese patients may have degenerative problems, especially in weight-bearing joints such as waist, hip, knee, and wrist, or these problems may appear during exercise. It is recommended that physical activity be regulated accordingly in these patients. Especially water sports are more suitable for such patients.

Cardiovascular evaluations of sedentary individuals before the program could prevent exercise-related problems. Risks of exercise-related injuries should be paid attention in patients with morbid obesity and weight loss should be targeted before starting the exercise program. If exercise is to be started, the severity of the exercise should be considered due to cardiac risk.

### **Obesity Surgery (Bariatric Surgery) and Exercise**

Exercise and physical activity in patients undergoing bariatric surgery maintains weight loss and muscle mass during calorie restriction, improves liver insulin sensitivity, glucose activity and cardiovascular fitness in the metabolic sense, increases capillary density, fat oxidation, and mitochondrial content reduces lipotoxicity in terms of skeletal muscles.

Light and moderate exercise programs that can be applied in the preoperative and postoperative periods should be planned individually on the basis of the targeted body weight.

- In the preoperative period, light exercises 3-4 days a week for 20-30 minutes are useful.
- Post-surgery exercise helps to achieve weight loss and improvement in body composition. At least 3 days and 30 minutes of exercise a week can support high fat loss.

In order to maintain weight loss after bariatric surgery, moderate exercises are recommended and benefits of the higher dose exercises are also reported. Resistant exercises were shown to improve cardiorespiratory fitness, muscle strength, flexibility and functional strength.

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# SECTION 7

## PHYSICAL ACTIVITY AND EXERCISE IN PSYCHIATRIC DISORDERS



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# A

## BSTRACT

Health is defined as the condition of well-being in physical, mental and social areas. Being spirituality at a good state is interrelated and connected with being physically and socially at a good state. Exercise seems to have direct effects on the brain; however, its mechanism is not yet well understood. Exercise strengthens the brain's structure and rejuvenates the brain. Physical health may be adversely affected during mental illnesses, however, the possibility of mental illnesses increases during physical illnesses. Exercise is both preventive and curative for psychiatric disorders. This guideline will deal with the sub-headings of coping with stress, anxiety, depression, schizophrenia and alcohol addiction. However, it should not be forgotten that physical activities have a place in other mental disorders other than these headings.

## INTRODUCTION

Health is defined as the condition of well-being in physical, mental and social areas. Being well in spiritual area is connected and interacted with being physically and socially well. Physical health may be adversely affected during mental illnesses, however, the possibility of mental illnesses increases during physical illnesses. Psychiatric diseases are very common in the society, the chances of chronicity and recurrence are high; according to the results of a study conducted in Turkey, one in five persons met the diagnostic criteria of any psychiatric disorder at any time in their lives.

There is a mutual relationship between psychiatric diseases and physical activity (PA). Activity limitation should not be considered only as a clinical outcome of psychiatric disorders, it should be known that it has a role in etiology of some diseases. In this context, PA is both preventive and curative for psychiatric disorders. For example, in a recent study, it was shown that if the recommended level of PA in the guidelines is regularly maintained for 6 months, it decreases the symptoms of insomnia as well as alleviates the symptoms of anxiety and depression significantly.

There are many disorders that can be addressed under the heading of mental illnesses. This guideline will deal with the sub-headings of anxiety, depression, schizophrenia and alcohol addiction. However, it should be kept in mind that PA has a role in other mental disorders other than these headings. Let us give a brief review of the exercise effect mechanism before the definition of each disease, its effects on the person's life and exercise recommendations.

Exercise seems to have direct effects on the brain; however, its mechanism is not yet well understood. Studies to date point out factors such as various neurotransmitters, neuroplasticity, neurogenesis and increased brain blood flow. PA affects the expression of monoamines' release and receptors, particularly noradrenalin, dopamine and serotonin, which play a role in the etiology of a great deal of psychiatric disorders. In addition, it also affects the levels of endorphins and various hormones to provide a positive affection. Even this case is waggishly called as (*runners' high*) in the international literature. More interestingly, neuroimaging studies in the field indicate that regular exercise is directly associated with increased neuronal formation in the brain and synapses between neurons. The reflection of this situation in daily life refers to performing cognitive functions better such as learning and memory. In other words, exercise strengthens the brain's structure and rejuvenates the brain.

### **Physical Activity Training**

Stretching exercises, flexibility exercises, posture exercises, cardiovascular adaptation training, balance and stability training, aerobic exercises (walking/running, cycling, swimming, etc.), breathing exercises, in-water exercises, exercises for joint mobility and strengthening the weak muscles, which are planned for the needs of individuals, are very valuable approaches to cope with stress.

### **Recommended Physical Activity Level**

According to the guideline of the International Federation of Sports Medicine, moderate to light rhythmic aerobic exercises, for 20 and 30 minutes, 3 times per week, are recommended for major muscle groups. Before starting the exercise training, the person should be medically evaluated in detail.

#### The Points to be Considered While Planning Physical Activity Program:

- 1- Interventions should be completely adapted to the individual.
- 2- Lifestyle of the individual should be taken into consideration.
- 3- It should be possible to follow the status of persons.
- 4- Priority should be given to individual treatments compared to group therapies.
- 5- Patient safety is important.

### **Evaluation**

In psychiatric disorders, functional fitness and physical fitness should be assessed before the individual is provided exercise training. Field tests (e.g. 6-minute walk test, shuttle test) or laboratory tests (cardiopulmonary exercise test) could be performed to evaluate functional capacity. Training could be provided in submaximal level (50-80%) calculated according to maximal heart rate (220-age) of the individual or exercise load could be adjusted according to the Borg's Scale.

Also the muscle strength and endurance of the person, normal joint movement, posture analysis, muscle shortness and elasticity, anthropometric measurements should be evaluated by the physiotherapist. The health-related quality of life of the individual and the previous PA evaluation (e.g. International Physical Activity Scale, etc., or pedometer, accelerometer, etc.) are also important.

Aim of Personal Exercise Programs in Mental Disorders

1. Alleviating the pain level
2. Providing relaxation
3. Increasing muscle strength and flexibility
4. Providing increase in cardiovascular endurance and energy levels; reduction in fatigue
5. Ensuring autonomic regulation
6. Protection and arrangements for mobility and fall in elderly individuals
7. Ensuring improvement of laboratory findings such as cholesterol level
8. Providing weight control
9. Improving self-confidence and respect
10. Improving mood and well-being
11. Alleviating the symptoms of anxiety and depression
12. Providing self-management and motivation of patients in mental and physical health issues
13. Correcting the cognitive state (the effect of exercise on cell regeneration in the hippocampus, which is significant in the brain, especially for learning and memory, was demonstrated)
14. Providing quality sleep
15. Providing a better body image
16. Reducing social isolation
17. Ensuring the integrity of healthy soul and body by increasing the body awareness
18. Improving quality of life

**Patient Safety**

Medium-term activities, such as walking, are relatively safe. However, the walking, even moderate-intensity, may exacerbate some pre-existing problems. In these cases, it is important to evaluate the readiness of the individual for involving in the PA activity before the activity. Individuals should be enrolled in the program according to their eligibility as a result of a medical evaluation before exercise training. Another risk during exercises is musculoskeletal injuries. Each training session should include warm-up, aerobic training and cool-down phases. The purpose of the warm-up phase is to increase blood flow to the working heart and skeletal muscles, to increase body temperature, to prevent muscle-joint injury and abnormal cardiac rhythm changes. This phase lasts 5-10 minutes; stretching exercises, callisthenic movements involving upper and lower extremity are applied. The training phase lasts 20-60 minutes. The exercise program is completed by passing to the cool-down phase with exercises such as 5-minute walking, brisk walking, cycling and stretching. The pumping activity in the cool-down phase increases the venous return and accelerates the healing process. The risk of injury is reduced to minimum by putting on suitable footwear and involving warm-up and cool-down periods into the exercise and gradually increasing

the intensity and duration of exercise in time.

### **COPING WITH STRESS**

Stress is defined as the tension that arises from socio-environmental problems, which is a burden on the normal adaptive capacity of the individual or arises from the absence of effort after some circumstances. Excessive anxiety increases the activity of the sympathetic nervous system, causing sudden changes in heart rate and blood pressure, and the release of stress-related hormones. It is stated that chronic and latent stress related to loneliness, poverty, death of kinsmen and disappointment, accompanies to impaired immune system and is also associated with diseases such as colds and cancer. If this situation is not struggled, stress itself causes muscle tension and pain in the body, neck, shoulders and back, in particular. Stress has an adverse effect on an individual's quality of life and health.

### **Findings Accompanying to Stress Related Diseases**

Stress-related Disorders (SRD) such as chronic common pain syndromes may be accompanied by symptoms such as fatigue, pain, sleep disorders, morning stiffness, chronic headaches, dysmenorrhea, Raynaud's phenomenon, restless leg syndrome, restless bowel syndrome, paresthesia, subjective swelling and exercise intolerance. Reduction of interest, nervousness, tension, short-term memory problems, concentration, logical analysis and motivation difficulties, cognitive losses are among the important signs of stress. Unresolved stress causes emotional confusion. This creates a vicious cycle of anxiety, depression and negative emotions. Stress causes the release of stress-associated hormones; on the contrary, happiness increases the release of sedative hormones. A good mental health is essential in maintaining health and well-being for individuals and their families, whereas an impaired mental health indicates disability, low quality of life and reduced productivity.

PA is one of the most effective methods to deal with stress. Specially planned PA could be preferred for providing the progressive muscle relaxation techniques, breathing techniques, stretching exercises, therapeutic massage, electrotherapy techniques and general compliance. The aim is to relieve the overloaded muscle system, to provide relaxation, to improve postural disorder and to reduce drug use. It is an important part of the treatment to examine the business and home life of individuals with stress-related diseases and to arrange them with the necessary ergonomic modifications.

**Table 26.** Physical Activity Types in Coping With Stress

	Purpose	Exercise Type	Intensity	Duration (min/session)	Frequency (times/week)
In coping with stress	To relieve overloaded muscle system, to provide relaxation, to recover postural and reduce the use of medication.	Light and intensity aerobic activity (walking, running, cycling, swimming etc.	Maximum Heart Rate = 220-age (60-75% of maximum heart rate)	20-30	At least 3

**DEPRESSION**

Depression is the most common psychiatric disorder. The lifetime prevalence of depression is 10-25% in females and 5-12% in males. The relapse rate is high (75% within 10 years), the risk of chronicity and residual symptoms is high. It increases the susceptibility to cardiovascular diseases and causes additional problems such as sedentary life and poor nutrition.

Energy loss is among the main symptoms of depression. Psychomotor activity is usually decreases and it rarely increases due to discomfort. Patients with depression often complain of lack of energy, weakness and fatigue. They tell that the works are now very hard to do, which they would previously deal with easily, they cannot even do a little bit of these works and they do not get better with resting. Symptoms include loss of energy, insomnia or hypersomnia; they prevent the individuals from fulfilling their responsibilities, disrupt functionality and take the patient's fitness away. Inappetency or over-eating behavior leads to significant weight changes by preventing regular nutrition of the person.

Exercise therapy emerged as an alternative to the treatment of depression in recent years. It was shown that aerobic exercises and strength studies reduce depressive symptoms in both non-clinical samples and those with major depressive disorder. There are some noteworthy researches by which efficacy of exercise treatment on light and moderate depression was revealed in older patients, in particular.

**Physical Activity Recommendations in Depression**

PA in depression is preferred with the aim of reducing the risk of depression, treating the symptoms of depression and reducing the risk of depression attacks in the future. In the studies of the effects of PA on mental problems such as depression, the best improvement is observed if major muscle groups are run with rhythmic movements including light and moderate intensity aerobic exercises (such as jogging, swimming, cycling and walking) and resistance exercises. It was reported that the program should be applied at least 10 weeks and more, at least 3 days a week, 30 minutes a day.

When we look at the acute effect of the results, the positive effect of even one session on depression was confirmed. Changes in anxiety, depression and mood are often explained by endorphins and monoamine hypotheses. Exercise may also increase body temperature, brain blood flow, affect the hypothalamus-pituitary-adrenal axis (HPA axis) and physiological response to stress. It is important to note that these mechanisms also include improving self-efficacy, distractions and cognitive problems.

It was determined that the prevalence of depression in the elderly is 22% and there is a significant relationship between sedentary lifestyle and depression morbidity. Complications in this regard reveal the efficacy of exercise, particularly the programs including aerobic exercises of individualistically planned strength and balance training, in geriatric peoples on major depression treatment. At the same time, it is stated that PA training is also important for protection from depression.

All the factors mentioned above should be taken into account, while the leisure time and productivity of individuals with symptoms of depression are evaluated and planned by the ergotherapist. In addition to the positive effects of PA on cognitive, physical and mental aspects, exercise training in depression has a strong positive effect on decreasing depression scores and lifting the effect of antidepressant drugs.

## **ANXIETY DISORDERS**

Anxiety disorder is the common name for a group of mental illnesses where anxiety, apprehension and worry are the dominant symptoms. Panic disorder with short-term anxiety attacks in an explosive form and as attacks, generalized anxiety disorder followed by relatively mild, albeit continuously, anxiety about daily life events throughout the day, post-traumatic stress disorder and phobias coursing with tension, sleep disorder, intolerance and re-experiencing the events are included in this group. Although they are less known compared to depression, they significantly reduce social and occupational functionality of the person.

It is reported that there is an excessive sensitivity to the usual signals from the body in the individuals with anxiety disorder and these signals were misinterpreted in an incorrect manner by attaching particular importance, resulting in increased anxiety and even panic attacks. Exercise may serve to correct the symptoms of anxiety disorder by desensitizing to normal signals from the body.

Patients with panic disorder tend to hyperventilate to compensate for the height of blood carbon dioxide that causes a false drowning alarm. However, hyperventilation itself also causes anxiety. Regular aerobic exercise was shown to terminate this vicious circle by normalizing the ventilation pattern in patients with panic disorder. Agoraphobia is an important complication of anxiety disorders and a person with this disorder avoids from going outside



alone or mingling with the crowd or certain social environments. Since eliminating these and other avoidance behaviors is a fundamental principle in the behavioral treatment of anxiety disorders, exercise becomes a behavioral psychotherapy method in these patients.

### **Physical Activity Recommendations in Anxiety**

The effect of PA on anxiety disorders is thought to be multifactorial and physiological, neurobiological and psychological hypotheses were proposed. Some studies indicate that PA is a distraction that distracts the individual from anxiety symptoms. Anxious people experience internal confusion. Heart rate increases and sweating occurs during PA. Experiencing these physiological changes could give the person the insight that high heart rate and sweating are not hazardous.

Exercise training should be planned personally by the physiotherapist and surveillance is beneficial. The vast majority of experiences were obtained from aerobic exercises. Exercise is ideally done in small groups. It is recommended to start PA with low-intensity aerobic exercise, to advance to a moderate intensity and to increase the duration gradually. An anxious person may be using beta-blockers and therefore no increase may be observed in heart rate, in which case monitoring and surveillance with the Borg's Scale is beneficial.

PA fitness exercise could be arranged, for example, by walking 30 minutes daily or jogging 30 minutes three times a week, 60-80% of maximal oxygen uptake. Other alternatives are exercises of strength, mobility and flexibility performed at similar time and period. Patients should start with light intensity to ensure tolerance. Paradoxically, many patients may experience increased anxiety during the start of exercise. During the onset of PA, increased stress is explained by heart rate, palpitation, sweating and shortness of breath increasing with the activation of the sympathetic nervous system. Similar physical symptoms also observed in patients with severe anxiety. Therefore, many patients with anxiety disorder avoid exercise by noting that exercise increases their anxiety. By explaining this phenomenon, many patients can overcome this and continue to PA.

Adding training to PA is a good way in order for the person to know the physical symptoms of anxiety. It is less frightening to appear in normal situations such as exercise. It is an important experience to know that anxiety will decrease when they continue instead of avoiding. Some patients who exercise regularly may experience anxiety when forced to stop, for example due to an injury. This could be uncomfortable; however, it passes after a while. This could be explained by the patient's physical dependence to exercise.

## ALCOHOL AND SUBSTANCE USE DISORDERS

Alcohol/substance use disorders are seen as a problem that was growing and becoming widespread all over the world. Genetic, psychological and sociological factors play a role in their emergence. The disorder may be in the form of alcohol/substance abuse, as well as addiction. Alcohol or substance abusers may disrupt their responsibilities at work, school or home depending on repeated use of these substances; they suffer material, psychological or social damage, experience legal problems depending on the use and continue to use alcohol/substance despite all. They adjust their lives according to alcohol/substance use, the amount of the substance they use gradually increases and they have some problems when they cannot use the substance. The treatment of these disorders is mainly through the stopping the use of alcohol/substance. For this purpose, detoxification treatments and replacement treatment is used for stopping some substances and also various psychotherapies are incorporated into the treatment.

Exercise and sports are considered to have protective characteristics against alcohol/substance consumption. The frequency of alcohol and substance abuse is lower in young people who exercise regularly. In addition, involvement in a regular exercise program reduces the amount of alcohol consumed by addicted patients; regular exercise decreases the cirrhosis indications and the rate of dryness increases in persons who give up alcohol.

### Physical Activity Recommendations for Alcohol and Substance Use Disorders

Exercise in the treatment and prevention of alcohol and substance abuse was reported as a treatment approach that should be performed in parallel with other treatments. Increasing PA levels in the treatment of addiction increases social and psychological well-being. However, increasing the person's involvement in the PA requires an active participation of the individual. Depression is common among alcohol addicts. The beneficial effects of PA on improvement of psychosocial condition and fight against depression and anxiety were reported.

Many people are using alcohol/substance to cope with stress in daily life that they cannot overcome. Exercise may decrease the desire to alcohol by reducing stress. Another important psychosocial mechanism for reducing alcohol addiction is socialization. Based on this theory, strong social bonds could be created among the participants involving the socialization during exercise training. These social relationships may have a positive effect on mental health. The PA develops social support network and provides a calm and supportive environment for rehabilitation in case of a group activity.

Clinical experiences demonstrate that exercise training decreases all of the somatic deprivation indications in the acute phase. Many studies on light intensity aerobic exercises reported reduction in shivering, sweating and anxiety and improvement in sleep; they are also useful in the treatment of secondary diseases such as diabetes and cardiovascular disease. Light training exercises are started immediately after deprivation problems which emerge frequently at the second week of detoxification. The first step after somatic examination and functional test is light-intensity aerobic exercises and strength exercises are added after a few days. Subsequent exercise programs are months-long programs that aim for permanent change in lifestyle. Therefore, after the evaluation of the somatic parameters and functional tests, the patient could start them at the hospital and continue after discharge.

Long-term PA programs should include aerobic exercises, physical fitness exercises, strengthening and coordination exercises, breathing and relaxation exercises that begin at light intensity and gradually advance to vigorous intensity. People can be directed to exercise programs such as yoga body awareness. It is also possible to benefit from technological sources (pedometers, accelerometers, computer or mobile phone-supported interfaces and programs) to increase one's PA level. Continuation of regular PA functions to fill the void felt after alcohol addiction, contributes to the person to change his/her lifestyle, leads to happiness without taking alcohol/substance, contributes to cope with stress, offers positive alternatives instead of using alcohol/substance, increases self-confidence and thus reduces the risk of returning to alcohol/substance use, in addition to its effects which reduces anxiety, prevents depression and reduces the desire of using alcohol/substance.

**Table 27.** Physical Activity Types in Alcohol/Substance Use Disorders

	Purpose	Exercise Type	Intensity	Duration Frequency minute/session)	
Deprivation Treatment	Reduction in signs of deprivation	Light intensity aerobic activity (walking)	40-60% maximum heart rate*	15	4
	Improve/increase sleep	Light intensity aerobic activity (walking)	35-70% maximum heart rate	20	3
		Strength activities	40-70% 1 Maximum Repeat**		
Next Treatment	Improve/increase aerobic fitness	Vigorous intensity aerobic activity (cycling, walking, running)	50-75% maximum pulse rate	30	3-5
	Increase strengthen	Strength activities	%50-70 maximum heart rate, 1 Maximum Repeat	30	2-4
	Aerobic endurance increase	Moderate activity	50-70% maximum heart rate	45-60	2-4
	Improve/increase coordination	Ball sports	50-70% 1 Maximum Repeat 50-85% maximum heart rate	40	2-4

## SCHIZOPHRENIA

Schizophrenia is a severe psychiatric disorder that is more common in the society than it might seem to be, with positive symptoms such as delusions and hallucinations and negative symptoms such as inward closure, deterioration of cognitive functions, difficulty in fulfilling the responsibilities required by age, and lack of motivation. Symptoms occur mainly in the brain due to changes in dopamine and serotonin systems and the antipsychotic drugs used in the treatment may partially correct these changes. In particular, negative symptoms do not respond well to antipsychotic treatment and rehabilitation programs primarily target negative symptoms.

Obesity is very common in patients with schizophrenia and there are many reasons for this. Firstly, second-generation antipsychotic drugs used by patients cause metabolic syndrome through various mechanisms triggered by H-1, 5-HT<sub>2C</sub>, M<sub>1</sub> and  $\alpha$ -1 receptor antagonism and they lead to weight gain due to sedation they caused. In addition, negative symptoms in patients lead to inactivity and irregular nutrition. Inadequate self-confidence, avolition, social isolation and other unhealthy lifestyle habits contribute to the decrease in PA and contribute to obesity. With all these factors, lipidprofil is impaired and the risk of cardiovascular disease increases. It is well known that the morbidity and mortality of cardiovascular diseases are quite high in schizophrenia patients. The only role of PA in schizophrenia and other psychotic disorders is not to reduce the risk of metabolic syndrome. There are studies suggesting that the addition of regular exercise to antipsychotic treatment is associated with further improvement in negative symptoms. For these reasons, patients with schizophrenia are required to live a physically active life, and this is an indispensable part of the treatment, however, patients often have low motivation and adaptation to exercise programs. Therefore, the exercise programs recommended for psychosis patients should be flexible and tailored to the individual and measures should be taken to keep the motivation of the patients high.

### Physical Activity Recommendations in Schizophrenia

It was reported that a healthy diet and physical activity positively affect patients' weight and triglyceride, total cholesterol, plasma insulin and glucose levels. Exercise is of great importance for the schizophrenic patients with increased risk of weight gain due to antipsychotic treatment, particularly atypical antipsychotics, and therefore with increased susceptibility to obesity. In a study with involvement of schizophrenic individuals who take amoderate intensity 30-minute exercise training of 3-day brisk walking a week for 3 months, it was found that weight control was achieved, the individual's energy level perception, exercise tolerance and compliance level, upper body and hand grip strength were increased. In addition to those, it was reported that this 30-minute walking does not have to be continuous and that a 10-minute walking 3 times which is equivalent of 30-minute walking could be preferred.

However, according to the results of a meta-analysis conducted in 2015, exercise training has no significant effect on body mass index but increases physical fitness and reduces other cardiometabolic risk factors. Moderate to vigorous weekly exercises around 90 minutes significantly reduce psychiatric symptoms. This amount of exercise also increases functionality, is useful for comorbid disorders and consciousness. It was reported that aerobic and strength exercises and yoga reduce psychiatric symptoms, anxiety and psychological stress, improve health-related quality of life, aerobic exercise improves short-term memory, progressive muscle relaxation exercises reduce anxiety and psychological stress and PA, generally, add value to multidisciplinary care of patients with schizophrenia.

Routine PA reduces negative symptoms, stress and anxiety, increases concentration and attention, and reduces the severity of depression in schizophrenia. In some cases, the PA provides an infrastructure that supports social relationships, helping patients to establish a bond and to cope with social withdrawal. The body image of people with schizophrenia is affected. The often felt well-being after the PA may have a positive effect on the body image.

In exercise training, the physical environment of the person and the structure and level of social participation should be considered. Continuous motivation and support are key to participation. The PA program should be personalized and surveillance is useful. PA programs should be planned within the framework of the individual's functional capacity. Involvement of the person in the exercise programs should be promoted so as to form a behavioral change and the level of PA should be increased slowly. The program usually consists of aerobic exercises. Small groups are ideal to provide best training. It is recommended to start with light-intensity aerobic exercises and to gradually increase to the level of moderate intensity and increase the time gradually. Adults with schizophrenia who wish to lose weight should aim to be physically active for at least 1 hour per day. Many patients benefit from strengthening exercises, of course, however, experiences with this type of exercise are limited. In addition, mind-body co-existence methods such as body awareness and yoga, which change the perception of person by supporting visual image, and posture, breathing, flexibility and relaxation exercises, should be incorporated into the program as well.

**CONCLUSION**

Increasing PA in individuals with psychiatric problems should absolutely be preferred and encouraged with purpose of improving durability of the individual against stress, sleep quality and self-respect, improving the mood, reducing the momentary and future anxiety, thus increasing the level of health-related quality of life. In order to sustain FA for lifetime, different activity preferences (such as yoga, pilates, walking, swimming) should be offered to the individual, great effort should be showed to maintain the patient's motivation. In order to do this, it may be useful for the physician to question the PA recommendation to the patient in the control examinations, to appreciate the patient and to give the patient leaflets about the subject.

Exercise should be included in the treatment and rehabilitation programs applied to patients hospitalized in psychiatric clinics. In these clinics, there should be exercise rooms, exercises should be a part of the therapy program and patients should be encouraged to use these rooms. Out-patients should be urged to initiate a sport in addition to medications if there is no contraindication.

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# SECTION 8

## PHYSICAL ACTIVITY AND EXERCISE IN RHEUMATOLOGIC DISEASES

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# A

## BSTRACT

Rheumatic diseases are a group of diseases which are chronic with recurrent pain that may affect joints and connective tissue, as well as many organs and systems. These patients, have decreased mobility because of the joint, muscle, connective tissue or skin involvement due to the current disease and occurrence of systemic involvements. While evaluating these patients, the aim is to control the disease activity individually with medical treatment and to ensure that they continue their daily activities without pain and without limitation of joint movements. In order to establish the proper physical activity and exercise program in rheumatic diseases, the patient and the disease-specific evaluations should be performed. Education specific to patient is important for increasing the participation of the rheumatologic patient in to the exercise and physical activity program. The patients should be taught joint protection principles and energy conservation techniques that may be needed during their lifetime.

**Definition of Rheumatic Diseases:**

Rheumatic diseases include a group of diseases that may affect many organs and systems as well as joints and connective tissue with chronic, and recurrent pain. This group includes osteoarthritis, rheumatoid arthritis, spondyloarthritis, connective tissue diseases, vasculitis, gout, Behcet's disease and Familial Mediterranean Fever. Physical and biomechanical factors, genetic, individual and psychosocial factors play a role in the development of rheumatic diseases. These factors may be effective, alone or in combination, on development of disease.

In these patients, the mobility is decreased because of joint, muscle, connective tissue or skin involvement due to the current disease and occurrence of systemic involvements. The presence of systemic problems such as anemia or depression, as well as acute and chronic pain, joint stiffness, muscle weakness and even atrophy, depending on existing diseases, may cause a decrease in physical and sportive activities in these patients. Furthermore, the physical and psychological stress caused by the current problems cause the patient to be unwilling in participating to the community and to engage in social activity.

While evaluating these patients, the aim is to control the disease activity individually with medical treatment and to ensure that they continue their daily activities and keep them in the social life without pain and limitation of joint movements. For this purpose, it is important to recognize adult rheumatic diseases and to take an approach that includes exercise as well as medical treatment.

**Osteoarthritis (OA)**

Osteoarthritis is the most common joint disease and may be caused by degeneration of the joint cartilage, focal cartilage loss and hypertrophy of the bone adjacent to the joints. In OA cases, the balance between destruction and repair process in the articular cartilage and subchondral bone is impaired. In addition to articular cartilage, subchondral bone, ligaments, capsule, synovium and surrounding muscle tissue are also affected. Typical findings of OA; joint pain, limitation in joint range of motion, muscle weakness, joint stiffness and occasionally joint swelling. Hip and knee OA together affect more than 20% of the elderly people. Knee involvement leads to disability symptoms in 10% of those over the age of 55. While it was considered as a natural result of aging, it is also thought to be the interaction of many factors such as joint structure, genetics, local inflammation, mechanical forces, cellular, and biomechanical processes. In general, the symptoms and signs of functional capacity loss and pain due to OA severely limit the daily living activities, decrease the quality of life and increase the risk of morbidity and mortality.

According to the World Health Organization (WHO) estimates, approximately 25% of adults over the age of 65 have pain and loss of function due to this disease. While the rate between female and male under the age of 55 is equal, it is more common in females above the age of 55. Hand and knee OA is more in women over the age of 55, whereas hip OA is more common in men. The knee, hip, hand and cervical and lumbar spine regions, which are subject to continuous stress over the years, are more affected.

The aim of treatment of osteoarthritis is to decrease the symptoms, to prevent the development of disability and to improve the quality of life. Treatment should be arranged according to patient's expectations, functional capacity, disease severity, occupational requirements, and comorbidity of the diseases. In addition to pharmacological therapies, non-pharmacological treatment modalities should be used together and surgical treatment could be needed in severe cases.

### **Rheumatoid arthritis (RA)**

It is a chronic, polyarticular with symmetrical involvement, deforming, systemic, autoimmune and inflammatory disease affecting all ethnic groups. The most important feature of RA is the fact that it causes bilateral symmetrical chronic polyarthritis in all the joints covered with the synovial membrane, most frequently hands and feet in particular. The prevalence of RA, which is a common disease, is about 0.23-0.75%. Metacarpophalangeal (MCP), wrists and proximal interphalangeal (PIP) joints are the most common stiff joints (70-90%). The knees, elbows and metatarsophalangeal (MTP) joints also involved with a rate of over 60 percent. Hip and shoulders, ankles and especially C1 and C2 in cervical region are less frequently involved joints. Tenderness and pain in multiple joints, symmetric swelling, morning stiffness more than 30 minutes and stiffness lasting for several hours adversely affect activities during the whole day.

Although the etiology of RA is not known exactly, genetic predisposition, smoking, infectious agents, hormones and environmental factors such as poor living conditions are thought to have contribution.

In rheumatoid arthritis (RA), joint damage increases progressively and a significant number of patients suffer from severe labor loss over time. A significant proportion of the increased mortality in RA is attributed to the causes of ischemic heart disease. Other causes of death include infections, pulmonary and renal involvements, gastrointestinal bleeding and lymphoproliferative diseases.

In rheumatoid arthritis, joint damage and loss of function increase related with the duration of disease, early diagnosis and appropriate treatment decrease functional loss and joint damage. If RA is not aggressively treated, it may lead to labor loss, decrease in quality of life, joint replacement and death. Delay in the treatment may cause permanent joint deformities and disability in many patients within 10 years.

**Systemic Lupus Erythematosus (SLE)**

As a prototype of autoimmune diseases, SLE is an autoimmune multisystemic disease characterized by remission and exacerbations. The prevalence of the disease is 17-48/100,000 and the incidence increases between the ages of 15 and 45 and the female/male ratio is 9/1. Genetic, environmental and hormonal factors play an important role in disease pathogenesis. UV rays, infections, antibiotics, pregnancy, oral contraceptives and stress are the trigger factors.

In the disease which may develop insidiously or acute, some prodromal symptoms such as fever, malaise, weight loss, anorexia may appear, as well as arthritis, arthralgia and rash.

Patients with Systemic Lupus Erythematosus have increased cardiovascular morbidity. With the aggressive treatment, the atherogenic effects of inflammation may be reduced. The second cause of death is infections which are also associated with long-term diseases period, leukopenia, glucocorticoid use, immunosuppressive use and nephritis.

**Ankylosing spondylitis (AS)**

Ankylosing spondylitis is a prototype of the diseases called spondyloarthritis. It is a chronic, progressive rheumatologic disease characterized by inflammation, leading to bone fusion of especially spinal joints and surrounding tissues, with an unknown etiology. The main symptom is inflammatory back pain. Generally, the first symptoms start in the 20s and are more common and serious in males than in females. Other than the axial system, peripheral joints, eyes, intestines and skin could also be involved by the disease. The frequency of spondyloarthritis is approximately 1% and the frequency of ankylosing spondylitis is approximately 0.5%. The ratio of male/female is reported as 2-3:1.

The most important factor known in the etiology of disease is genetic predisposition. In the relatives of the AS patient, the risk of occurring the AS disease is increased by 20-40% compared to the normal population. Although carrying the HLA-B27 gene is the most important factor in the development of ankylosing spondylitis, it is not the main reason alone. Positive familial history of AS is 20%. The frequency of HLA B27 is 90-95%. However, in the studies it was found around 70% in Turkey. Depending on the disease, symptoms such as sacroiliitis and spondylitis, shoulder and hip joint and peripheral joint arthritis (knee), enthesitis, osteoporosis, vertebral fracture and spondylodiscitis may be seen.

In patients with ankylosing spondylitis, the major reason of the morbidity is due to restriction in back and neck movements. Involvement of the hip joint, which may occur in approximately 20-30% of patients, is an important factor of functional disability. General causes of death are cardiovascular diseases, cerebrovascular diseases, malignancy, renal failure, pneumonia and suicide.

**Familial Mediterranean Fever (FMF)**

Familial Mediterranean Fever is the most common, autosomal recessive, hereditary, auto-inflammatory disease characterized by fever, serositis and synovitis which is the most common and self-healing fever in Mediterranean-Middle Eastern ethnic groups. The disease is most commonly seen in the Armenians (1:250) in the Sephardic Jews (1:1000), in the Turks (1:1075) and in the Jews of Eastern Europe (1:73,000). In our society, 1 to 3 out of every 1000 people has FMF. 90% of the patients have clinical findings below the age of 20. AAA rarely occurs after 40 years of age. The rate of carrier is the highest in Turks with 1:5, in Armenians with 1:6, in Sephardic Jews with 1:8 - 1:16.

The gene affected by Familial Mediterranean Fever is the MEFV gene in the short arm of the 16th chromosome. This gene encodes a protein called "Pyrin" or "Marenostrin". Pyrin is localized in the cytoplasm and binds with tubulin (microtubules). It regulates the IL (Interleukin) -1 $\beta$  activation. It inhibits NF-kB activation and apoptosis. Mutant pyrin leads to inflammation due to uncontrolled IL-1 production and inhibition of leukocyte apoptosis. Colchicine prophylaxis provides a significant reduction in the frequency, duration and severity of complete remission or attack, and prevention of amyloidosis in a significant proportion of patients.

The prognosis of the disease is due to early diagnosis, MEFV gene mutation (M694V) carriage, homozygous mutation carriage and regular colchicine use. Amyloidosis, which is the most abstained complication, occurs in patients not receiving regular treatment. Early diagnosis of the disease and prophylaxis of colchicine prevent long-term amyloidosis development and multiple organ failure, such as chronic renal failure.

**Behcet's Disease (BD)**

Symptoms of the disease are respectively; recurrent aphthous ulcers in the mouth, genital ulcers, uveitis and/or vasculitis that can affect all layers of the eye, intermittent arthritis that can affect the lower extremity joints, deep acneiform lesions and/or erythema nodosum lesions. Rarely vasculitis and/or thrombosis in the arterial and venous system, lesions in the central nervous system, thrombosis and/or arterial aneurysms in the pulmonary system and inflammation in the gastrointestinal tract may also be seen in the BD.

There is no specific laboratory test. Pathergy test may be helpful in the diagnosis. There is a relationship between HLA-B51 gene and Behcet's disease. The prevalence is 20-370/10,000 in Turkey. BD is a chronic disease with remission and exacerbations.

In addition to the natural immune system, the acquired immune system is also active in BD and proinflammatory cytokines and T helper 1 type cytokines are responsible for the etiology. Behcet's disease is usually sporadic; however, there is an increased proportion of Behcet's disease

in the family. Behcet's disease was found to be primarily associated with MHC class 1 genes (HLA-B51). The HLA-B51 gene in Behcet's patients in the Silk Road region is between 50-80%, while the frequency of those carrying the gene in the normal population is approximately 25%. At the same time, relationships with other MHC genes were described.

Treatment is arranged according to the type, severity and age of the symptoms. Aggressive treatment may be necessary in the early period of the disease because of the increased frequency of eye, vascular and neurological involvement in young and male patients compared to older and female ones.

Severe organ involvements aggravates prognosis. Pulmonary artery aneurysm, central nervous system involvement, major vessel involvement, amyloidosis, cardiac and intestinal involvements are the major causes of mortality. Eye involvement can cause loss of vision in young male patients.

An integrated management approach is required for the treatment of musculoskeletal system diseases. Musculoskeletal disorders have an important place among the causes of disability and they seriously affect the quality of life. In addition, their socioeconomic burden is great. In these diseases, a better life is possible with early diagnosis and treatment.

The purpose of treatment in patients with arthritis can be summarized as to relieve pain, prevent joint damage and other complications and to provide a functional improvement in their daily activities. Medication is not enough to achieve these goals. Patient education, regular controls and a multidisciplinary approach should not be neglected.

Treatment of these diseases includes early diagnosis, family and patient education, physical medicine and rehabilitation, (posture, chest expansion and peripheral joint movement protection, exercise, pain control, recovery of physical functions, post-surgery mobilization), bed selection, smoking cessation, trauma avoidance treatment methods.

Pain occurring during the course of the disease causes chronic pain, fatigue, decreased physical activity and quality of life. Although it is known that exercise increases the health quality in rheumatologic diseases, it is discussed which exercise should be recommended for the patient during active periods of the disease. It was recently demonstrated that muscles secrete cytokines as an endocrine organ and regular exercise training has an anti-inflammatory effect.

**Assessments for Physical Activity Planning**

In order to establish the right physical activity and exercise program in rheumatic diseases, the patient and the disease-specific evaluation should be performed. Other than the disease-related symptoms, demographic and biological characteristics such as age, gender, educational, socio-economic and marital status, patients' expectations, stress, motivation, mental and emotional and psychological status, obesity, heart diseases; environmental, social and cultural factors may also be the cause of physical inactivity. In addition, physical fitness parameters such as strength, endurance, flexibility and shortness of the muscles that may affect physical activity and exercise performance should be evaluated by considering the symptoms of the disease. Also, expectations of the patient and his/her family regarding exercise and physical activity for exercise compliance should absolutely be noted.

In rheumatologic diseases, besides the physical involvements, some other factors such as pain, morning stiffness, fatigue, kinesophobia, depression and anxiety, physical compliance parameters, disease-specific factors including disease activity, functionality level, and quality of life may affect the participation in physical activity and exercise. Therefore, these parameters should also be evaluated.

***Pain Assessment:***

The most reliable indicator in pain assessment is the patient's own pain expression. However, it should be noted that some of the patients may not be able or have difficulty in identifying their pain. Therefore, different pain assessment methods should be used in rheumatologic patients. The easiest way to evaluate pain is to ask the patient if he or she has pain. However, the "presence" or "absence" of the pain is not enough alone for assessment. After the assessment, the severity, type, characteristics, localization of the pain, the relationship with time, the factors that reduce and increase the pain should be known.

Numerical, verbal and visual scales are mostly used scales to determine the severity of pain. At the numerical scales, it starts with the absence of pain (0) and the worst pain level (10-100). One of the most common one is the Visual Analog Scale. The patient is asked to mark his or her pain on a 10 cm horizontal or vertical ruler, typed painlessness at the one end and the most severe pain at the other end.

***Morning stiffness:***

This symptom is a critical parameter, which helps to decide about the clinical disease activity. The severity, location and duration of stiffness are the sub-headings that should be questioned.



***Assessment of Disease Activity:***

It is important to assess the activity of the disease when deciding on the severity and type of exercise. Disease activity is performed with special scales which is specific to the diseases. The commonly used scales are the SLE disease activity index (SLEDAI) for lupus, the Ankylosing spondylitis disease activity index (BASDAI) for AS, the Disease Activity Index 28 (DAS28) for RA, the index of autoinflammatory disease activity (AIDAI) for FMF and Behcet's Syndrome Activity Scale (BSAS) for Behcet's Disease, as well as other various scales.

***Functional Status and Assessment of Daily Living Activities:***

In rheumatic diseases, patients have to be questioned about the difficulties in self-care activities such as bathing, dressing and eating and in leisure time activities. Suggestions to overcome these difficulties should be included in the content of exercise and physical activity training.

There are many disease-specific scales such as the Short Form-36, WOMAC and Bath Ankylosing Spondylitis Functional Index (BASFI) which assess and monitor the functional status and daily living activities.

***Assessment of Quality of Life:***

Quality of life is related with the patients' perceive of their own status within their own system of cultures and values. It also includes physical functions, psychological status, social relations within and outside the family, environmental impacts and beliefs. The concept of quality of life is multidimensional, so it is difficult to measure objectively. For this reason, instead of global scales, the Rheumatoid Arthritis Quality of Life Scale (RAQoL) and the Ankylosing Spondylitis Quality of Life Scale (ASQoL) could be used.

***Assessment of Anxiety and Depression:***

In rheumatologic diseases, clinical depression is more than twice as common compared to normal population. In addition, there are some literature which shows that patients with psychological symptoms such as depression and anxiety have poorly participated in physical activity and exercise programs. The Beck Depression Inventory (BDI) and the Hospital Anxiety and Depression Scale (HAD) and the Beck Suicidal Idea Scale (BSE) are among the most commonly used scales to determine the level of depression and anxiety in rheumatic patients.

**Assessment of Fatigue:**

Fatigue is a common finding in rheumatic diseases. Fatigue is defined as the subjective assessment of tiredness and energy loss. Factors related to rheumatologic patients causing fatigue are thought to be pathocronobiological factors such as sleep disorders, physical inactivity, and pathophysiological factors such as anxiety, depression, chronic pain, obesity and poor social support. In addition, ethnicity, marital status, smoking, constitutional findings, neurological involvement, cardiovascular involvement, headache and antidepressant drug use are also associated with high fatigue levels.

**Assessment of Kinesiophobia:**

Kinesiophobia is defined as an excessive and irrational fear of physical activity or movement in painful conditions or injuries. Fear of movement and activity may lead to physiological disorders which results a decrease in mobility, strength and aerobic capacity. Increased activity restriction causes decreased activity tolerance; fear of activity also causes the balance disturbance. The fear of activity also prevents to perform the activity correctly. Fear and anxiety can lead to increased pain perception. In chronic rheumatic diseases, arthritis, joint pain and severe articular involvement can trigger the kinesiophobia. Therefore, the assessment of kinesiophobia in rheumatic diseases should be included to the clinical evaluation.

**Assessment of Physical Activity Level:**

The studies refer that patients have low level of physical activity in rheumatic diseases. Symptoms of many diseases such as fatigue, pain, morning stiffness and psychological disorders may interfere with physical activity. In order to assess physical activity, objective methods such as heart rate monitoring, pedometer, accelerometer, and stabilometer can be used as well as subjective methods such as questionnaires regarding to daily or past status.

**Patient Education**

Education is important to increase the participation of the rheumatologic patient in the exercise and physical activity program. The factors that should be part of patient education are as follows.

- The patient should be informed about the symptoms and the disease.
- He/she should be told that his/her illness is chronic and will accompany him/her throughout his/her life.
- The gains by doing exercise and physical activity program should be explained.

- The patient should be explained that he/she has to be under the control of the physician (rheumatologist, physical medicine and rehabilitation specialist) and physiotherapist throughout the disease.
- Patient and his/her family's need to get a positive perspective towards the disease.
- Positive posture and body perception should be improved.
- The questions that they want to ask should be listened and their participation to the therapy should be improved.

Joint protection principles and energy conservation techniques should be taught as they need lifelong adaption.

### ***Joint Protection Principles***

- Pain should be used as a warning signal to organize the activities.
- Patients should carry loading as distributed equally to the joints.
- Alternative methods should be used in order to reduce loading during the effort required activities.  
For example, the use of supportive devices, reducing the weight of objects they carry.
- To learn how to use the joints functionally without exceeding their anatomical limits.
- Forcing positions that may lead to deformity should be avoided.
- It should be avoided to stay in the same position for a long time.
- Extremely hard grasps should be avoided (such as opening a hard door-handle).
- Muscular strength and range of motion should be maintained.

### ***Energy Conservation Techniques***

- Easy and difficult activities should be planned alternatively to follow each other.
- Activities should be done more slowly.
- The environment should be organized with appropriate ergonomic approaches.

### **Physical Activity and Exercise**

Rheumatologic patients mostly experience a restriction in daily living activity restriction and participation restrictions which result physical inactivity. Physical inactivity constitutes movement and participation restrictions. This continues as a vicious cycle and leads to a gradual decrease in the quality of life. Physical activity has a great role in the prevention of fatigue, stress, osteoporosis, cardiopulmonary failure and premature deaths. Combination of strengthening and flexibility exercises and the exercises which increase aerobic capacity improves both the biomechanical and functional status. Physical activity also reduces stress, anxiety and social isolation.

**Acute Effects of Physical Activity:**

Patients with rheumatologic diagnosis indicate that their pain increased with physical activity and exercise. This is a temporary condition due to excessive loading to the joints. Pain usually goes down and is not an obstacle for sustaining activity.

**Chronic effects of physical activity:**

It was stated that daily, regular and moderate exercise in early phase patients increased muscle performance and quality of life. It is also known that it improves flexibility, aerobic capacity, muscle functions, bone density and daily living activities. While moderate and regular exercise does not have an effect on osteopenia, also vigorous and long-lasting exercises cause joint damage.

**Physical Activity and Exercise in Rheumatoid Arthritis**

It is thought that the physical fitness and physical activity level of patients with RA may be decreased as a result of severe joint pain, musculoskeletal problems and cardiorespiratory system. In RA, physical activity and exercise provide secondary protection, not primary.

**Physical Activity and Exercise Program:**

Exercise program should be adapted to daily life in order to be continuous in patients with rheumatoid arthritis. As it is a chronic and progressive disease, it should aim to increase the patient's functional capacity in every phase.

In active RA patients range of motion exercises should be preferred for avoiding contractures and the range of motion should be followed carefully. Exercises aimed at maintaining the range of motion in the very active patients, as well as exercises for large muscle groups such as trunk muscles should be taken over. Low intensity land and water based exercises could be safely recommended to RA patients, regardless of disease activity.

If it is planned to increase oxygen capacity and muscle function through exercise, the intensity of exercise should be moderate to vigorous. These exercises should be recommended to the patient 30 minutes a day and at least 3 days a week. All these recommendations for exercise intensity are not different from general exercise recommendations. However, there are some suggestions that should be taken into consideration when applying.

- In order not to increase the symptoms in the patient participating in the physical activity program for the first time, the exercise intensity should be low and the period should be 2-3 weeks, unlike the general exercise intensity approaches.
- Due to the intermittent course of the disease, the loading of the exercises should not be regular, instead the symptoms of the disease should be followed.

- Focusing on the target of exercise rather than the symptom of the disease in patients with stable conditions will increase the effects of exercise.

Cycling, walking, dancing, low fitness exercises and strengthening exercises with resistance band or weight are recommended for these patients. Water-based exercises using water buoyancy or water resistance are effective methods to increase patient participation. In addition, group exercises are effective exercise methods to increase the motivation.

Rheumatoid Arthritis is a life-long disease. Therefore, the patient should become independent from the physiotherapist as quickly as possible for continuing the exercise. Changes in the exercise program should be re-planned after assessment of the patient's general condition and disease activity. With regular aerobic exercises, joint mobility and muscle strength and functional level increase without joint complaints and fatigue. Furthermore, determining the activities that patient can do and enjoy as an exercise will increase both the continuity of the exercise and the motivation of the patient.

In order to protect small joints, the patient should be warned about the shoes he/she will use during exercise.

#### ***Hand Exercise Recommendations:***

Hand deformities of RA affect the patient from both the cosmetic and functional aspects and impair the quality of life. After the diagnose hand exercises should be given to the patient immediately which will support joint protection techniques and slow down the rate of deformity development. In this sense, functional positioning exercises for wrist and small joints of hand, stretching exercises, strengthening exercises with resistance band and weights are the exercises that we can recommend to the patient.

Points to be considered in exercise program:

- Swelling and hot joints
- Central nervous system related symptoms
- Peripheral neurological symptoms
- Sensory and vascular disorders
- Acute burnout and increased complaints
- Severe pain that cannot be explained on the joints
- Tendon ruptures
- Endoprosthesis

**Contraindications:**

There are no definite contraindications for physical activity. There are relative contraindications that need special care.

- Special exercises should be planned in cases such as pericarditis, congestive heart failure, pleural, pulmonary fibrosis and vasculitis
- Exercises should be recommended to strengthen bone density in case of osteoporosis
- It should be kept in mind that vigorous exercises loading on destructive joints will increase destruction in major joints.

**Physical Activity and Exercise in Ankylosing Spondylitis**

Ankylosing spondylitis shows a progression which causes flexion posture in the spine and entire body in late phases. Therefore, the purpose of the exercise program is to provide the right posture of the spine and mobility of other joints. Exercise in AS should necessarily be a part of treatment whether on land or in water. The aim of the exercise is primarily to maintain and increase the mobility of the spine and other joints, to strengthen breathing and abdominal muscles as well as arm and leg muscles and to increase physical fitness and relaxation.

**Contents of the Exercise Program:**

- Breathing exercises: breathing exercises are important not only for vital capacity but also for increasing thoracic mobilization. Teaching breathing exercises by combining with other exercises both help the patient learn easily and prevent a long and boring exercise program.
- Posture Exercises and Postural Balancing Training: In order to preserve and maintain the postural balance, the patient should be told about the body biomechanics and be given posture exercises to support them. The patient should be informed of sitting, standing and upright postures.
- Mobility and flexibility exercises: exercise is known to increase mobility but not to reduce ankylosis. Therefore, exercising before the development of ankylosis will be a more protective approach. Mobility exercises towards the side which the patient has difficulty to move will also increase the functioning.
- Strengthening exercises: The strengthening is important for the continuity of the posture. It could be performed on land and in water. The intensity of the exercises could be changed by positions, increasing weight, using theraband and increasing the number of repeats.

- Cardiovascular exercises: The follow-up of these patients is important due to aortic insufficiency and cardiac abnormalities. It is known that cardiovascular exercises are especially important in coping with fatigue.
- Sports and recreational activities: Activities performed at least 200 minutes per week in the early phase were found to be related with pain and stiffness. Sport is also important for maintaining mobility and general physical fitness. While activities such as swimming, hiking and cycling are recommended, contact sports as karate and high-impact sports such as step aerobics, football and basketball are not recommended for risk of fracture.

### **Physical Activity and Exercise Recommendations in Osteoarthritis**

When planning an exercise program for the patient with osteoarthritis, the patient's age, disease stage, comorbid diseases, and biomechanical features of OA should be taken into consideration. Stretching, strengthening, isotonic, isometric, balance, proprioception and aerobic exercises should be included in the program. Water-based exercises could be included in the program according to the preference of the patient and physician. Exercises should be performed initially under the supervision of a therapist and should be clearly explained and demonstrated to the patient so as to the patient can perform it alone.

#### **Benefits of Exercise:**

- Reduces the loading on the joint with the increase in muscle strength
- Improves function by increasing proprioceptive perception
- Strengthening exercises should be given particular importance for the patients with joint stabilization problems
- Neuromuscular exercises should be added for the patients with biomechanical disorders such as genu varum and varus.

**Table 28.** Exercise and Activity Examples by Disease Types in Rheumatology

Disease Diagnose	Exercise Recommendations	Activity and Sports Recommendations
Osteoarthritis	<ul style="list-style-type: none"> <li>• Flexibility exercises</li> <li>• Strengthening exercises</li> <li>• Aerobic exercises</li> <li>• Balance and proprioceptive exercises</li> <li>• Aquatic exercises</li> <li>• Clinical pilates</li> <li>• Yoga</li> </ul>	<ul style="list-style-type: none"> <li>• Walking</li> <li>• Swimming</li> <li>• Aerobic dance</li> <li>• Cycling</li> <li>• Jogging</li> </ul>
Rheumatoid Arthritis	<ul style="list-style-type: none"> <li>• Flexibility exercises</li> <li>• Strengthening exercises</li> <li>• Aerobic exercises</li> <li>• Balance and proprioceptive exercises</li> <li>• Aquatic exercises</li> <li>• Clinical pilates</li> <li>• Yoga</li> </ul>	<ul style="list-style-type: none"> <li>• Swimming</li> <li>• Light-moderate walking, jogging</li> <li>• Aerobic dance</li> <li>• Cycling</li> </ul>
Ankylosing	<ul style="list-style-type: none"> <li>• Strength exercises</li> </ul>	<ul style="list-style-type: none"> <li>• Low-tempo walking</li> </ul>
Spondylitis	<ul style="list-style-type: none"> <li>• Cardiopulmonary exercises</li> <li>• Posture exercises</li> <li>• Mobility and flexibility</li> <li>• Global postural reeducation exercises</li> <li>• Aerobic exercises</li> <li>• Aquatic exercises</li> </ul>	<ul style="list-style-type: none"> <li>• Swimming</li> <li>• Tai Chi</li> <li>• Cycling</li> </ul>



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# SECTION 9

## PHYSICAL ACTIVITY AND EXERCISE IN CHRONIC GASTROENTEROLOGICAL DISEASES

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# A

## BSTRACT

It is important to raise awareness in the community about the protective and enhancing effects of physical activity on health. In clinical practice, gastrointestinal system (GIS) diseases are among the disease groups that are commonly seen. Obesity, dyslipidemia, insulin resistance, metabolic syndrome and stress are important risk factors for the occurrence of these diseases. It is recommended to take advantage of physical activity, which has positive effects in preventing these risk factors, for prevention and treatment of diseases.

## 1. Gastrointestinal System Diseases that Physical Activity is Effective on

### a. Gastroesophageal Reflux

Gastroesophageal reflux (GER) is defined as the escape of stomach contents to esophagus. The main cause of GER is the spontaneous relaxation of the lower esophageal sphincter (LES) which is seen naturally in healthy persons after meals. This is called as physiological GER. If the escape is more than normal and caused complications, it is called GER disease (GERD).

As its prevalence is at different rates in various geographies, it varies between 2.5% and 33% across the world. Its prevalence in Turkey has similarity with the world as well as it shows regional variations in itself.

The most important complaint is retrosternal pain and burning sensation that expands from hypochondrium/lower xiphoid to neck.

Advanced age, obesity, asthma, chronic lung diseases, certain medicines used in the treatment of diseases, caffeine-containing drinks, citrus fruits, ketchup, tomato paste and fatty foods increase the risk of reflux.

History and physical examination are the most important steps for diagnosis. Barium studies may be required if the response to treatment is inadequate or if long-term esophageal pH monitoring, esophageal intraluminal impedance analysis, reflux scintigraphy, anatomical abnormality or complications in atypical cases are considered. Upper GI endoscopy is valuable in the evaluation of complications.

Lifestyle changes (regulation of nutritional habits, recommendation of appropriate physical activity program), medication, endoscopic and surgical treatments could be applied.

In addition to its negative impact on quality of life, Barrett esophagus (precancerous) and stenosis is the most important complication.

### b. Cholelithiasis

The cholelithiasis is formed by the collapse of the contents (bilirubin, bile salts, phospholipids and cholesterol) dissolved in the gall bladder. Cholelithiasis is a common disease in developed countries. Although the incidence varies according to gender, age and ethnicity, it is 10-15% in western countries, while it is 6-7% in Turkey.

Factors that may cause gallstone formation include female gender, advanced age, obesity, alcohol use, hyperlipidemia, hemolytic anemia, history of gallstones in the family, ethnicity, use of oral contraceptives, number of pregnancies, central type obesity, metabolic syndrome and menopause.

Some of the patients have asymptomatic gallstones and they do not have any lifetime symptoms. Biliary colic pain is observed in 90% of symptomatic patients. Nonspecific symptoms such as nausea, vomiting, dyspepsia, diarrhea and retrosternal burning with pain may be observed.

Acute cholecystitis is one of the causes of biliary pancreatitis and fistulation morbidity and mortality. Females, obese and elderly individuals have the highest risk.

Depending on the patient's clinical condition and comorbidity, medication and surgical treatment could be used.

### **c. Non Alcoholic Fatty Liver Disease**

Non-alcoholic fatty liver disease (NAFLD) is a clinicopathologic condition with a wide spectrum ranging from simple lipoidosis to steatohepatitis-cirrhosis and end-stage liver disease. Histopathologically, it is defined as the presence of micro or macrovascular oil infiltration in at least 5% of liver cells.

Its prevalence varies between 20-60% depending on the techniques used in the diagnosis.

The incidence is increasing with increasing prevalence of obesity.

The most important reason is obesity. Type 2 diabetes, hyperlipidemia, metabolic syndrome, some drugs (such as steroids, calcium channel blockers, aspirin, some antibiotics, and synthetic estrogen), total parenteral nutrition, ileal bypass and female gender are among important risk factors.

Diagnosis is made by clinical signs and symptoms, laboratory and imaging methods. Clinical indications are not specific to the disease; it could be asthenia, abdominal pain. It is present in about 50% of patients with hepatomegaly. Acanthosis nigricans could be seen as a sign of insulin resistance. Although liver enzymes can be used as screening tests, they are not sensitive enough to be at normal limits, nor do they correlate with the severity of the disease. Ultrasonography is the most widely used imaging method in diagnosis. Computerized tomography and MRI may be helpful in showing the degree of fattening. Reference diagnosis method is liver biopsy. It should be distinguished from other diseases that may cause fattening in the liver (cystic fibrosis, rapid weight loss, Wilson's disease, glycogen storage diseases, fatty acid oxidation disorders, various syndromes, etc.).

Its prognosis depends on early diagnosis and treatment. There is not an effective medical treatment. A multidisciplinary approach involving dieting and exercise programs is needed.

### **d. Inflammatory Bowel Diseases**

Inflammatory bowel diseases (IBD) are the Crohn's disease (CD), ulcerative colitis (UC) and indetermined colitis (IC). They are disorders triggered by incompatible immune responses to the gastrointestinal flora as a result of combination of genetic susceptibility, environmental and immunological factors. They cause chronic and recurrent inflammation in the gastrointestinal tract.

Epidemiological studies indicate an increased incidence of IBD.

The incidence of IBD in Turkey is reported as 2.6/100,000 for UC and 1.4/100,000 for CD.

Abdominal pain, bloody/bloodless diarrhea, weight loss, failure to gain weight, fever, growth retardation, malnutrition, nausea and/or vomiting, arthropathy, erythematosis and secondary amenorrhea in girls are the main symptoms and signs.

Although the causes are not fully known, it is thought that they occur in individuals with genetic predisposition with the contribution of some environmental factors. These factors include smoking, factors of infection, appendectomy (decreases UC risk, while increases CD risk), breastfeeding, nutrition-related factors (refined sugars, ready-made products are increasing), drugs, socioeconomic factors and stress. It is determined that oral contraceptive drugs and nonsteroidal anti-inflammatory drugs may increase the risk of IBD. In recent years, intestinal microbiota imbalances were also shown to play a role in the pathogenesis. Studies show that individuals with IBD have an increased risk of lifetime IBD development in their first-degree relatives.

As a result of inflammatory bowel diseases, malnutrition, malabsorption, fistula, stricture and malignancy may develop.

Diagnosis is made endoscopically and histologically. IBD's are chronic diseases which course with remissions and exacerbations. In the treatment, nutrition, corticosteroids, aminosalicylate derivatives such as mesalazine, immunosuppressive drugs (azathioprine, 6-mercaptopurine), methotrexate, biological agents (infliximab, adalimumab, etc.), antibiotics and, if necessary, surgical treatment are used.

#### **e. Diverticular Diseases**

The diverticula mucosa (by taking muscularis mucosa) protrudes into pericolic fat layer from weak spots in the circular muscles on increasing internal colon pressure.

The diverticula disease of the colon is associated with abdominal pain and changes in bowel habits. It is frequently located in the left colon in western societies.

The frequency of this disease is 50% in the patients aged 80 and over, whereas it is rare in the patients aged 40 and below. It is more common in females.

The disease is closely related to fiber intake and amount. The development of left colon diverticula in societies with Western-style pulpless eating habits is associated with excessive meat consumption.

Diverticular disease could be asymptomatic or complicated or uncomplicated symptomatic. Patients may have complications such as diverticulum microperforations and accompanying peritonitis with inflammation. Stricture and fistulation are among the other common complications.

In patients with sigmoid colon diverticulitis, nausea, vomiting and bowel habits change could be seen in addition to left lower quadrant pain and fever. If inflammation is close to the bladder, dysuria and urinary frequency increases. A palpable mass may be seen in the left lower quadrant with pain and rebound sensation during abdominal examination. In laboratory examination, inflammatory markers are high. A difficulty or obstruction in the bowel passage may be diagnostic for some patients, whereas pneumoperitoneum in complicated diverticulitis,

air in the portal vein or extraluminal air fluid levels are important findings for diagnosis.

Imaging is essential in diagnosis. Barium colon radiography is often used for diagnosis.

Complications include diverticulitis, bleeding, abscess and large bowel obstruction. Medication or surgery could be administered depending on the condition of patient and complication.

#### **f. Constipation**

Although the definition of chronic constipation varies from person to person, it is characterized with decreased defecation frequency, stiff feces, and straining, incomplete defecation feeling. According to the results of the studies performed in Turkey, the incidence of constipation varies between 22 and 40%. Risk factors of chronic constipation include female gender, advanced age, low income level, low level of education, medications (such as opiates, some antihypertensives, tricyclic antidepressants, iron preparations, antiparkinsonian and antiepileptic drugs), other underlying diseases, psychological problems, malnutrition and decreased level of physical activity. Complications such as hemorrhoids, anal fissure, rectal bleeding, organ prolapse, fecal plug, fecal incontinence may be seen as a result of chronic constipation.

The aim of constipation treatment is to normalize bowel movements, to provide soft defecation, to provide defecation without difficulty at least three times a week, to prevent complications and to improve the quality of life of the patient. Treatment includes patient training, dietary changes, laxatives and enemas administered oral or rectal. Treatment should, if possible, correct the underlying pathology.

#### **Effects of Physical Activity**

Obesity, insulin resistance and lipid profile disorders are important risk factors in the gastrointestinal system-related diseases we described above. There are many studies in the literature that physical activity and aerobic exercise is effective in controlling weight and regulating metabolism. Therefore, importance of physical activity should be emphasized in both the prevention of gastrointestinal system diseases and the treatment of existing diseases.

There are studies showing that physical activity prevents the formation of GER, NAFLD, IBD, cholelithiasis, diverticular disease and constipation. In studies, it is stated that the said effect of physical activity is provided by decreasing obesity, visceral fatting and insulin resistance. It was reported in cholelithiasis that it inhibits bile stasis by prokinetics effect via cholecystokinin. In constipation and colon malignancies, in particular, physical activity has some positive effects on prevention of these diseases through the acceleratory effect of exercise



on gastrointestinal transit time. It was showed that physical activity in IBD reduces the feeling of symptoms due to the positive effect of physical activity on stress and does not increase the disease activity.

The above mentioned benefits apply mostly to light to moderate physical activities. The situation with respect to vigorous exercises is indicated in the contraindications to physical activity.

### Physical Activity Prescription

In order to avoid risk factors in healthy individuals, exercises with major muscle groups (walking, swimming, etc.) may be recommended. As physical activity, a sub maximal aerobic exercise will be sufficient for 3 to 5 days a week, half a day. It should reach 70% of maximal heart rate ( $220 \text{ age}/\text{min}$ ) in submaximal aerobic exercise. While telling this target to the patients, it could be told them that they will have difficulties in singing a song but will be able to talk to the one next to him/her. It could be completed in totally 30-minute sets as 10-minute sets in people with geriatric or very sedentary life. These activity targets should be personalized by taking into account the accompanying comorbidities (such as severe heart disease, liver disease, lung disease, degenerative joint and spine diseases).

In addition to aerobic exercises, strengthening exercises for abdominal muscles could be recommended to reduce abdominal fat deposition. Care should be taken when recommending exercise in patients with GER and hiatal hernia.

The patients with gastrointestinal symptoms should be recommended to consider mealtime in determining exercise time. That is to say, they should avoid exercise when they are excessively full.

### Contraindications/Risks

- a. It should be kept in mind that fluid loss through breathing and sweating may pose a problem in diseases (malabsorption, celiac, IBD active stages, etc.) coursing with fluid loss during intensive exercise.
- b. Cardiovascular risk factors (coronary artery disease, congestive heart failure, hypertension, etc.) should be questioned. It should be noted that vigorous physical activity may be risky in patients with mesenteric vascular disease.
- c. Comorbid joint and spine diseases should be taken into consideration while determining the type and intensity of physical activity.
- d. In patients with a history of umbilical and inguinal hernia, GER, history of previous GIS surgery, physical activities that increase intra-abdominal pressure should be avoided.
- e. It should be kept in mind that GIS symptoms such as vomiting, nausea, abdominal pain, chest pain and heartburn in people engaged in heavy sports activities such as marathon runners and post-exercise GIS hemorrhage may be observed.

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# SECTION 10

## PHYSICAL ACTIVITY AND EXERCISE IN PREGNANCY, POSTPARTUM AND MENOPAUSE PERIOD

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## **A** BSTRACT

Pregnancy is a period that many anatomical and physiological changes occur in order for fetus meet the needs. Other than anatomical and physiological changes, emotional, social and psychological changes are also the factors affecting physical fitness during pregnancy. Therefore, it would be very useful for pregnant, who do not have any medical or obstetric risk, to increase their physical activity level and do exercise in order to better adapt to these changes and to minimize the problems seen in pregnancy.

It was reported that regular physical activity and exercise during pregnancy increase and maintain physical fitness, help control weight, reduce the risk of gestational diabetes in obese women and increase the feeling of psychosocial well-being. Therefore, in the very recent committee report of the American College of Obstetricians and Gynecologists (ACOG), it was recommended that pregnant women, who do not have a medical or obstetric complication, should do moderate intensity exercise every day of the week, 20-30 minutes a day.

Considering the anatomical and physiological changes during pregnancy, the planned exercise program should include; posture training and teaching the correct body mechanics, aerobic exercise program for protection of cardiovascular endurance, strengthening training (upper extremity, lower extremity, abdominal muscles and pelvic floor muscles), strengthening training to prevent edema, varicose and cramps and relaxation and respiratory training.

## PREGNANCY AND POSTPARTUM PERIOD

Pregnancy is a period that many anatomical and physiological changes occur in order for fetus meet the needs. Pregnancy and postpartum period are the periods that require women to go to health checks at regular intervals and therefore have the highest motivation to provide the necessary behavioral changes for healthy lifestyle. Women who begin their pregnancy with a healthy lifestyle (e.g. exercise, good nutrition, non-smoking) should be encouraged to maintain these healthy habits. Pre-pregnancy period and pregnancy period should be seen as an opportunity in terms of healthy habits for the individuals without healthy lifestyle.

Movements that are regularly performed during the day and lead to increase of heart rate and respiratory frequency are physical activities. Exercise is physical activity types performed for improving cardiac, respiratory or muscular compliance. As a repetitive activity, its personalized level is determined.

According to the 2015 data of Turkey Statistical Institute (TURKSTAT), the total fertility rate increased to 2.17 children, while the highest fertile age range is 25-29 in Turkey. According to 2014 TURKSTAT 29.3% of Turkish women are overweight and 24.5% are obese.

Regular physical activity during pregnancy provides physical fitness, helps weight management, reduces the risk of gestational diabetes in obese women and increases psychological well-being.

In pregnancy, physical inactivity and excessive weight gain are accepted as independent risk factors for maternal obesity and related pregnancy complications, including gestational diabetes mellitus (GDM). International Diabetes Federation 2015 data indicates that one in every 7 births is affected by gestational diabetes.

### Anatomical and Physiological Changes in Pregnancy and Postpartum Period

The most significant changes during pregnancy are; postural changes such as progressive lordosis as a result of weight gain and shift of center of gravity. Stability is impaired depending on all these postural changes and balance problems may occur. The pelvic floor collapses by about 2.5 cm with the effects of compression and gravity by uterus growing during pregnancy. In this period, if pelvic floor muscles are not supported by appropriate exercises, some problems such as urinary stress incontinence, pelvic organ prolapse and sexual dysfunction may be seen in the future. In addition, pelvic floor muscle dysfunction may cause lumbopelvic pain during pregnancy.

In addition, with the growth of the uterus, the abdominal muscles are separated toward both sides and this is called 'diastasis recti abdominis'. The increase in the distance between the abdominal muscles causes these muscles to weaken. Accordingly, more than 60% of all pregnant women have low back pain.

During pregnancy, blood volume, heart rate and cardiac output normally increases and systemic vascular resistance decreases. These hemodynamic changes provide circulation reserve to protect the pregnant woman and fetus at rest and during exercise. Cardiac volume and heart rate are also affected by the position of the pregnant woman. Venous return decreases due to compression of the uterus growing from 4th month of gestation on the inferior vena cava while on the supine position. This may cause hypotension in pregnant women.

During pregnancy, there are also respiratory changes. Minute ventilation primarily increases by 50% as a result of increased tidal volume. Due to the physiological reduction in pulmonary reserve, the ability to perform anaerobic exercise deteriorates, the availability of oxygen for strenuous aerobic exercise and increased workload falls permanently behind. Physiological respiratory alkalosis of pregnancy may not be sufficient to compensate for the metabolic acidosis developed by strenuous exercise. Reduced subjective workload and reductions in maximum exercise performance may limit the ability of more vigorous physical activity, especially in overweight or obese pregnant women. It was shown that the aerobic training in pregnancy increases the aerobic capacity in normal weight and overweight pregnant women.

Changes in the levels of relaxing, estrogen and progesterone hormone during gestation cause changes in collagen tissue metabolism and the flexibility of the connective tissue increases. The increase in this hormone level makes the body vulnerable to injuries. It also causes digestive and circulatory system problems.

In pregnant women, basal metabolic level and body temperature are higher than non-pregnant women. If body temperature rises above 39.2 degrees (hyperthermia), the fetus is affected negatively especially in the first 3 months. Therefore, fluid intake, ambient temperature and humidity are important in pregnancy.

It was shown that excessive bed rest and sedentary lifestyle can increase the risk of venous thromboembolism especially in this period, since pregnancy and postpartum period will cause a physiological increase in the coagulation parameters in the blood. Some publications suggested that bed rest that recommended for preventing preterm labor in pregnancy has no convincing evidence. The American College of Obstetricians and Gynecologists states that "bed rest is not effective for the prevention of premature labor and should not be routinely recommended". Patients with recommended long term bed rest or physical restrictions are at risk of venous thromboembolism, bone demineralization and dysfunction.

It is reported that rapid and excessive weight gain during pregnancy leads to increase in many risks such as gestational diabetes, pre-eclampsia/pregnancy toxemia, increased risk of infection in pregnancy and postpartum period, risk of macrosomia in fetus, low and premature birth risk, birth problems and increased risk of cesarean. Thus, the ideal weight gain during pregnancy is approximately 7 kg for pregnant women starting with a high BMI, while it is approximately 11-16 kg for pregnant women starting with a normal BMI (20-26). Obese pregnant women should be encouraged to make healthy lifestyle changes involving physical activity and rational diet.



The period in which all these anatomical and physiological changes begin to return to normal after birth is called postpartum period, which is a window of opportunity to initiate, propose and strengthen a healthy lifestyle.

Postpartum period is divided into three categories as emergency, early and late period. The emergency postpartum period covers the first 24 hours after birth and includes acute anesthesia and postpartum complications. The early period includes the time until the end of the 1. week. Late postpartum period includes the time required for recovery or normalization of the genital organs. The last stage traditionally lasts until the 6<sup>th</sup> week.

When the postpartum physical and mental status is examined: The ligaments and the collagenous connective tissue are still softer and elastic than in the pre-pregnancy period and may take up to 4-5 months to fully recover. As a result of a combination of the weakened abdominal muscles, decreased mechanical control and increased ligament elasticity, lumbar region may become more vulnerable to injuries and protrusion to abdomen from the place diastasis may be observed. The pelvic floor is weaker than before the pregnancy. The perineal region is stretched on its own and it may become sensitive and edematous due to traumas such as intrapartum episiotomy or tears and subsequent sutures. The presence of hemorrhoids may also be an acute discomfort and an additional trauma. Severe, edematous and painful and cramped legs and swollen wrists and feet may cause distress in the early postpartum period, although it is not significant in the prenatal process. Although back pain is not seen in pregnancy, it may occur frequently after birth. Poor positions of breastfeeding and replacing the diaper, tension and fatigue may cause this problem. With the onset of lactation, mother may feel breasts growth, temperature increase, fullness and pain and this pain can spread towards the axilla. Psychologically, primary maternal anxiety is dominant. In the long term, prolongation in the return to daily living activities related to the mode of delivery, problems caused by the weight gain during pregnancy, increase in the risk of osteoporosis, deterioration in sleep quality and constipation adversely affect the quality of life of the mother.

### **Effects of Physical Activity**

Physical activity is defined as any bodily movement produced by the contraction of the skeletal muscles and improves and protects heart lung health at all stages of life, reducing the risk of obesity and its associated diseases and leading to longer life. Although pregnancy is associated with anatomic, physiological and psychological changes, physical activity and exercise carry minimal risk, reduce complications and are more effective for mother to adapt to this process.

The potential benefits of physical activity to the mother during pregnancy and postpartum period are:

- Organizes circulation and digestive functions.
- It is effective in preventing venous thromboembolism.
- Provides mother with weight control.
- Prevents the formation and progression of postural disorders.
- Reduces waist and back pain, prevents diastasis recti abdominis.
- Helps to increase endurance and strength; reduces the risk of falling and injury and improves balance.
- Supports the muscle activity required for birth, reduces the need for obstetric intervention and cesarean delivery rate.
- It was demonstrated that vertical positions and straining and breathing exercises during labor positively affect maternal stress hormones released at birth.
- Reduces possible pelvic floor trauma during delivery.
- Helps improve the potential for shortening the birth.
- It is important in the prevention of pregnancy diabetes mellitus, it was shown in studies that physical activity in women with pregnancy diabetes can decrease blood glucose levels or help prevent preeclampsia.
- Physical activity contributes to increase in social interaction and well-being sensation in social and psychological aspects
- Improves sleep quality.
- Reduces fatigue because it increases physical fitness level.
- It accelerates recovery after delivery. Reported to be beneficial in prevention and elimination of the problems that may be seen in early and late postpartum periods.
- It was shown that moderate physical activity during postpartum period does not have any side effects on breastfeeding amount and milk content and infant development.
- It is effective in the prevention and treatment of osteoporosis.

Effects of physical activity on fetus;

- Most of the fetal response studies to maternal exercise are focused on fetal heart rate changes and birth weight. Studies indicate a moderate increase (10-30 beats per minute) in the fetal heart rate during or after exercise. Three meta-analyses concluded that there was no or minimal difference in the birth weight between those who do exercise during the pregnancy and the control group. However, comparable controls suggest that it is more likely to give birth to a baby 200-400 gr.

less in birth weight in those who continue to do vigorous intensity exercise in the third trimester, whereas there is no increase in the risk of fetal growth retardation. In a cohort study evaluating umbilical artery blood flow, fetal heart rate and biophysical profile during and after a strenuous exercise in the second trimester, 30 minutes of exercise in active and inactive pregnant women is well tolerated by women and fetuses.

- It was reported that there is no teratogenic effect in the fetus due to the thermoregulatory mechanisms in pregnant women who regularly perform moderate physical activity during pregnancy.
- It was reported that the weight of the baby of a fit pregnant, who started exercise at the third trimester, is very low compared to the other pregnant women, however, 5-year follow-up studies suggest that body mass indexes are more normal and neurodevelopmental levels are better.

### **Indications of Physical Activity in Pregnancy and Postpartum Period**

In the absence of obstetric or medical complications or contraindications, physical activity should be recommended during pregnancy and postpartum period. Pregnant women should be encouraged to continue physical activity or to start safe physical activity/exercise. In women with obstetric or medical problems, exercise regimens should be individual. Obstetricians and other health professionals should carefully consider women with medical or obstetric complications before making recommendations on the participation in physical activity during pregnancy.

### **Physical Activity Prescription**

The physical activity/exercise prescription principles for pregnancy are not different from the general female population. Before recommending an exercise program, a thorough clinical examination should be performed to ensure that the patient does not have any medical reasons for avoiding exercise. The components of exercise prescription during pregnancy should be considered in every physical activity, regardless of the purpose, such as general health improvement, recreational activities or sports activities. In order to reveal the potential benefits of exercise, the type, severity, duration and frequency of exercise sets should be determined by taking into account the current physical fitness level of pregnant women. At the same time, attention should also be paid to the progression of exercise intensity over time. In addition to the components of the exercise prescription, while performing any exercise in the prenatal period, warning signs should also be taken into account in order to complete the exercise, and pregnant women should be warned not to continue exercising when they encounter these conditions.

- **Physical Activity/Exercise Type**

**Aerobic Activity/Exercises:** Major muscle groups are used. In order to benefit more from aerobic activity, the duration, frequency and intensity should be adjusted. Moderate intensity activity, at least 3 days a week, is recommended for aerobic exercises. Anaerobic activities are the activities which release the immediate and explosive force. Activities such as speed races, dumbbell lifting and laughing are among the anaerobic activities. Anaerobic activity types are not recommended during pregnancy due to physiological changes in mother.

Aerobic activities

1. Safe outdoor activities: Walking, jogging (rapid walking), swimming, in-water exercises etc.
2. Safe indoor activities: Treadmill, foot pedal, stationary bike, elliptical devices, etc.

**Resistant exercises (weighted):** It increases muscle strength, function, endurance, and bone density. In exercise selection, the exercises involving the large muscles of the body, arms and legs should be considered. Each set should contain 8-12 repetitions of the movement. It is important to apply the right technique to avoid injuries and there should be 60 - 90 seconds rest between sets. Light weight and frequent repetition should be applied. Do not breathe during exercise. Breathing should be given with movement. The muscle groups should be taken into consideration and the balance between the groups should be maintained. Types of strengthening exercises:

1. Free weights (sand bags, weight rings, bands etc.)
2. Devices related to strengthening (They are used for strengthening the special muscles)
3. Your own body or weight (you may use your weight as push-ups, pull-ups, etc.).

**Flexibility (stretching):** It stretches muscles and tendons, improves flexibility and protects joints and muscles (tense muscles cause damage to joints). Before stretching, the muscles must be prepared for exercise. After several warm-up movements, stretching is done at the end of the movement and gently. Stretching should be felt but no pain. At the time of stretching, breathing should be given.

**Dangerous Activities Not Recommended During Pregnancy:** Contact sports, skiing, water skiing, underwater sports, high altitude exercises, sports done in hyperthermic, hyperbaric, and hypoxic conditions, horse riding...

**Safe Activities During Pregnancy:** Walking, swimming, in-water exercises, aerobic dance, stationary cycling, yoga, clinical pilates, stabilization exercises...

- **Physical Activity/Exercise Intensity**

A speech test could be used to determine the intensity of exercise. You should be able to sing while performing light intensity exercises. You should be able to keep talking easily while performing moderate intensity exercises. You should be able to keep a conversation with bated breath during a vigorous exercise.

Another identification method is to count your heart rate for 1 minute. Your maximum level is calculated with the formula of 220-your age. You could calculate your working intensity by taking the percentages of this value. Another method: it is about perceiving your own condition. Borg's Scale (between 12 and 14 "somewhat difficult" appropriate for pregnant women) (Table 29).

**Table 29.** Borg's Scale

Score	Perceived Difficulty Level	Heart rate
6		60
7	Extremely light	70
8		80
9	Very light	90
10		100
11	Light	110
12		120
13	Somewhat hard	130
14		140
15	Hard	150
16		160
17	Very hard	170
18		180
19	Extremely hard	190
20		200

**Steps to be Included in the Exercise Session**

**Warm-up:** It should be 5-10% of the whole exercise session. It is performed by running general muscle groups with light intensity. It prevents the occurrence of injuries, provides better muscle control, and increases your metabolic rate gradually.

**Ongoing exercise (loading):** 15-50 minute of selected exercise or activity is continued.

**Cool-down:** The heart, circulation and breathing are normalized by continuing the activity with reduced intensity.

The recommended moderate exercise is at least 150 minutes a week, 20-30 minutes a day. This period includes warm up-cool down time and should be planned individually.

**Content of Physical Activity/Exercise in Pregnancy**

Given the anatomical and physiological changes during pregnancy, the planned exercise program:

- Posture education and teaching correct body mechanics,
- Aerobic exercise program for the protection of cardiovascular endurance,
- Strengthening training (upper extremity, lower extremity, abdominal muscles and pelvic floor muscles),
- Proprioceptive training,
- Strengthening and training to prevent edema, varicose veins and cramps,
- It should include stretching/relaxation and breathing training

**Points to be considered for Safe Physical Activity/Exercise in Pregnancy**

The exercise recommendations to be given to those who do not exercise regularly and in the pre-pregnancy period are different.

**Those Doing Regular Physical Activity/Exercise**

- Avoid contact sports, activities with high risk of falling and abdominal trauma. Underwater sports are not recommended.
- Exercise period and intensity should be organized in line with the recommendations and the internal temperature of the body should be kept under 39.2 °C.
- Moderate intensity exercises should be preferred.
- To reduce the stress on the musculoskeletal system, suitable shoes that support the foot and comfortable clothing should be worn.
- In order to prevent water loss, appropriate amount of liquid should be taken and exercise is not recommended in hot and humid environments or when the person suffers fever. Empty your breasts before exercise in lactation period.

- Allow at least 5 minutes for warm-up and cool-down.
- Avoid stretching the muscles that affect two joints at the same time.
- Professional support should be taken in special exercises. (e.g. pelvic floor exercises).
- Avoid exercises that require balance and including too much crouching, cross stepping and quick change of direction.
- Long-term exercise in the supine position is not recommended after 16-week gestation (gestational week) to avoid aortocaval compression (from the pressure on the vein feeding the infant).
- Energy (calorie) intake should be determined according to your needs.
- High-intensity and long-term exercise may lead to hypoglycemia; therefore, it is important to minimize this risk through sufficient caloric intake prior to exercise or limiting the exercise time to 45 minutes.
- Prolonged exercise should be done in an environment with proper temperature and adequate calorie should be taken with adequate hydration. In studies on pregnant women who do exercises with their tempo in a temperature-controlled environment, the internal body temperature more than 30 minutes increased by less than 1.5 °C and remained within the safe range.

#### **Those Who Do Not Perform Pre-Pregnancy Regular Physical Activity/Exercise**

- Some pregnant women, gynecologists and other health professionals are concerned that regular physical activity during pregnancy will lead to miscarriage, fetal growth restriction, musculoskeletal injury and premature labor. These concerns do not apply to uncomplicated pregnancies. Those who exercise regularly before pregnancy could adjust the intensity of exercise during pregnancy and continue their exercise within safe exercise limits in a controlled manner. Just like in-water pregnancy exercises, weight of the own body should not be imposed on the person doing exercise.
- Under the supervision of a physiotherapist, it should start with simple and basic exercises and gradually increase exercise tolerance.

#### **Signs for Finishing the Physical Activity/Exercise**

- Vaginal bleeding
- Regular painful contractions
- Amniotic fluid escape
- Dyspnea complaint before effort
- Dizziness

- Headache
- Chest pain
- Muscular weakness affecting balance
- Leg pain or edema (thrombophlebitis should be excluded)

### **Physical Activity/Exercise in Special Cases**

Some publications suggested that bed rest that recommended for preventing preterm labor in pregnancy has no convincing evidence. The American College of Obstetricians and Gynecologists states that

"bed rest is not effective for the prevention of premature labor and should not be routinely recommended". Patients with recommended long term bed rest or physical restrictions are at risk of venous thromboembolism, bone demineralization and dysfunction. Although frequently recommended, bed rest is only rarely necessary and, in most cases, should be considered to allow movement.

Obese/gestational pregnant women should be encouraged to make healthy lifestyle changes involving physical activity and rational diet. Obese women should start with low-intensity short-term exercise and gradually increase. Recent studies examining the effects of exercise in pregnant women did not show a side effect of exercise, which provides a moderate reduction in weight gain.

In postpartum period, light abdominal exercises are appropriate after cesarean and then the exercise program is advanced considering wound healing. In order to prevent the increased risk of venous thromboembolism during this period, it is recommended to start breathing exercises and lower extremity pumping exercises as soon as possible.

### **Exact Contraindications of Physical Activity/Exercise**

- Hemodynamically significant heart disease
- Restrictive lung disease
- Cervical insufficiency
- Multiple pregnancies with premature birth risk
- Continuous bleeding in second or third trimester
- Placenta previa (after 26th week)
- Premature birth risk
- Membrane ruptures
- Preeclampsia/pregnancy triggered hypertension
- Severe anemia



**Relative Contraindications of Physical Activity/Exercise in Pregnancy**

- Anemia
- Maternal cardiac arrhythmia
- Chronic bronchitis
- Uncontrolled Type 1 diabetes
- Severe morbid obesity
- Extremely weak women (BMI <12)
- Extreme sedentary lifestyle
- Intra-uterine growth retardation
- Uncontrolled hypertension
- Orthopedic limitations
- Uncontrolled hyperthyroidism
- Uncontrolled seizures
- Heavy smokers

Positive pregnancy test

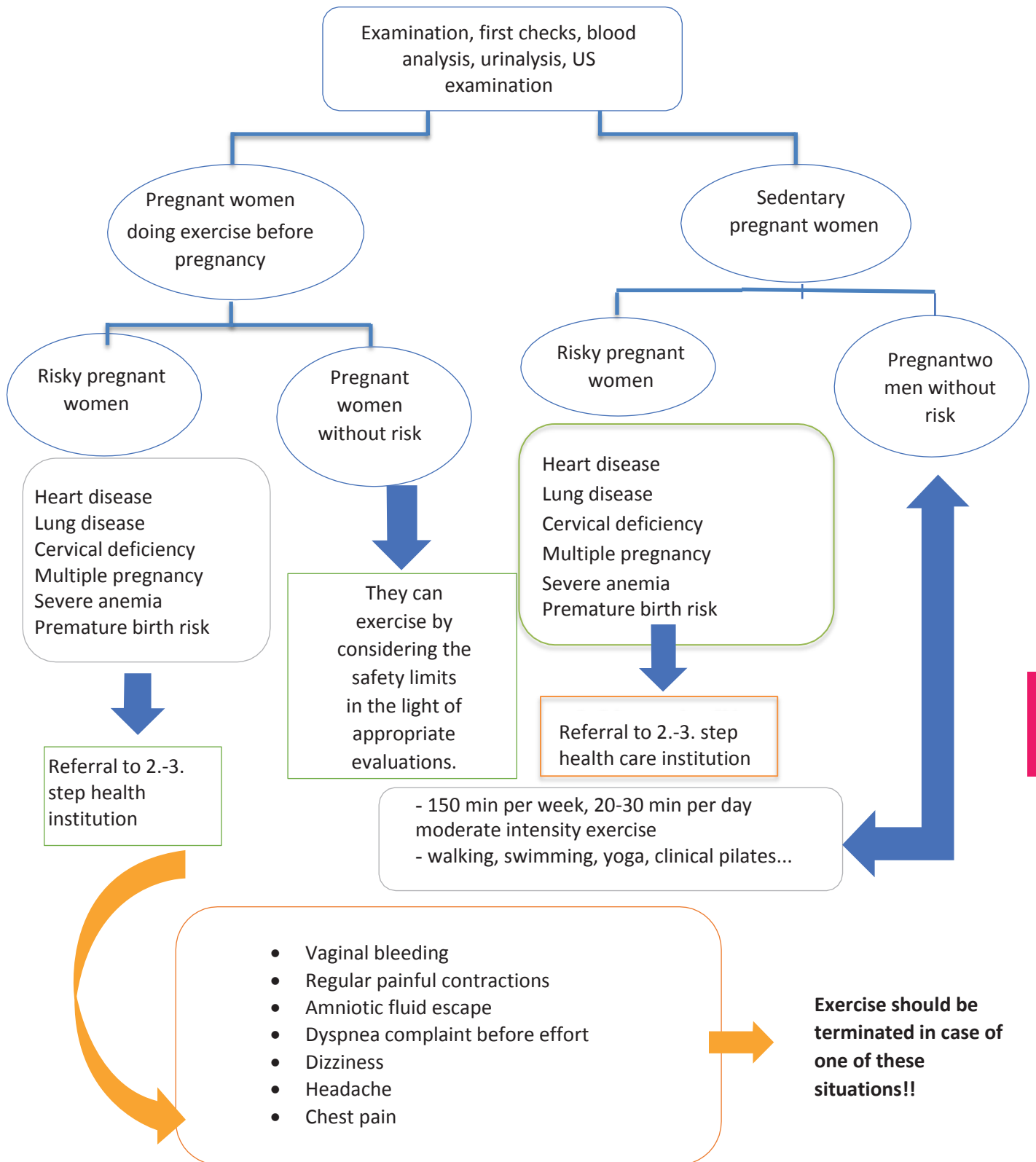


Figure 3. The Physical Activity Algorithm in Pregnancy

**PHYSICAL ACTIVITY AND EXERCISE IN PERIOD OF MENOPAUSE****ABSTRACT**

As the last seen menstruation period, menopause is defined as the end of the reproduction period and the beginning of a new period. The period in which endocrine, biological and clinical characteristics of menopause begin to be formed and which is called as "perimenopause" or "climacterium" includes; "premenopause", "menopause" and "postmenopause" periods.

While the mean age of menopause (mean age at the last menstrual cycle) is 51 years, women usually go through menopause between the ages of 49 and 55. In 1% of women, menopause occurs before the age of 40. This condition called early menopause is known to be associated with high altitude survival, malnutrition and smoking.

The population of pre-menopausal and post-menopausal women is rapidly increasing and constitutes 15-20% of the population in many countries. Considering that the average life expectancy of women is 80 years, it is known that women live one third of their lives after menopause. When the ovaries do not produce enough estrogen in the menopausal period, vasomotor, physical, psychological, and biochemical symptoms occur. Three out of four women experience varying degrees of climacteric symptoms. In addition to these symptoms, there is a significant increase in the number of diseases associated with post-menopausal loss of the activity of sex hormones such as osteoporosis, cardiovascular diseases in parallel with the number of older women in society.

**MENOPAUSE**

As a word, menopause defines the last menstrual bleeding in the woman's life. Both women and health professionals define the term "menopause" as the end of the reproductive period and the end of the menstrual cycle. The decrease in the number of germ cells and hormone-producing cells that protect the follicles in women as the age progresses is the main factor in the loss of menstrual functions. Before menopause, the period in which menstrual cycles become irregular and the first symptoms are seen is called "premenopausal" period. Women, who complete the period of amenorrhea lasting 12 months after the last menstrual period, enter the "postmenopausal" final period. This period lasts from menopause to old age. The "perimenopausal" period is a wider definition and is defined as the period in which unpleasant symptoms experienced by women occur. The climacteric period refers to the years that anatomic and physiologic changes occur and women advance to the infertility period from the reproductive period and the period that covers before and after the last menstrual cycle.

Menopause could be examined in 4 parts by age of onset and type:

- Spontaneous menopause: The cessation of menstrual cycle when it is appropriate, without any surgical procedure or medical treatment.
- Surgical menopause: It is an immediate menopause as result of surgical removal of the ovaries before the natural menopause age.
- Early (premature) menopause: Deterioration of ovarian function before the age of 40 due to any reason.
- Triggered menopause: It is a menopause type triggered by medical factors such as chemotherapy and radiotherapy.

### **Prevalence/Incidence**

Menopause generally occurs between the ages of 45 and 58 across the world, whereas it is between 45 and 52 in Turkey. While the average age of menopause is 51 years in the world, it is 46 years in Turkey. In Turkey, 88.99% of the women entering menopause stated that they entered the menopause by natural ways and 11.01% by surgical method. The rate of women who have postmenopausal bleeding is 11.09% and the mean duration of bleeding is 7 months. Among the problems intensively experienced during the menopause period, hot flush sweating (66.47%) and emotional changes (55.17%) take the first and second ranks, respectively.

### **CHANGES IN THE PERIOD OF MENOPAUSE**

In the post-menopausal period, estrogen production from the ovaries is discontinued. The drop in estrogen production leads to a relative increase in androgens and causes an increase in androgenic characteristics, such as oily skin, acne and virilisation on the face, and affects in a negative manner the lipid metabolism which affects the risk of development of cardiovascular diseases in the long term. In the post-menopausal period, ovaries continue to secrete low-density testosterone in 50% of women. In other 50% of women, there is not a significant testosterone production from ovaries due to complete fibrotic ovaries.

Hot flashes and night sweats are among the most common vasomotor symptoms that occur due to estrogen deficiency in women during menopause. Hot flash is defined as an unpleasant feeling of warmth on the face, head and chest and this warmth may spread in any direction and sometimes occupy the entire body. Hot flashes could be accompanied by palpitations, dizziness, nausea, headache, fainting and night sweats. Night sweats may wake women from their sleep and they often feel the need to change their clothes. Frequent night sweats cause chronic sleep disorders and fatigue, resulting in irritability, mood swings, instability, and concentration disturbances.

Slowdown in basal metabolic rate due to the aging process and increased weight gain in the menopausal period are crucial since posing the risk of obesity.

Estrogen deficiency in menopause results in atrophy of the urogenital tissues, decreased vaginal and cervical secretions and thinner, dry and less elastic vaginal wall. Atrophic vagina is associated with vaginal dryness, pain, vaginal infections and dyspareunia (painful sexual intercourse). Bladder and urethra atrophy leads to urinary frequency, dysuria, urinary incontinence and recurrent urinary infections. Contrary to vasomotor symptoms, atrophy in urogenital tissues does not cure without treatment over time. In addition, changes in sexual function in the majority of women entering the menopause are reported to negatively affect sexual interest, sexual activity and sexual response cycle. Furthermore, another symptom of pelvic floor dysfunction is prolapses, which is clinically diagnosed by grading between 1 and 4 as partial or complete prolapses of anterior or posterior wall of the vagina and also uterus. Since symptoms such as prolapses and urinary incontinence cause discomfort during physical activity, it is reported to be an important factor in decreasing the physical activity level of women during this period.

The majority of women entering the menopause complain of psychological and emotional symptoms. Decreased estrogen levels with menopause lead to decreased cognitive performance and increased risk of dementia in women. In addition, women in the menopausal period report that their quality of life and sense of well-being decrease. Women may often have a depressive mood accompanying to the feeling of worthlessness, crying, anxiety, fatigue, pain and headache.

In menopause, there are many sequels such as osteoporosis and cardiovascular diseases depending on low level of estrogen and resulting in significant morbidity and mortality. The most known effect of estrogen deficiency is osteoporosis and the acceleration of the resulting fracture development (especially in the wrist, femur neck and vertebrae). In addition, postmenopausal women have an increased risk of cardiovascular disease for the relationship between cardiovascular diseases and decreased estrogen levels. The relaxing effect of estrogen on the vessel wall and its decreasing effect on lipid stores on the vessel wall are the most effective mechanisms on atherosclerosis.

Osteoporosis is a disease characterized by low bone mass and deteriorations in micro-architecture of bone tissue. In the first three years following the menopause, bone mineral density decreases and bone loss is the fastest. In addition to these changes in the bone, decreasing muscle mass with age results in an increased risk of falling because of a decrease in both muscle strength and endurance.

**DIAGNOSIS AND FOLLOW-UP**

This period is an opportunity for women to change their lifestyle and to be directed to physical activity, since routine controls should be performed in the perimenopausal period with irregular bleeding. In this period, blood tests, lipid profiles, urinalysis, hormone analyzes, mammography analyzes, bone density measurements, routine evaluation of the patient's needs are important.

**TREATMENT**

It is supported with some researches that hormone replacement therapy (HRT) is effective in prevention of post-menopausal symptoms and illnesses. However, it was shown that this treatment should be planned individually and that early onset of risk-free treatment is effective, that MI risk was increased in patients who started HRT over 60-65 years of age. Also, if menopausal symptoms reduce the quality of life, low-dose hormone therapy is recommended during menopausal transition.

The aim of the treatment of osteoporosis is to alleviate the patient's symptoms and to reduce the risk of fractures and falls. There are many drugs that can be used to prevent bone loss and these drugs significantly decrease fracture susceptibility. It is also important to treat the causes of secondary osteoporosis, such as endocrine disorders or rheumatic diseases. In addition, it is important to assess the dietary disorders and use of corticosteroids. The risk of night falls significantly increases with the change in sleep patterns and responses to drugs and the incidence of nocturia. Given these risk factors, falls could be reduced by initiating appropriate exercise programs that promote walking, stability and strength, avoiding multiple drug use, supplementing vitamin D, evaluating and correcting vision and using assistive devices.

HRT approaches in pelvic floor dysfunctions encountered during the menopausal period, medical approaches that support the continence, as well as importance of exercise training in prevention and treatment, are emphasized.

**The Benefits of Physical Activity/Exercise during Menopause**

In menopausal period, vasomotor symptoms including symptoms such as hot flashes, night sweats and sleep disturbances seriously affect quality of life. HRT was reported to reduce these symptoms but cause serious side effects (increased risk of breast cancer incidence in case of the uses for ten years or more). Studies indicate a decrease in vasomotor symptoms as result of a structured and planned exercise program. It was proved that, 24 hours after a moderate physical

activity, objective and subjective hot flashes decreased. According to the studies, hot flashes are associated with high cholesterol, triglycerides, apolipoprotein A and glucose levels. Regular exercise reduces the symptoms of hot flashes, as it is effective in reducing cholesterol, triglycerides, apolipoprotein A and glucose levels. In addition, it was shown that regular exercise, three times a week, reduces hot flushes and improves the quality of life in women who have depression in menopause because the mechanism here achieves this by causing the physical activity to increase the production of endorphin in the thermoregulatory center in the brain. It is also known that the sleep quality and sleep characteristics of physically active menopausal women are better and the rate of night awakening is less.

Osteoporotic fractures due to decreased bone mineral density during menopausal period cause serious morbidity and indirect mortality depending on decreased mobility. Weight-bearing exercises are important for bone development and maintaining mechanical loading of bone. Exercise training lasting more than 6 months have significant and positive effects on the mineral density of the femoral neck. There are various exercises that benefit osteopenia or osteoporosis in menopausal women. The aim of all of these exercises is to prevent bone loss and increase bone mineral density. In addition, it reduces falls and prevents fractures resulting from falls. We could put the exercises together in a few groups. The first group includes high-effective weight-bearing exercises, such as jogging, brisk walking or running. Exercises such as cycling, skiing or swimming are not considered as weight-bearing exercises. Second exercises are resistant exercises. Strengthening the muscle with resistance exercises serves many purposes. Muscle strength training aims to increase muscle mass and create a physical tampon against bone surfaces and reduce fracture risk. Through the weight lifting training, the pressure signals pass to the bone and bone formation is stimulated. Furthermore, increased muscle strength contributes to the prevention of falls with strengthening collateral muscles. Stretching and balance exercises, which improve mobility and balance, are the third exercise group. These exercises improve the ability to regain the walking stability and balance in women with low bone density, thus preventing falls that lead to fractures.

Somatic symptoms during menopause are body-related symptoms, including muscular and joint pain, extremities or tingling sensation anywhere in the body, dizziness, headache, and shortness of breath. It was reported that physically active women experience less pain during and after the menopausal transition. It is known that regular exercise positively affects somatic symptoms in menopausal women and improves the quality of life.

Participation in moderate exercise is reported to reduce the severity of psychological symptoms in the menopausal period. Psychological benefits associated with exercise involvement are distraction and increased social interaction. Regular walking, cycling, gardening and work-related activities every day were found to improve the mood and psychological functions of menopausal women.

Also the decrease in the diameter and content of pelvic floor muscles with aging leads to changes in muscle function. Therefore, it was reported that the incidence of urinary incontinence is higher in menopausal women in relation to the end of menstruation and the emergence of menopausal symptoms. The principle of pelvic floor muscle training (PFMT) is based on two main tasks of the pelvic floor muscles, one is supporting the pelvic organs and the other is contributing to the urethral/anal sphincters closure pressure. The voluntary pelvic floor muscle contraction provides the urethral closure, stabilization with the compression and movement of the pelvic floor muscles inward and causes resistance to downward movement. Studies investigating the efficacy of PFMT in postmenopausal women reported that it is an effective approach to reducing urogenital symptoms. Therefore, it is important for women to evaluate the pelvic floor muscles in the early period and to apply PFMT.

### **Physical Activities/Exercises in Menopausal Period**

Exercises that can be applied in menopausal period include; the aerobic exercises, resistance and strengthening exercises, exercises for balance and proprioception, in-water exercises and spinal extension exercises, flexibility exercises and exercise practices for special conditions (urinary/fecal incontinence, circulatory disorders, etc.).

#### **Aerobic Exercises**

Aerobic exercises, including walking, swimming, dancing, aerobics, tennis and cycling, are exercises related to the use of major muscle groups. The recommended level of aerobic exercise is moderate physical activity performed every day, at least 30 minutes per week (perceived effort: 12-13) (perceived effort 14-15), or submaximal three days a week.

#### **Resistant Exercises**

Resistance and loading exercises are two major methods that stimulate bone metabolism. Exercises involving loading forces are reported to have a significantly better effect on bone metabolism and reduce the risk of bone fracture with the help of gravity and muscular overload as compared to resistant training without loading such as weight lifting.



However, since other joint limitations such as osteoarthritis, disc herniation, vertebral fractures and knee problems are observed in the geriatric population, the loading exercises are not always applicable in this population. Therefore, the resistant training without overload is recommended in the geriatric population.

In order to maintain or ameliorate the bone density of the hip and femur in the postmenopausal women, moderate to vigorous resistant exercises (70-90% of a maximum repeat) should be performed 2-3 times a week, with 8-12 repeats for each exercise and 3 to 4 sets a day. Studies demonstrate that dynamic, vigorous-intensity and short-term exercises stimulate bone formation. Accordingly, it is reported that resistant exercises, which are performed 4 times a week, with high intensity (70-90% of a maximum repeat) and dynamically (resistance + speed = strength training), trigger muscular contractions by stimulating Type II muscular fibers associated with bone formation. Particular emphasize should be given on abdomen, back, pelvic floor, hip circumference, femur and arm muscles, which are among the important muscle groups.

### **Balance and Proprioceptive Exercises**

When vertebral fractures occur, collapses occur in the vertebral body and this may trigger loss of balance by triggering the anterior-posterior oscillations of the body. In addition to this, the decrease in the sensitivity of the proprioceptors in the paravertebral muscles affects the flattening of the trunk and leads to an increased risk of falling. In postmenopausal women, exercises that improve posture and balance together with walking training are very important. At first, it should include walking training involving run of the muscles including hip flexors, knee extensors and thumb extensors. Some exercise recommendations that improve walking and balance include; broad-based gait, walking in different directions, toe tipping, small jumps, weight transfer from one leg to another, standing on one foot and coordination exercises for upper and lower extremities. In addition to balance training, proprioceptive training is also important for improving postural control. Strengthening and proprioceptive exercises are needed to be performed together for improving the mobility.

### **In-Water Exercises**

In-water exercises involving swimming or vertical water exercises lead to little or no loading on the bone. Reduction of the gravitational force in the water makes the in-water exercises more comfortable and easier to tolerate in the elderly population with joint diseases and obesity. In-water exercises improve the balance and muscle strength, as well as stimulate the body muscles that control the balance of the body.

**Spinal Extension Exercises**

The increase in kyphosis angle in the thoracic curve with aging in postmenopausal women is one of the most common problems. Spinal curve changes lead to changes in balance, posture and body image, muscle spasm, tendency to fall, changes in the apophysical joints of vertebra, causing physical and psychological problems. Anterior vertebral compression fractures occur in many patients with kyphosis. The tonus of paravertebral muscles plays an important role in improving postural alignment. Therefore, spinal extension exercises are recommended in postmenopausal women for the prevention of vertebral fractures and improvement of postural alignment.

**Flexibility/Stretching Exercises**

In order to increase the flexibility of muscles in case of short and spasm, they should be applied with at least 2-4 repeats and 2-3 sessions per week and at least 15 sec at the final point in addition to the normal exercise program.

**Pelvic Floor Exercises**

Two main theories were suggested on how pelvic floor muscle training could be effective in the prevention and treatment of incontinence:

1. The women consciously learn to flex prior to or during increase in abdominal pressure and as a behavior modification, maintains these contractions to prevent the pelvic floor from moving downwards.
2. To increase the structural support and durability of the pelvic floor, the women are taught regular force training over time.

**Exercises in special cases**

Exercise practices for additional problems such as urinary/fecal incontinence, circulatory problems, and respiratory problems should definitely be included in the program after appropriate evaluations.

**Recommended Activities**

Brisk walking, dancing, aerobics, step, callisthenic exercises, cycling, swimming, jogging, clinical Pilates, Yoga etc. activities could be performed singly or in company with a group.

**Indications**

Physical activity should be specially planned and given in the light of personal assessments for both primary and secondary prevention in the pre- and post-menopausal period. If safety limits are taken into account while physiotherapies are added other than hormonal therapies, it would gain advantage without any problems.

**Contraindications**

There is no contraindication in referral to physical activity, if the patient does not have any known acute disease and risk factor or impairment of general health status.

**Recommendations**

- Physical activity programs should be planned individually and interim evaluations should be made for loading and the dosage (frequency, duration, intensity) should be gradually increased.
- The exercise program should include preventive and therapeutic approaches to all problems involving the menopausal period.
- Nutrition recommendations for prevention and treatment of menopausal risks should be absolutely included in the programs along with physical activity programs.
- Attention should be paid to appropriate environment and clothing adjustments during physical activity and exercise programs.

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# SECTION 11

## PHYSICAL ACTIVITY AND EXERCISE IN INFECTIOUS DISEASES

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# A

## BSTRACT

Physical activity may contribute to the development of body resistance and protection against infections. The incidence of infection is higher in physically inactive people than the people doing regular physical activity. However, in case of infection, physical activity may cause some medical risks for the individuals and their surroundings.

Infectious diseases may occur due to viruses, bacteria, fungi and parasites. The most common infections in the community among the acquired infections are upper respiratory tract infections. The most common form of upper respiratory tract infections is the common cold. Usually caused by viruses, the common cold is generally a mild form of and self-limited infection, as well as it may cause complications such as the development of sinus, middle ear and lung infections due to secondary bacterial infections. Although viruses are considered as the primary cause of sore throat (tonsillopharyngitis), incidence of beta-hemolytic streptococcus as a factor is also high.

Infectious mononucleosis is a systemic viral infection of which main finding is sore throat and which courses with fever, weakness, fatigue and enlargement of the lymph nodes in the neck. Infectious mononucleosis can show a prolonged course, requiring specific recommendations for careful follow-up and physical activity. The virus spreads through the blood vessels to the reticuloendothelial system, particularly where proliferation of T-lymphocytes occurs. As a result, the spleen could grow in varying degrees and become fragile. In cases that increase intra-abdominal pressure such as weight lifting, the spleen may spontaneously rupture and cause life-threatening bleeding. The risk of splenic rupture may be increased in physical activities such as contact sports where pressure or impact is probable.

Heart muscle infections (myocarditis) may develop depending on some viruses and bacteria and pose a special problem in sports medicine. Acute diarrhea (gastroenteritis) may affect physical performance due to fluid loss. The reduction in plasma volume caused by diarrhea induced fluid loss and the fluid loss as result of sweating during physical activity may lead to collapse. A previously undiagnosed heart disease may become apparent. Rarely, myocarditis may develop as a complication of infectious gastroenteritis.

The infection of "human immunodeficiency virus" as part of the retrovirus family (HIV) virus, HIV) is a chronic condition associated with disability, decreased exercise capacity and impairment of daily living activities.

Skin and soft tissue infections rarely limit physical activity. Herpetic infections could spread among people in contact sports and epidermophytosis (athlete's foot) could also be seen frequently.



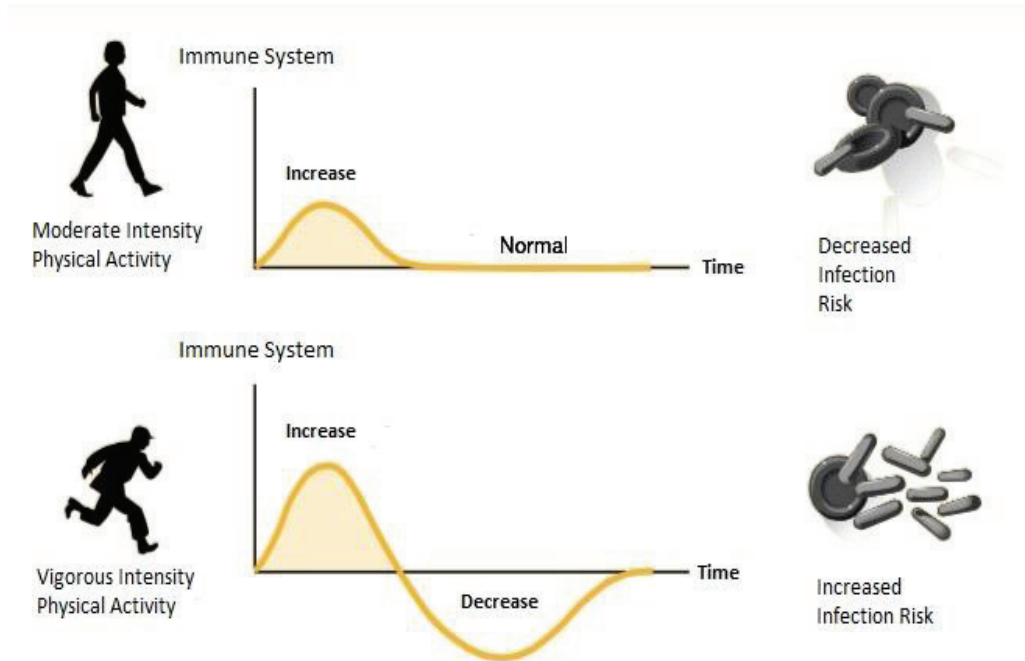
**How is physical activity affected by infections?**

In order to limit the infection in fever infections, the body begins to fight microorganisms such as viruses or bacteria with antibiotics and some changes occur in metabolism. This effort may affect various organs and tissues. Amino acids are used to increase the synthesis of immunoglobulins and immune cells and the presence of fever further increases the energy need, causing the metabolism to accelerate. In addition, anorexia is a general symptom associated with fever and the body is then activated to use its own private depots as a source of energy. Fat depots are not used effectively for fever infections; instead, amino acids collected from striated muscles are used. This quickly creates a negative nitrogen balance. Although there are interpersonal differences, muscle strength decreases by 15% in case of a long term infection.

Bed rest is seen as part of the treatment of febrile infections due to a decrease in muscle strength. Inactivation of the muscle to produce the energy required for the immune system leads to a decrease in the aerobic capacity by 25%. In this case, both infection and bed rest are a disadvantage for physical activity. Aerobic capacity decreases along with muscle strength and endurance in the infections coursing with fever. This negatively affects a person's ability in daily living activities.

**Physical activity both activates and suppresses the immune system**

In general, physical activity protects the body against infections by activating the immune system. A person who begins a progressive regular exercise could strengthen the immune system. Vigorous aerobic exercise more than one hour gives strong stimulation to the immune system, however, but it temporarily weakens immune functions immediately after the exercise program (Figure-4). In this period, the sensitivity to infection is temporarily higher. This effect may be seen in the persons doing physical activity both trained and untrained. This decline in immune functions depends on the intensity and duration of exercise. Usually, such as decrease is observed in the immune system in physical activities more than a few hours a day. Therefore, resting periods are very important while physical activity is planned.



**Figure 4.** The Effect of Exercise on Immune System  
(Cited from Source 4)

## HIV INFECTION

### Definition

It is a disease in which the human immunodeficiency virus penetrates the immune system, causing the body of the individual to be vulnerable to opportunistic infections. The individual can survive for many years without any sign of the disease.

### Prevalence/Incidence

According to the UNAIDS 2016 report, there are 36.7 million people across the world infected with HIV. 34.9 million of these people are adults. The incidence is 2.1 million people and 1.9 million of which are adults.

### Causes

This disease caused by HIV is transmitted through sexual contact, infected blood and blood products, and from mother to baby by vertical passage.

### Prognosis

The disease can be asymptomatic for many years. If the necessary treatment is not received, the disease progresses to the Acquired Immunodeficiency Syndrome (AIDS). Life expectancy was prolonged with antiretroviral therapy (ART) and HIV infection is accompanied by many comorbid diseases such as cardiovascular diseases, cancer, respiratory and skeletal musculoskeletal disorders.

**Treatment**

The main aim of ART is to provide viral replication to be suppressed and immunological functions to be protected, to be able to generate a continuous virological, immunological and clinical response, to achieve the best possible quality of health and life by reducing the HIV-related morbidity and mortality and to extend the life span of the patient.

**Effects of physical activity in the persons with HIV**

Low aerobic endurance was distinctly reported in HIV-positive patients. Antiretroviral drug therapy reduces the amount of oxygen taken by the muscle. These people have lower blood hemoglobin levels and blood volume and smaller muscle masses. This causes low aerobic capacity.

Exercise training is important in terms of general health protection in HIV-positive patients. The available evidences suggest that exercise training improves aerobic capacity, muscle function, functional ability and quality of life. In these patients, the combination of aerobic exercise and resistant exercises reveals positive effects.

**Indications**

The benefit of physical activity for adults with HIV was demonstrated in many studies. However, no consensus could be reached on the most effective level of physical activity.

HIV-related disability is associated with decreased physical activity and disruption in daily living activities. Research demonstrates that physical activity in people with HIV increases aerobic capacity, muscle strength, flexibility and functional capacity. Therefore, physical activity should be recommended in disease rehabilitation.

Resistant exercise increases body composition and lean body mass. Aerobic exercise stimulates the hormones that provide water retention in the kidneys; this increases blood plasma. It also supports the production of plasma protein, which leads to more blood plasma. Increased blood plasma volume reduces blood viscosity and increases blood flow, especially in small blood vessels. As a result, increased blood flow also increases the use of oxygen during exercise.

Physical activity is a recommended intervention also for combating the side effects of ART and comorbid diseases for people with HIV.

### Physical Activity Prescription

Although there is not a definite physical activity prescription for all individuals and moderate intensity physical activity is recommended for benefit, physical activity prescription varies from one person to another.

In the literature, the majority of the exercises associated and described with healthy life are moderate activities.

Detailed clinical assessment and risk analysis should be made for HIV infected persons and evidence-based exercise prescriptions should be prepared. The physical activity prescription of the person should be determined by evaluating the functional capacity, the drugs used and the available symptoms.

For aerobic exercise:

- heart rate between 50-70%
- average period 40 min (10 min warm-up, 15-20 min exercise and 10 min cool-down)
- frequency 3 days a week

Resistant exercise:

- 60-80% of a maximum repeat (the amount of weight that can be lifted at once)
- 3 sets
- 10-12 repeats

### Contraindications/Risks

Conditions that pose contraindication to physical activity in those with HIV infection are the contraindications specified in infections-specific general contraindications section of the guide and in case of other accompanying diseases (such as cardiovascular diseases, orthopedic and neurological diseases).

## MYOCARDITIS

### Definition

Myocarditis is a disease table that develops following influenza-like symptoms such as fever, shivering, headache, muscle pain, general weakness and gastrointestinal symptoms such as loss of appetite, nausea and diarrhea.

Myocarditis has a special place in sports medicine because of the occurrence mechanism of the disease. It is especially important in terms of involving the heart which is an organ affected by aerobic activities.

**Prevalence/Incidence**

The exact incidence is unknown because of the difficulties in diagnosing viral infections and myocarditis. Since non-invasive community-based comprehensive studies could not be made on the epidemiology of myocarditis, a definite prevalence could not be given.

**Causes**

While the most common cause is viral infections (Adenovirus, Enteroviruses, hepatitis C virus, HIV), bacterial, helminthic and protozoal causes may also lead to myocarditis.

**Prognosis**

Prognosis is usually good in acute myocarditis with or without pericarditis. Myocarditis could be cured in 2 to 3 months without leaving sequelae; however, recuperation may take longer in rare cases.

**Treatment**

Patients with myocarditis with asymptomatic or mild cardiac symptoms should be followed in hospital, taken on bed rest and monitored. Symptoms should be treated in cases with arrhythmia and cardiac insufficiency.

Myocarditis is treated in three steps; If the cause is known, treatment for the causative agent, hemodynamics regulating modalities and interventions for cardiac dysfunction.

**Effects of Physical Activity****Prevention**

Physical activity has no role in preventing disease development.

**Treatment/Indications**

Physical activity should be avoided as much as possible in the treatment of the disease. Bed rest is important for recovery.

**Physical Activity Prescriptions**

Physical activity is not recommended in the case of myocarditis. If there is no symptom in patients with acute myocarditis, left ventricular function is normal and arrhythmia complaint was diminished, the patient may be allowed to do normal sports activities within 6 months.

**Contraindications/Risks**

Since there is no early marker of myocarditis, it is recommended to avoid vigorous exercise in the early period of respiratory infections.

**4. General Recommendations on Infection and Physical Activity**

- Vaccination-related records should be updated and necessary vaccinations should be completed
- Contact with infected people should be minimized
- Appropriate distance should be left with the people having cough or nasal flow and those wearing a mask
- Hands should be washed regularly
- Each person should have a separate towel and care should be given to hand hygiene
- Common use of tools and equipment should be prevented
- Diet should be restricted with adequate protein supplementation
- If any, diet or fast weight loss programs should be left
- Before an vigorous and prolonged exercise, a sufficient amount of carbohydrates should be taken to prevent the suppression of the exercise-related immune system
- 8-hour sleep a day is recommended
- Life stress should be kept minimum

**5. Infection and Physical Activity Risks****Personalized Risks**

- The risks of physical activity during infection vary according to the intensity and type of activity as well as the location and degree of infection and active microorganism. Intensive/long-term physical activity reduces protection against infections and worsens infection. It may also worsen the myocarditis, which is an important complication of an asymptomatic infection. If the person is a trained athlete, this risk rate is higher compared to the one doing regular exercise. For this reason, recommendations should be personalized.
- The nervous system is usually affected and the motor coordination capacity is impaired in the case of the infections caused with fever. This will especially affect the performance capacity, so a higher level of attention is required during the activity. The risk of injury of joint, tendon and ligament structures increases if this is not met.
- The people with fever ( $\geq 38^{\circ}\text{C}$ ) are always recommended resting. The patients, who have a body temperature more than normal by 0.5-1 C and more, pulse rate showing an increase of 10 or more per minute and general symptoms (such as fatigue, headache, muscle pain, joint pain), should rest.

- Generally, if fatigue is seen alone or together with other symptoms (muscle pain, muscle sensitivity, joint pain, headache), rest should be recommended until these symptoms are eliminated.
- In all infections, care should be taken in the first 1-3 days of infection, even if there is no fever. Within this period, the body defense system is activated and the signs of infection become more evident. Severe infections usually have prodromal symptoms lasting 1-3 days. After this period, serious findings of infection emerge. If the symptoms do not worsen later, physical activity could be started gradually. However, if there are other symptoms such as sore throat, cough, hoarseness, activities should be more restricted according to the intensity of the symptoms. Care should be taken in the sore throat without any other symptoms until the symptoms are eliminated. Rest is recommended in streptococcal tonsillopharyngitis until symptoms are eliminated. Care should be taken in the first one week of treatment because of residual bacterial toxins.

The first day of the disease in upper respiratory tract infections;

- vigorous physical activities should be avoided in the case of symptoms such as sore throat, cough, nasal flow or nasal obstruction.
- all physical activities should be avoided in the case of symptoms such as muscle/joint pain and headache, fever and weakness, diarrhea or vomiting.

The second day of the disease;

- Exercise is not recommended if the person has fever, vomiting and cough.
- If fever or weakness is not observed, light physical activities (for 30-45 minutes with the heart rate <120 beats/min) are recommended.

The third day;

- Contact your doctor if fever and upper respiratory tract infections continue.
- If there is no fever or weakness and worsening of the initial symptoms, moderate exercises (for 45-60 minutes with a heart rate <150 beats/min) are recommended.

- In infectious mononucleosis, athletes engaging in sports requiring contact such as football, wrestling should not do sports for 4-6 weeks from the onset of symptoms. The enlarged spleen is fragile and it may be ruptured in situations such as impact, weight lifting. It takes a long time for the spleen to reach its normal size and density.
- Vigorous physical activity should be avoided in the cystitis and gastroenteritis.
- In skin infections, recommendations should be at a personal level. Minor superficial skin infections do not pose an obstacle in front of exercising. For people who engage in contact sports (such as wrestling, etc.), dermal herpes infection is outside of this.

Even in the presence of minor herpes infection, activity should be avoided until the vesicle is crusted. For erythema migrans, resting is recommended during the first week.

- People with genital infections should avoid vigorous exercise. For asymptomatic genital chlamydia infection, limitation of physical activity during antibiotic treatment is an appropriate approach.
- Asymptomatic HIV infection is not an obstacle to exercise and sports. Even, exercise has vital importance on the quality of life of the patient with many HIV infections.
- In most of the febrile patients, exercise can be resumed gradually after the fever is relieved. If unexpected cardiac symptoms occur (such as dizziness, chest pain, arrhythmia), exercise should be stopped and a medical examination should be performed. In this case, myocarditis associated with many infections may have developed. Myocarditis may also develop without signs of infection. Patients with acute myocarditis are recommended to return to normal sportive activities within 6 months (no symptoms, normal left ventricular function and no arrhythmia). During exercise, worsening is a serious symptom and an emergency cardiac examination is required. In such a case, acute coronary syndrome should also come to mind in the middle age group.

#### **Environmental Risks**

- In athletes, warts should be treated as they may spread to the environment.
- In close contact with wrestlers, infections may be transmitted. Herpes gladiatorum is one of them. It is caused by contact with herpetic skin lesions from person to person. Epidemics were reported among wrestlers.
- Among the athletes, respiratory tract infections may spread through droplets or by contact with contaminated items. In addition, heavy or long term exercise may increase the sensitivity to respiratory tract infections by weakening the defense mechanisms.
- Athletes with HIV infection may involve in sporting activities as others. In sports with a high risk of contact with blood (wrestling, boxing, etc.), the physician of an HIV-positive person should inform the person about the risks of transmission. Since the diagnosis of HIV infection of the athletes due to patient confidentiality cannot be known unless it is approved by itself, it is thought that a general restriction cannot be applied.



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# SECTION 12

## PHYSICAL ACTIVITY AND EXERCISE IN ORTHOPEDIC PROBLEMS

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## POSTURAL PROBLEMS AND DEFORMITIES

**Posture**, is the position of the body segments to each other and their compatible placement with each other. It is known to be the least stressed position on the body. Usually, it is associated with static positions of body. It is a position where body mechanics provide maximum level of biomechanical competence with minimum energy consumption.

**Ideal posture** requires minimum muscle support; reduces stresses to muscles and ligaments and minimizes stresses to joints. The upright posture, first of all, requires a well-balanced head posture on the vertebral column and the pelvis, then on the feet. All postures outside the ideal posture are considered abnormal postures. Abnormal postures are common in all societies and lead to some light-to-vigorous musculoskeletal system problems.

Problems or risks caused by abnormal postures include:

- Mechanical problems of the musculoskeletal system,
- Pain, stiffness, dysfunction,
- Increase in stress on the ligaments and muscles,
- Increase in load on the joints,
- Increased energy consumption to provide body mechanics is unnecessary and excessive muscle activity.

Depending on these risks, lumbar neck pain, disc pathologies, degenerative changes in the joints and osteoarthritis may be seen in advanced stages. Different deformities may occur in the spine, knees and feet.

The most common postural problems and/or deformities due to postural disorders include:

Spinal curvatures (scoliosis), increased lumbar lordosis or thoracic kyphosis, round shoulders, loss of cervical lordosis, straight head tilt, femoral anteversion in the hip, genu varum in the knee, genu valgum, tibial torsion, genu recurvatum, standing varus or valgus deformity, pesplanus, pes cavus, cubitus varus and valgus in the elbow.

As a mechanical and complex structure, the spine has 3 basic functions. These are to;

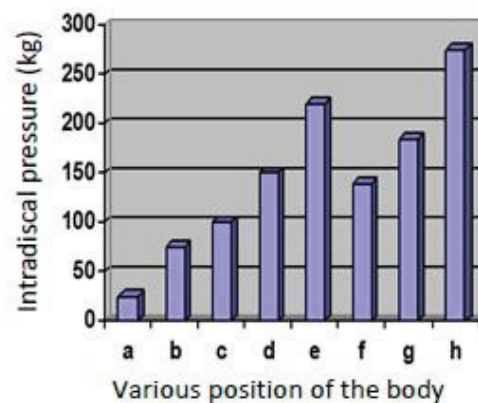
1. Transfer the head and upper part of the body and the loads carried to pelvis,
2. Ensure the trunk mobility by providing trunk stabilization,
3. Protect the spinal cord.

Static loading on the spine affect the whole body and leads to severe postural deformities such as scoliosis, kyphosis, pelvic tilt. In addition, as a result of abnormal load distribution, it also disrupts lower extremity biomechanics and causes some alignment imbalances in the lower extremity. It also creates pressure on some internal organs in some cases such as scoliosis and kyphosis.

Conditions that increase the static loading on the spine could be listed as especially long standing, weight bearing, incorrect sitting, wrong body mechanics and incorrect ergonomic principles. Factors leading to static load in the spine depend on the position of the object according to the movement center of the spine, the shape, size, weight and intensity of the object, the degree of flexion and rotation of the spine and the loading rate. Therefore, individuals should be educated on the protection of spine against static load and the posture while doing some functional activities such as upright position, sitting, weight lifting or bending.

Below are loads of loads on the L3 disc in different positions.

- a. Lying on back
- b. Lying on side
- c. Standing upright
- D. Standing forward bending
- e. Standing leaning forward with weight lifting
- f. Sitting upright in chair
- g. Leaning forward in a chair
- h. Leaning forward and lifting weight in chair



For example, standing and walking for long time may lead to overload and compression to the joints of the vertebral column and also an increase in the intradiscal pressure. Likewise, it increases cartilage loading and causes cartilage destruction. In the studies, it is indicated that 2 hours of standing leads to stress on waist mechanics and low back pain; resting for 10 minutes restores the muscle activity in the spine by 25%. Therefore, the rest intervals given during the spine loading are quite important.

If major loads are imposed on the vertebral or peripheral joints or in the case of extreme external overload as result of lifting any weight or exposure to long term repetitive micro traumas, soft tissue injuries, such as tendinitis and bursitis, occur. Various degrees of cartilage tissue destruction are seen in the joints. Furthermore, patients with osteoporosis due to aging or other causes may have vertebrae, pelvis, metatarsal bones, femoral head and neck fractures or fatigue fractures.

In order for postural problems and simple deformities not lead to more serious deformities and secondary problems, it is of great importance to detect those by primary healthcare physicians and to refer to relevant health professionals (orthopedists and/or physiotherapist). Postural problems do not require surgery; however, it may be needed if deformities, refractory pain, loss of function, deterioration in quality of life and in cases where vital needs lead to deficiency such as shoe-wearing cannot be come through by physical treatment methods. In this case, the patient should be directed to orthopedics for surgical correction. These issues will be discussed under the related titles.

### **Low Back and Neck Problems**

Low back pain is a common and significant health problem such that it is costly for society due to direct and (diagnosis and treatment costs) and indirect (loss of labor force) economic losses, as well as its negative effects on the quality of life. The disability caused by chronic pain became one of the most important factors affecting the loss of labor and decrease in production especially in developed countries.

In the United States, it is reported that 25 percent of all workday losses occur due to low back pain and that it causes 20 million work-day losses per year and sickness absence nine days per patient.

Since it is not possible to determine the exact etiology in the majority of patients with low back pain and to reveal the source of pain, it should be taken into consideration whether or not the source in the diagnosis is mechanical; In the treatment, the approach to improvement of pain and functional disability should be targeted. In the treatment of chronic low back pain, it is generally stated that a single treatment method is ineffective and multidisciplinary treatment approaches rather than a single treatment method and exercise programs with active participation of the patient and low back protection training are recommended.

70-90% of individuals in today's societies were found to have low back pain at least once in any period of their lives. According to an important study conducted in Turkey; in 1120 patients, 37.4% of women and 44.4% of men had low back pain due to disc pathologies.

Low back pain is classified as acute, subacute and chronic by durations. Low back pain that lasts up to a month is defined as acute; between 1-3 months as subacute and more than 3 months as chronic. While 75-85 percent of patients with acute low back pain could recover without any treatment within 6-8 weeks during first acute attack, 38% of the patients experience a second attack

within a year. 41% of patients with subacute low back pain and 81% of those with chronic low back pain may develop a new acute attack within the same year.

There are some risk factors affecting the incidence and prevalence of low back pain. These could be classified as occupational, personal and psychosocial factors.

1. Occupational risk factors:

The main factors leading to low back strain and pain and labor loss could be classified as; professions requiring heavy bodily labor, heavy lifting, pulling, turning, lifting by turning, asymmetrical heavy lifting, bending, static work situations (long sitting or standing), vibration and driving.

2. Personal risk factors:

- a. Age: The first episode of low back pain usually occurs at the age of 25-30 years. The prevalence increases with the beginning of the working years. Low back pain is more common around the age of 55 years.
- b. Gender: The risk is similar in both sexes until 60 years of age. Women who are over 60 years of age are at a higher risk due to osteoporosis.
- c. Race: White race (5.8%) has low back pain more than black race (3.7%). However, there are some studies demonstrating that there is no racial difference in low back pain.
- d. Level of education: In some studies, low level of education was shown to be a risk factor for low back pain.

3. Anthropometric factors: In some studies, obesity and height were shown to be risk factors for low back pain.

4. Postural factors: The role of leg length inequality, scoliosis and other postural changes in low back pain is contradictory.

- a. Spine mobility: In most cases of low back pain, there is some restriction in the range of motion of the lumbar region.
- b. Muscle strength: Many studies showed that the strength of abdominal and spinal muscles is reduced in patients with low back pain.
- c. Physical fitness and exercise: Low physical fitness, weakness of trunk muscles, loss of flexibility in the vertebral column and incorrect exercises may play a role in low back pain.

5. Smoking: Many studies found a relationship between smoking and the frequency and duration of low back pain. Possible mechanism explained; decrease in the diffusion required for feeding to the intervertebral discs and increase in the intradiscal pressure as a result of frequent coughing. The incidence of osteoporosis is also known to increase by smoking.

6. Pregnancy: Tendency for low back pain increases by hormones in pregnancy. Especially in the last period of pregnancy, the load on the pelvic ligaments increases.

7. Psychosocial risk factors: Patients with chronic low back pain have higher rates of depression, anxiety, hypochondriasis, hysteria, alcoholism, divorce, tension headaches and other factors.

Neck pain is a common health problem in societies such as low back pain. It is seen in similar rates in all ages and sexes. One in every 3 people in the community suffers neck pain at least once in their lifetime. The majority of neck pain is light and temporary. Rarely, it can be very painful, even heavy enough to cause disability. Nowadays, neck pain is common in computer users, especially those working at desk. The incidence of neck pain increases with age. Tensions in daily life and work stress increase neck pain. Findings such as disc pathology back-shoulder pain, numbness in the hands, dizziness, imbalance and headache may also be seen together with neck pain. Neck pain may occur gradually due to postural disorders and mechanical loading, and may also occur suddenly due to major traumas such as traffic accidents (whiplash injury).

### **Early Diagnosis and Treatment**

#### **1. Early diagnosis, prevention and referral**

- The family physician should carefully assess the patient about the risk factor.
- He/she should educate the individual about low back and neck health and the activities that he/she should do.
- Patients with high risk factors should be given importance for low back pain and followed closely.
- Groups with high risk factors should be trained in proper body biomechanics.
- For a more detailed assessment or exercise program, the patient should be directed to the physiotherapist and the program of physical activity personally designed should be followed.

If necessary, opinion from other relevant experts should also be obtained.

#### **2. Intervention in Emergencies**

For lumbar region fractures; advanced age (9%), long-term steroid use (33%), severe trauma (11%), contusion and abrasion (62%), and the presence of many red flags (90%) pose a risk, while malignancy history for spinal metastasis (33%) does. These patients require an emergency evaluation and urgent intervention according to the result.



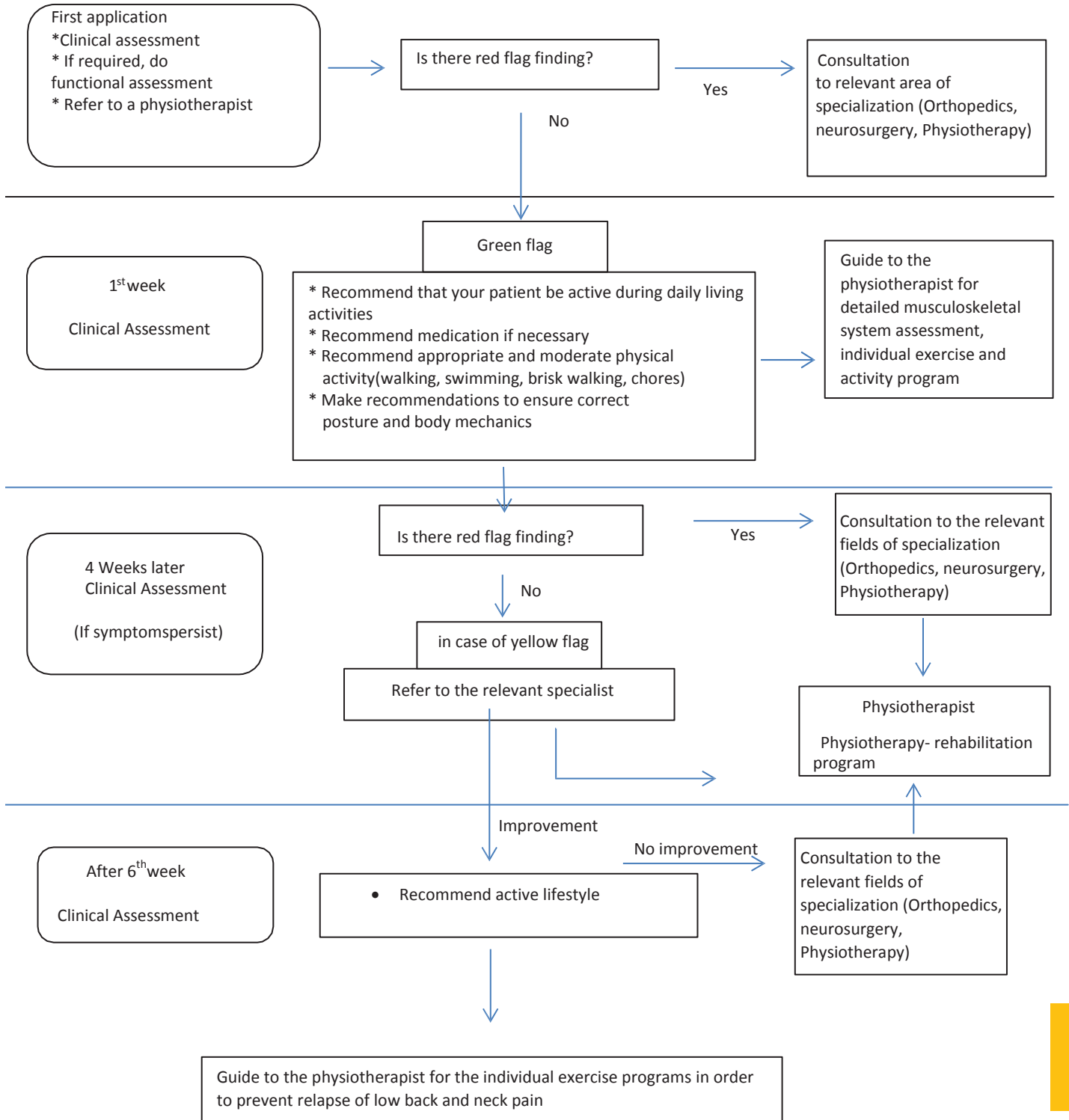
***Emergencies identified as a Red Flag in Low Back Pain:***

- Starting age <20 or >55
- Severe trauma like falling down from height, traffic accident
- Continuous, progressive, non-mechanical pain
- Thoracic pain
- History of carcinoma, use of systemic steroids, abuse of substance, history of HIV
- Serious, resistant restriction in lumbar flexion
- Common neurological findings
- Structural anomaly
- Sedimentation >25 mm/hour

**3. Surgical Treatment**

Surgical indications in low back and neck problems are confirmed in case of severe pain causing loss of work force for 3 months and more and neurological losses proved in electrophysiological tests. In addition, recurrent painful attacks, permanent deformation in the quality of sleep and life may be evaluated as indications of surgery.

**LOW BACK AND NECK PROBLEMS**



**Figure 5.** Low Back and Neck Problems

## Training for Physical Activity and Correct Body Mechanics

### 1. Prevention and Physical Activity

Applications and modifications for risk factors include:

Some changes in lifestyle:

- Elimination of obesity to reduce joint loading
- Ensuring proper posture and proper body mechanics
- Avoiding static positions (remaining stable in front of PC formore than 30 minutes)
- Teaching correct sitting and lying positions
- Adopting a physically active lifestyle
- Implementation of simple home exercise or office-type exercise program
  - ✓ Posture exercises
  - ✓ Isometric and isotonic exercises
  - ✓ Stretching exercises to ensure flexibility
  - ✓ Respiratory exercises and respiratory control
- Personalized aerobic exercise program should be organized (especially swimming, walking, pilates,yoga)
- Teaching the correct body mechanics during weight lifting and functional movements
- Environmental regulation to be suitable for body mechanics (ergonomic regulation)
- Recommendations for choosing suitable footwear and clothes
- Giving auxiliary tools if required

### 2. Regulation in Static Positions:

#### Lying position

Loads on the lumbar region are minimal in a well-supported lying position. If the knees become stiff in extension, lumbar lordosis increases and loading in the region increases. The psoas muscle is relaxed by flexing the hip and knees; accordingly, lordosis decreases and the loads on low back reduce to minimum.

**Relaxed and unsupported sitting position**

The gravity line goes forward in the unsupported and relaxed sitting. The pelvis is tilted towards the anterior, the normal lordosis disappears. Load in the lumbar region is much higher than the standing position.

**Upright sitting position**

In the upright sitting position the lumbar lordosis increases with the pelvis tilted to the forward. Loads on the lumbar region are reduced; however, they are still more compared to standing upright position.

**Seat-supported sitting position**

The load imposed on lumbar region in the back support sitting position is less than that in unsupported sitting position since some part of upper body weight is eliminated.

With the increase of the forces on the intervertebral joint, degeneration occurs in the joints and low back pain develops. For this reason, upright sitting position on a chair (preserving normal lordosis in the low back, with appropriate height and not too soft) suitable for lumbar biomechanics should be a preferred sitting position for low back - neck health.

**Osteoarthritis**

Osteoarthritis (OA) is the most common joint disease in Turkey as in all societies. Osteoarthritis is a degenerative joint disease that mainly affects the articular cartilage as well as the ligaments in the joint and the bone beneath the cartilage. Some problems, such as osteoarthritis, occur in the peripheral joints against static or overloading on the musculoskeletal system. OA is associated with aging and usually begins after the age of 40. According to the World Health Organization (WHO) estimates, roughly 25% of adults over the age of 65 all over the world have pain and loss of function due to this disease.

High evidential risk factors causing osteoarthritis in the hips and knees are:

- Biomechanical factors
  - ✓ acute (injury)
  - ✓ chronic (overload and instability)
- Gender (female), age (aging) and genetics
- Increased body mass index or obesity
- Major or minor traumas
- Joint laxities or instabilities

- Lower extremity alignment disorders and standing pronation deformity
- Previous operations or injuries
- Reduction in proprioception
- Physical inactivity
- Working in a static posture for long time (working by sitting at a table or standing for long time)
- Professional postures or sportive activities (sitting in poor postures or knees bending and kneeling for a long time, prolonged vibration exposure, repetitive forward bending, repetitive movements overstraining or overloading the joints, sportive activities such as crouching or jumping)
- Excessive and vigorous physical activity
- Sports performed at extremely vigorous levels or when tired
- Use of hard floors during sports or activities
- Use of unsuitable shoes

### **Prevention and Treatment and Physical Activity**

#### **Prevention and physical activity**

- Patient training
- Weight control
- Personal exercise and physical activity programs (swimming, walking, aquatherapy, Tai-Chi, Yoga, Pilates)
- Personal physiotherapy and rehabilitation programs following detailed musculoskeletal assessment
- Lifestyle modification (active life, avoidance of heavy activities causing strain and load on joints)
- Joint protection program (avoiding static positions such as long term standing and sitting, protection from loads on joints through activity modification, rest breaks during activities, using orthotic support and walking aids if necessary)
- Selection of shoes with soft sole, flexible structure and ideal heel height (for men: 1.5-2 cm, for women: 2.5-3 cm) and shock absorber

- Prevention of sportive (basketball, volleyball, long duration running) and professional (occupations requiring prolonged standing and work at kneeling position, construction, agriculture and factory works requiring weight bearing) activities that overload the joints
- Modification of unsuitable daily or professional activities
- Proper nutrition
- Preventing social isolation in the elderly, providing a socially active life by providing appropriate social support
- Effective treatment of comorbid diseases

### **Surgical Treatment**

Corrective surgical procedures should be performed in patients with congenital and developmental anomalies that cause risk for osteoarthritis. Surgical interventions in osteoarthritis should be considered as preventive surgery, early approaches and late rescuing-reconstructive surgeries.

Preventive surgery is mostly associated with lower extremity alignment disorders. Early surgical procedures are used in meniscus tears in the knee, limited chondral defects, ligament injuries, labral tears in the hip and shoulder or rotator cuff tears. Late-term reconstructive approaches are related to arthroplasty operations.

### **Foot Deformities**

There are many deformities in the feet caused by the musculoskeletal system. Foot deformities are also seen in some degenerative joint diseases such as osteoarthritis, rheumatoid arthritis, psoriatic arthritis, and ankylosing spondylitis. The most common foot deformities are pes planus or pes planovalgus, calcaneal epin (heel spur), hallux valgus, hallux rigidus and hallux varus deformities.

**Pes planus:** It could be defined as flattening during loading on the medial longitudinal arch of the foot. The shape of the medial arch is related to the shape of the bones and the flexibility in the ligaments. Generally, the medial longitudinal arch develops spontaneously in the first decade of life. The use of appropriate shoes and orthoses for medial arch flattening may generally be sufficient to solve this problem.

**Hallux Valgus (Bunion):** It is the deviation of the thumb in the adduction direction in the frontal plane from the 1. metatarsal joint. 1. metatarsal head appears bulged from the dorsal or medial part. 1. finger takes a protruding appearance from the metatarsal base to the outside (lateral).

In case of progression, rotation is also seen in addition to lateral deviation. Hallux valgus may be seen due to various reasons. They include:

- Deformity of foot biomechanics (pronation or pes plano valgus deformities in the foot),
- Structural disorders of metatarsal bones,
- Muscle imbalance,
- Wrong shoes (pointed and high-heeled shoes are one of the most important reasons)
- It is familial predisposition.

The expansion of the first metatarsal head makes it difficult to find suitable shoes and normal shoes lead to excessive friction of this part and consequently to the development of bursitis. This situation can cause serious pain and discomfort. It can disrupt the walking of elderly persons and cause further deformities to develop or falls.

**Hallux Limitus/Rigidity:** As a result of degeneration of the 1. metatarsal joint, it is a foot problem characterized by pain, dorsal flexion joint movement limitation and dorsal osteophyte formation. If there is only a limitation in the 1. metatarsal joint, it is called as hallux limitus; if complete fusion occurs as the restriction and degeneration progresses and causes complete fusion in the joint, it is called as hallux rigidity. Degeneration in the joint may occur with repetitive microtraumas. The pain occurs during walking of the finger.

**Deformities in other fingers:** Prolonged use of incorrect shoes, false foot biomechanics and intrinsic muscle atrophies in the foot cause hammer toes, claw toes or finger retraction.

### **Prevention and Treatment:**

#### **1. Foot and Nail Care**

For foot health and problems (such as callus, korn, keratosis, nail ingestion) that may occur in the foot, moisturizing of the skin of the feet and proper cut of nails and foot cleaning are very important.

## 2. Choosing Appropriate Shoes

Good shoes and soft sole reduce the loads on muscles; delay muscle fatigue; provide muscle-supported joint protection.



**Figure 6.** Footwear selection

## 3. Surgical Treatment

As foot deformities are painful conditions that affect the quality of life and affect the activity at a very high level, there is a need for surgery in a relatively early period. Early surgical interventions and corrective surgical interventions for foreleg, mid and hind leg deformities could be applied. In early period, fixed deformity development could be prevented by applying muscle-tendon relaxation, extension surgery toward early stage hammer toe, paw finger, hallux valgus early dynamic deformities. In case of frequently encountered pathologies of the thumb such as hallux rigidity and unrelieved pain in rigid pes planus despite the conservative therapies, excessive alignment disorder, having difficulty in wearing shoes, surgical procedures are applied. In cases, where cartilage damage develops in deformities that early intervention was not administered and osteoarthritis develops, arthrodesis or arthroplasty surgeries may be performed considering the patient's age, activity and clinical condition.

## 4. Physical Activity

Other than isometric and isotonic exercises that strengthen the intrinsic and extrinsic muscles of the ankle, exercises that develop proprioceptive sensations such as walking on a smooth and soft floor, picking bed lining with foot, rolling the ball placed on the sole of feet, stretching the achilles tendon, jumping a hurdle, working on balance board could be applied. In case of necessity, orthopedic surgeons or physiotherapists could be used for orthotic support and insoles.



## OSTEOPOROSIS

The definition of osteoporosis in the recent years is as follows: "A systemic skeleton disorder that increases fracturability and the susceptibility to fracture as result of low bone density and deterioration of microarchitecture structure of bone tissue".

The identification above was made according to the values obtained from the diagnostic methods using Dual X-Ray Absorptiometry (DEXA) and the presence of fractures. Accordingly;

- Normal: bone mineral density (BMD) or bone mineral content under
- 1 standard deviation (SD) for young adult,
- Osteopenia (low bone mass): BMD between -1 SD and -2.5 SD for young adult,
- Osteoporosis: BMD below -2.5 SD for young adult,
- Settled Osteoporosis: It is defined as having BMD below -2.5 SD for young adult and additionally detecting one or more fractures

Osteoporosis is one of the most important social health problems in the world. More than 1.5 million individuals experience osteoporosis every year. In the world, hip fractures are thought to be doubled in 15 years and increased by 4 times in 2041. Although there are no accurate records in Turkey, it is reported that there are around 8 million osteoporosis patients and 1 out of every 3 women and every 5 men has osteoporosis problems. Riggs and Melton raised the definition of Type I osteoporosis for postmenopausal osteoporosis and Type II osteoporosis for senile osteoporosis. Type I Osteoporosis is mainly associated with early postmenopausal bone loss. Along with the relative preservation of cortical bone, there is a significant loss of trabecular bone. Although the Type II Osteoporosis is part of the aging process, it is also accompanied by increased osteoclastic activity. In the Type II osteoporosis, the losses in cortical and trabecular bone are similar. Other causes of the Type II osteoporosis are; decreased mobility, deficiency of Vitamin D metabolism and inadequate calcium intake. Hip fracture is commonly seen in the clinic associated with the Type II osteoporosis.

**Table 30.** Comparison of Type 1 and Type 2 Osteoporosis

	<i>Type 1 (Postmenopausal Osteoporosis)</i>	<i>Type 2 (Senile Osteoporosis)</i>
<b>Age</b>	51-75 years	75 years and above
<b>Female/Male</b>	6/1	2/1
<b>Bone Involvement</b>	Trabecular	Cortical + Trabecular
<b>Location of Fracture</b>	Vertebrae, wrist	Hip, pelvis, tibia
<b>Possible Cause</b>	Estrogen reduction-Menopause	Ageing
<b>Bone Loss Rate</b>	Fast	Slow
<b>PTH Function</b>	Decreased	Increased
<b>Vitamin D Metabolism</b>	Secondary decreased	Primary decreased

### Risk Factors of Osteoporosis

The risk factors of osteoporosis could be classified under 4 headings: structural and genetic factors, lifestyle and nutrition, medical conditions and environmental factors. The content of these risk factors is as follows:

1. Structural and Genetic Factors: Aging, low bone density, female sex, white skin, premature menopause, poor body structure, any fracture occurred in previous years or after the age of 50, genetic factors (osteoporosis history in the family).
2. Life Style and Nutrition: Inactive and sedentary life, diet with poor calcium and vitamin D, excessive coffee consumption, alcohol use, smoking, excessive salt or protein intake.
3. Medical Conditions: Drugs (steroid, thyroid hormone, heparin, diuretic use), surgical menopause, gastrointestinal problems that may cause malabsorption, chronic renal failure, hyperparathyroidism.
4. Environmental Factors: Slippery and wet floor, bad weather conditions, inadequate lighting, unusual stairs and floor coverings, the floor cords, piece carpet and so on that may lead to stumbling.

### Osteoporosis Fractures

Osteoporosis fractures affect the musculoskeletal system, causing chronic pain and decrease in functional capacity and quality of life. The most frequently encountered fractures in osteoporosis are hip fractures, vertebral fractures, Colles or radius lower end fractures.

## Treatment

### 1. Physical Activity and Exercise

In osteoporosis, there are 3 factors affecting bones with physical activity and exercise. These are:

1. Muscle tension: The muscle tension affects the bone in a variety of ways. During contraction, the muscle directly imposes stress on the bone through its tendon.
2. Axial load: It is a factor characterized by axial loading and ground reaction caused by gravity.
3. Systemic factor: Resistant exercises and endurance type exercises trigger versatile reactions of endocrine system.

**Exercises** cause an osteogenic response in the region where mechanical stress is applied as a result of the tension they created on skeleton. Exercises that create a mechanical load on the bones stimulate bone formation and increase bone mineral density. In particular, the activities that overload the bones reduce bone destruction and even increase bone production. Physical activities such as walking, Tai-Chi, pilates, yoga, which were regularly done since youth and impose load on the body, resistant isometric or isotonic exercise have positive effects on bones. Bone losses may be prevented or reversed with exercise programs. In addition, risk factors that cause falls such as low muscle mass or muscle strength, poor balance and coordination could also be changed. It is known that the majority of aerobic exercise types increase bone density. For example, **walking** among the aerobic exercises frequently used by the elderly increases cardiovascular endurance, as well as it also has positive effects on bones. On the other hand, as being performed against the gravity and not imposing load on the bones, swimming does not have a significant effect on bone mineral density. For this reason, if bone mineral density is to be increased in the elderly with osteoporosis, aquatherapy exercises, such as in-water walking and in-water strengthening instead of swimming, and exercise programs that impose load on bones, such as weight-bearing exercises, should be preferred.

### 2. Nutrition

- Calcium and vitamin D consumption should be increased. Adequate intake of calcium is important not only for bone health, but also for the fulfillment of some other functions in the body (such as muscle movements, heart rate, normal blood clotting). 90% of our need is synthesized in the skin by the way of sunlight, whereas 10% is synthesized with nutrients. For synthesis of Vitamin D in the skin, the arms and legs should be exposed to sunlight about 20-30 minutes per day. Sunbathing should not be behind the glass.

has a protective effect on bone mineral density.

- Estrogen-like substances, especially in soya, have protective effects against osteoporosis.
- Thanks to the essential fatty acids it contains, fish contributes to bone health. Fish should be consumed at least 2 times a week.

### **3. Surgical Treatment**

Primary surgery has no role in treatment of osteoporosis. In the treatment of fractures that are a complication of osteoporosis, appropriate surgical fixation procedure is applied to the location and shape of fracture.

# OSTEOPOROSIS

## Risk factors in osteoporosis

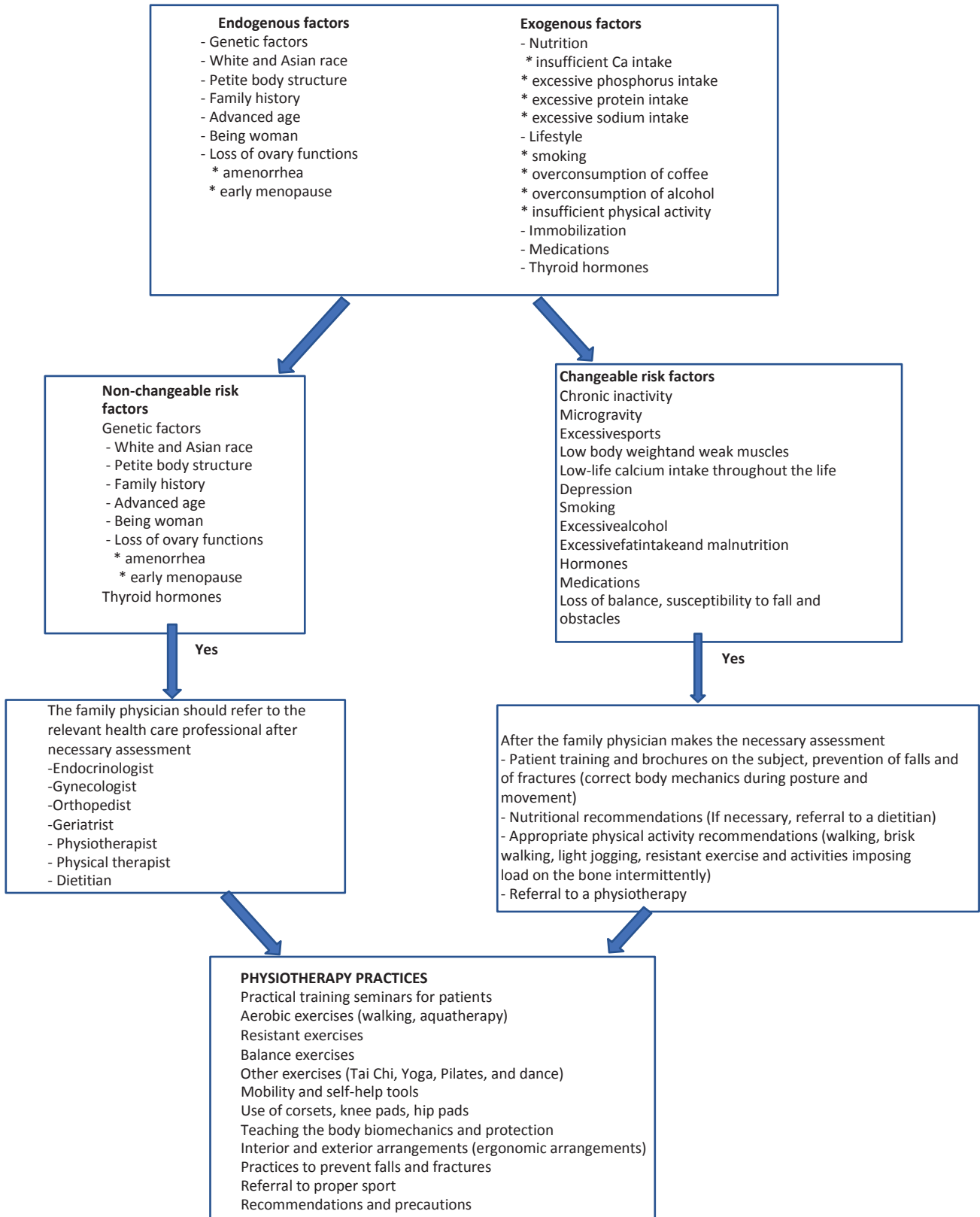


Figure 7. Risk Factors in Osteoporosis

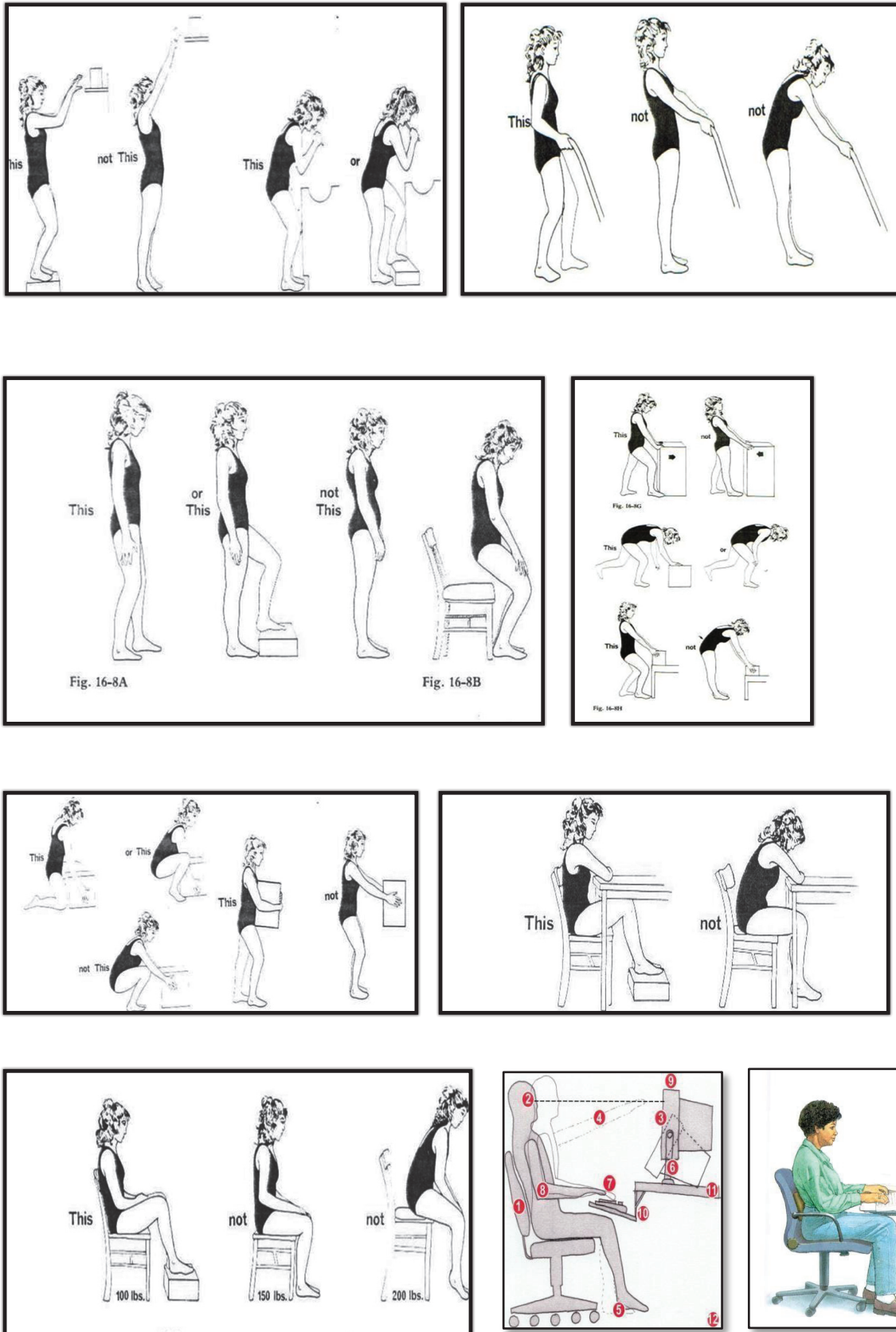


Figure 8. Ideal Positions Protecting Low Back and Neck Health that can be Used in Patient Training

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# SECTION 13

## PHYSICAL ACTIVITY AND EXERCISE FOR ELDERLY WITH CHRONIC DISEASES

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## INTRODUCTION

### Elderly Population in the World and Turkey

The number of the individuals over the age of 60 is estimated to be 1.2 billion in 2025, 1.3 billion in 2040 and 2 billion in 2050. Nowadays, one out of every 7 people is over the age of 65 in the developed countries, while it will be one in every 4 people as of 2030. This refers to onset of the process of "ageing of the elderly" for the elderly population. By the end of the first half of the 2000s, the number of those aged-85 years or more and under the category of "old elderly/ advanced age" will be six times greater than the 65-year-old "young elderly".

The situation in Turkey is similar. While the population over the age of 65 is %8.2 in 2015, it is estimated to reach 10.2% in 2023, 20.8% in 2050 and 27.7% in 2075. According to TURKSTAT 2015 data, the expected life expectancy at birth is 75.3 years in males, 80.7 years in females and 78 years in average.

### Active Aging

There are national and international decisions and practices to support active living. One of them is "developing the services of exercise, physical activity and rehabilitation for all seniors" as a first strategic priority as part of Turkey Healthy Aging Action Plan and Implementation Program (2015-2020) by the Ministry of Health. In the plan, regular activity and exercise habits in the elderly are considered to be the most important determinants of healthy aging in the short and long term. The importance of exercise is emphasized in order to prevent the incidence of diseases especially in advanced ages. In addition, it is emphasized that it has a positive effect on improvement of the quality of life of elderly and the maintenance of well-being in social and psychological aspects.

Another study is the preparation of "Active Life Strategy Plan" by the Ministry of Family and Social Policies, Directorate General for Disabled and Elderly Services in 2016. In this plan; It is stated that the implementation of active aging policies is of great importance in minimizing the risks that may be faced in the future. The plan was formed under the titles of "involvement in the labor market", "involvement in society" and "independent living" of old people. In terms of independent life; cooperation with the Ministry of Health is foreseen in the steps to be taken to preserve the mental, social and physical well-being of the elderly person.

The most prominent one among many international studies is the realization of the "Active Aging Index" project in 2012 Vienna Declaration after the 2002 Madrid Plan of Action on Ageing by the Working Group on Aging by United Nations and European Economic Commission. One of the indicators included in the index is the independence levels and the rate of physical activity of elderly individuals.

### Health Compliance Level

For the physical activity and exercise recommended for elderly, the elderly individuals are gathered under 3 basic groups according to the Health Compliance Level adapted from recommendations of the World Health Organization in 1996.

#### **Group 1: The elderly who have physical fitness, no disease and are independent in their functions:**

The purpose of physical activity in this group is to promote health and prevent disease; because the lack of sedentary lifestyle and physical fitness are important risk factors. For primary prevention of cardiovascular disease, at least moderate physical activity should be performed. Moderate activities are important since they provide enough heart rate increase so as to ensure the individuals to feel warmth in their bodies and lightly pant for air.

#### **Group 2: Elderly with no physical fitness but chronic disease and independent in functions:**

Lack of motivation for this group of people (having some weaknesses and/or chronic diseases in the musculoskeletal system) for doing exercise should be prevented. It is important to maintain exercise and activity in the treatment of any chronic disease, such as hemiplegia, osteoarthritis, diabetes and cardiovascular disease. Light intensity, less repetitive strength training and regular walking is effective in the elderly in this group.

#### **Group 3: Elderly people who do not have physical fitness but chronic disease and not independent in their functions:**

The elderly in this group with weakness, inadequacy, high levels of chronic diseases and comorbidities are often dependent on the help of others in simple daily activities. In a few studies, it was shown that exercise practices support significant improvements in the physical functions and psychological conditions of people living in nursery or eventide home.

### Physical activity

Physical activity is; any body movement created by skeletal muscle resulting in energy consumption and includes activities such as dressing, shopping and gardening. Exercise is a subgroup of physical activity that is expressed as planned structured and repetitive movement, with the aim of developing and protecting one or more components of physical fitness. Even if people start physical activity in the late periods of life, mortality decreases and life expectancy is prolonged. High levels of physical activity and compliance reduce morbidity. In many studies, positive effects of physical activity in cases such as cardiovascular disease, respiratory system problems, dementia and cancer are highlighted in many studies.

In the World Health Organization guidelines issued in 2010, the physical activity definition and exercise plan for individuals aged 65+ are as follows: activities performed daily, with family or collectively, such as entertainment, leisure activities, activities for transportation from one place to another (walking and cycling), work, chores, sports and planned exercise activities.

1. Individuals aged 65 years and above should do moderate intensity aerobic physical activity at least for 150 min per week or vigorous intensity aerobic physical activity for 75 min. This program could also be planned as equal-term moderate intensity and vigorous intensity physical activity within one week.
2. Aerobic activities should be performed in sessions of at least 10 minutes. In the guide, it also stated that aerobic activity could be spread all week.
3. In order to obtain better results from exercise, moderate intensity physical activity duration should be increased to 300 minutes and vigorous physical activity duration to 150 minutes. Moderate intensity physical activity and vigorous intensity physical activity could be performed evenly with the total period unchanged.
4. Individuals with reduced mobility should perform physical activity at least 3 days a week to increase their balance and to avoid falls.
5. Strengthening exercises involving major muscle groups should be performed at least 2 days a week.
6. Individuals, who are considered at risk in terms of health if they perform physical activity, should be physically active as much as possible.

In the physical activity directive published by the World Health Organization in 2010;

1. **Slow Walking**- 3500 steps/30 min (Young middle age), 2500 steps / 30 min (Elderly)
2. **Moderate-Speed Walk**- 4000 steps / 30 min (Young middle age), 3500 steps / 30 min (Elderly)
3. **Quickstepping**- 4500 steps/30 min (Young middle age), 4000 steps/30 min (Elderly) is recommended. Regular walks and walking on different grounds accompany good balance, flexibility and improvements in walking skill.
4. One of the best exercises as alternative activities to walk is **swimming or in-water exercise**. Since the body weight is insignificant in the water, load does not impose arms and legs load the swimming is preferred. Swimming is a lifelong sport and maintains the physical fitness of individuals.
5. Some people like **cycling** and they can ride on a stationary bike or ride outside. Before cycling, you should slowly warm up, then turn the pedal more quickly and finish at a slower speed to cool down. Stretching exercises should be done before starting.

**Light, Moderate and Vigorous intensity Exercise within the Day:**

- ✓ **Light Intensity Exercises:** Slow walking, exercise bike, seated fishing, gardening, dancing, golf, light housework.
- ✓ **Moderate Intensity Exercises:** Brisk walking, cycling, standing fishing, brisk running, swimming, tennis, heavy house or garden work.
- ✓ **Vigorous Intensity Exercises:** Walking uphill or walking with weight, cycling, fishing by walking, running, hockey, and volleyball.

**What are the Benefits of Physical Activity and Exercise?**

1. Increased muscle strength and flexibility,
2. Prevention of fracture risk due to decreased bone loss and increased bone mineral content,
3. Prevention of falls,
4. Decrease in obesity and increase in lean body mass,
5. Increased glucose tolerance,
6. Increased high density lipoprotein (HDL) and decreased lipid concentrations,
7. Decrease of vascular resistance,
8. Increased maximum aerobic capacity and voluntary ventilation,
9. Development of cardiovascular function and reduced risk of disease
10. Increased physical performance, functional capacity and psychomotor skills,
11. Development of mental functions as a result of oxygenation of the brain and increased alertness
12. Decreased anxiety and depression and increased sleep quality,
13. Increased well-being,
14. Prolongation of the life span and the increased quality of life.

**What Should Be Considered in Physical Activity Recommendations?**

1. Medicines that were used while not doing physical activity should be taken during the activity period,
2. It should be taken at the same time of day on a regular and continuous basis,
3. It should be done at least 1 hour after meals, not when very hungry,
4. The intensity, duration, frequency should be appropriate to be effective, however, if the person wants, the level of exercise should be reduced,
5. Avoid holding your breath during activity,
6. The objectives of the exercise should be well established, the priority objectives should be determined and it should be suitable for the capacity of the person and customizable,

7. Functional exercises should be planned in treatment approaches,
8. Exercises should be increased over time,
9. It should include warm-up, cool-down and stretching exercises too,
10. It should be safe and has a low probability of injury,
11. Person's wishes, living conditions, psychological status should be taken into consideration,
12. It should be enjoyable and easy to perform,
13. It should make changes in the way of life such as a more active life,
14. The exercise program should increase muscle strength, flexibility, endurance, coordination, balance and functional capacity.

### Exercise Types

**Strengthening Exercises:** Strengthening exercises preserve the muscle mass of the elderly as well as maintain the functional capacity of the muscle. Strengthening exercises could be applied to the major muscle groups of the lower and upper extremities 1-2 times a week (10-12 repeats, with weight). When doing exercise with weights, it could be done using dumbbells or the weights that the person makes at home. A bottle filled with sand or water could be used instead of dumbbell provided that its cover is firmly closed. Instead of a sandbag, a cloth bag could be filled with beans, rice, bulgur or sand. Also, exercise bands could be used. Exercise band is available in a variety of strengths ranging from light to vigorous and it is a durable, flexible stretchy band suitable for use in exercise.

When calculating the severity of exercise, care should be taken to prevent the risk of injury and pain; severity should be personalized and progressive. 12-15 repeats with low resistance should be given for muscular endurance; whereas 8-12 repeats with high resistance should be given for gaining strength. Set number should be between 1 and 3. Rest periods should be given between sets.

**Flexibility Exercises:** Functional activities may be limited due to reduced flexibility in major joints. Usually, the flexion of the shoulders, hips and trunks and especially the extension and rotation movements need to be increased. Stretching exercises in the elderly should be taught by safe, effective and simple techniques. At the beginning of the exercise program and during the warm-up period, more dynamic stretching exercises should be used and in the cool-down period, static stretching exercises should be used.

**Aerobic Exercises:** Aerobic exercise programs are primarily designed to improve cardiopulmonary function. For the effect of the aerobic exercise program, the resting heart rate should be increased. In the cardiovascular risk group, light and moderate intensity activities are recommended and the exercises should be at least 2-3 times a week for 20 minutes.

**Callisthenic Exercises:** Callisthenic exercises are a useful form of exercise that can be used to make changes in tempo, duration and durability. They are aerobic exercises performed as group and accompanied by tempo. They motivate participation by enabling the participants to adapt to callisthenic exercises.

**Balance and Coordination Exercises:** Balance requires muscle strength and joint mobility. A sedentary lifestyle, arthritis or other diseases of the musculoskeletal system may affect strength and mobility. The fact that balance is a complex function and based on many different factors requires a thorough evaluation and accurate diagnosis.

Exercises such as Yoga, Tai Chi and Pilates may also be recommended.

### Walking Training

Walking training is of great importance in exercise programs applied in the elderly. In order to provide support and to reduce the stress on the joint, walking should be performed with a suitable shoe and suitable, comfortable and season-appropriate dress. The program should be arranged to reach the target heart rate, with the normal step, balanced and easy to walk in the appropriate area and time (same time of the day). The walk should start slowly and the duration and distance should be increased gradually until it reaches the desired level. Initially it is aimed to walk for 30 minutes. This period and beyond are reached by increasing 10 minutes a day. Some recommendations could be offered to help you improve walking time (e.g. get off the bus one stop earlier and walk home or use the stairs instead of getting on the elevator).

Stretching exercises should be performed before walking and the walking should be started slowly and softly. While walking, the head should be held upright and the abdomen should be pulled inwards and the arms should be swung freely. It is important to walk at a proper distance, and then the distance should be increased gradually.

Walking is the best exercise for all ages. No other equipment is required except for suitable shoes. Leg, back and abdominal muscles run at their comfortable rhythm and speeds by walking. As it is a physiologically good exercise, it increases muscle tonus, strength and circulation, improves balance and helps to reduce spasms in the leg and back muscles.

The physiological benefits of walking include the development of mental status and self-confidence. It reduces stress and tension of people, allows them to enjoy their environment. It helps people improve their mobility, well-being and self-sufficiency and increase the ability to do daily living activities.

**Walking alone or with others**

Some people like to walk alone so they can choose their own speed. Some others prefer to walk alongside someone or in walking groups for walking more regularly.

**Start to walk**

If you do not have regular walking habits, you either get tired quickly or cannot walk at the desired speed. In this case it is important not to give up. You warm with stretching exercises. The walking distance and time are increased as you reach the desired level. You could measure your progression by following a specific route.

It would be inconvenient to walk during the winter or when the weather is very cold or snowy. If walking is the only exercise option, you could walk by wearing thick clothing, snow mask or snow boots. People with chronic illnesses such as coronary artery disease or emphysema can walk in places such as the health center or in large shopping centers.

**Walking in people with physical problems**

People with emphysema, shortness of breath, visual loss, balance problems, weak leg muscles, foot pain and edema, muscle weakness due to stroke and other negative effects of chronic disease can walk, though just barely. For example, techniques for improving lung capacities could be taught to individuals with chronic lung disease. People with stroke, arthritis and other disabilities could be taught walking safely with crutches, walking sticks or walkers. It should be kept in mind that some people may have balance, vision or hearing problems.

**Alternative activities to walk**

One of the best exercises is swimming or in-water exercise. Since the body weight is insignificant in the water, load does not impose arms and legs load the swimming is preferred. Swimming is a lifelong sport and maintains the physical fitness of individuals.

Some people like cycling and can ride on a stationary bike or ride outside. Before cycling, you should slowly warm up, then turn the pedal more quickly and finish at a slower speed to cool down. Stretching exercises should be done before starting.



**Home Exercises**

A lower number of home exercises for needs revealed more positive outcomes in terms of patient performance. Callisthenic exercises could be given at home 3 times a week for 20 minutes. Home exercise programs are used as part of elderly information programs implemented to reduce the falls of the elderly. Motivation of the elderly is very important to start the exercise program. However, before starting the exercise, the elderly should be controlled by physicians and it should be determined if there is any condition such personal characteristics, factors related to exercise program and environmental factors which affect their participation in physical activity.

**Periods of exercise sessions:**

- 5-10 min *warm-up period*,
- The exercise period including 20 min *strengthening, balance or flexibility* exercises where performance is *the highest*,
- 5-10 min *cool-down* period.

**General characteristics of exercise:**

- Exercise program should be applied to individuals between 12-16 weeks.
- Exercises should be applied to individuals, 30-45 minutes per day and 3 days a week.
- Exercises should be started once a day with 3 repeats and continued with 2 repeats more on weekly basis.
- Exercises should be performed with a maximum of 9 repeats and 1 time a day.
- Each exercise session should consist of warm-up and stretching for the first 10 minutes, balance, strengthening, flexibility and anti-fall exercises for the ongoing 10-20 minutes and cool-down periods for the last 10-15 minutes.
- Exercises should be terminated immediately in case of an unexpected situation during exercise.

**Unexpected situations during exercise:**

- Chest pain
- Cardiac rhythm impairment
- Dizziness, weakness, fatigue and blackout, loss of balance, falling,
- Joint muscle pain to prevent exercise

### Physical Activity in the Elderly with Chronic Disease

With advancing age, the development of cardiovascular diseases, Type 2 diabetes, obesity and some types of cancer increase. Musculoskeletal diseases such as osteoporosis, osteoarthritis and sarcopenia are also common in the elderly. Age is the primary risk factor for both the development and progression of most chronic diseases. However, regular physical activities help to change these risk factors. **Regular physical activity has an important role in preventing diseases and increasing quality of life.** Therefore, elderly patients with chronic diseases should be encouraged to do regular physical activity. **Neither advanced age nor chronic diseases are obstacles for physical activity. Regular physical activity in many chronic diseases should be recommended as a treatment method in the elderly because of its therapeutic and/or preventive effects.** However, in the elderly with chronic disease; the type, duration and intensity of physical activity may vary depending on the level of the disease and the personal trait. **Elderly people with chronic illnesses should consult their physician before starting physical activity. The recommendations of the physicians and the relevant experts should be absolutely considered when determining the type, duration and intensity of physical activity.**

1. In hypertension, which is one of the common diseases in old ages, aerobic physical activities especially for large muscle groups should be preferred. Such activities should be performed every day for about 20-30 minutes. Strengthening exercises should be carried out twice a week and these exercises should be started with light to moderate activities.
2. If possible, the duration of physical activity should be gradually increased in the elderly with chronic respiratory diseases. Walking is usually the most recommended aerobic exercise type. It is recommended that muscle strengthening exercises should target the muscles of the lower extremity (hip, thigh and leg) and special exercises for strengthening the respiratory muscles should be included in the program.

**There is a physical activity suitable for every disease and every condition. Doing slight physical activity is better than not doing at all; vigorous physical activity is better than little physical activity and provides more benefit.**

None of the diseases listed below and common in the elderly does not pose an obstacle for doing physical activity. However, the physician should be consulted about how to start the physical activity and what type of activity to perform in the given time.

- Musculoskeletal disorders (osteoarthritis, arthritis, osteoporosis, orthopedic problems),
- Neurological diseases (stroke, Parkinson, neuropathy),
- Cardiovascular diseases (cardiac insufficiency, coronary artery diseases, peripheral vascular diseases),

- Respiratory tract diseases (COPD, asthma),
- Sensory diseases (Vision disorders, hearing disorders),
- Acute/chronic pain,
- Nutrition disorders, malnutrition,
- Severe systemic diseases,
- Cancer,
- Depression.

Physical activity in the above mentioned diseases; prevents possible complications, progression and development of disability related to the disease, increases the quality of life and provides independence in daily living activities.

As a result, advanced aged people or people with chronic illnesses such as addiction, dementia and arthritis or even those who are temporarily inactive due to fractures or operations (other than daily living activities, 6 hours in bed, sleep and chair) should do physical activity. Different physical activity approaches could be recommended to them.

**Table 31.** Types of Exercise Specific to Chronic Disease

<b>Disease</b>	<b>Exercise Practices</b>	<b>Benefits of Exercise Training</b>
<b>Arthritis</b>	Aerobic Resistant Exercise	<ul style="list-style-type: none"> <li>• Losing weight</li> <li>• Preservation of cartilage integrity</li> <li>• Preservation of muscle, tendon strength</li> </ul>
<b>Cancer</b>	Aerobic	<ul style="list-style-type: none"> <li>• Reduction in body fat</li> <li>• Decreased estrogen level</li> <li>• Reduction in the gastrointestinal system transition time</li> </ul>
<b>Coronary Artery Disease</b>	Aerobic Resistant Exercise	<ul style="list-style-type: none"> <li>• Reduced blood pressure</li> <li>• Reduction of LDL</li> <li>• HDL increase</li> <li>• Reduced fibrinogen</li> <li>• Reduced total body fat</li> <li>• Reduced insulin resistance</li> <li>• Reduced cortisol levels</li> <li>• Decreased smoking</li> </ul>
<b>Depression</b>	Aerobic	<ul style="list-style-type: none"> <li>• Reduced depression and anxiety</li> <li>• Increased self-confidence</li> <li>• Increased sleep time</li> <li>• Reduced insulation</li> <li>• Reduced drug use</li> </ul>
<b>Weakness-Fragility</b>	Aerobic Resistant Exercise	<ul style="list-style-type: none"> <li>• Reduced body fat</li> <li>• Increased muscle strength and mass</li> <li>• Reduced drug use</li> <li>• Reduced depression</li> <li>• Increased use of dietary protein</li> </ul>
<b>Mobility Disorder, Falling</b>	Resistant Exercise Balance Training	<ul style="list-style-type: none"> <li>• Increased strength and balance</li> <li>• Improvement in walking stability</li> <li>• Decreased fear of falling</li> </ul>

**In Bedfast or Inactive Elderly;** first of all, the risk of falling from the bed and the chair should be eliminated, appropriate support and movement assistive devices should be used and the environment should be ventilated and illuminated.

The following bed exercises should be done: frequently turning in bed, deep breathing techniques, diaphragm and auxiliary respiratory muscles activities, exercises to maintain joint range of motion (spreading, closing and lifting the legs, scuffing heels in the bed, moving the ankles, opening-closing the arms from shoulder and elbow, opening-closing the hands) and stretching exercises (reaching toward the lower end of bed with the toes, reaching toward upper bed head with arms and opening both arms to the sides as far as possible).

These in-bed activities prevent bedsores, the pumping activities on the ankle reduce the risk of arteriosclerosis and associated embolism. The individual should not hold his/her breath during the in-bed activities and should inhale from nose and exhale from mouth in a deep and comfortable way.

On the other hand, with breathing exercises, an improvement could be achieved in capacity of sputum extraction and respiratory function. In-bed activities enable bedfast elderly to be partially independent in performance of self-care activities as well as increase the quality of life of the person by reducing the burden of caregivers.

**Those Who Can Sit** They can do strengthening exercises with opening and closing of the joints, balance and stretching exercises, strength exercises with small weights on their legs and arms, so that muscle weaknesses due to immobility could be reduced.

Regular physical activity has positive effects on many system functions. Increased aerobic activity is found to be associated with decrease in all-cause mortality and morbidity in older adults. Studies show that regular exercise improves life expectancy and quality of life even in individuals who did not perform regular physical activity until old age.

### **Evaluation before Physical Activity and Exercise in the Elderly:**

The first evaluation provides the necessary information for the appropriate rehabilitation program.

3 important elements are handled under the evaluation of the elderly. These are; mental status of the elderly, functional and physical evaluation.

- Evaluation of cognitive functions (Mini Mental State Test)
- Evaluation of musculoskeletal system (joint movement, posture, muscle strength, flexibility, pain, fatigue, body weight, body fat ratio)
- Evaluation of balance and fall

- Evaluation of walking
- Evaluation of the cardiopulmonary system (Heart rate, respiratory rate, systolic and diastolic blood pressure and O<sup>2</sup> saturation should be assessed before and after the activity)
- Evaluation of functional capacity and activity level
- Evaluation of quality of life
- Environmental evaluation

### **Risks of Physical Activity and Exercise in the Elderly (Absolute Contraindicated)**

1. Dehydration,
2. Delirium,
3. Chronic Obstructive Pulmonary Disease (COPD) exacerbation,
4. Exacerbation of Congestive Heart Failure (CHF),
5. Malnutrition (MNA-SF<7),
6. Acute Infection-high fever,
7. Deep vein thrombosis,
8. Unexplained weight loss,
9. Acute exacerbation period of rheumatic diseases,
10. Foot ulcer,
11. Proliferative retinopathy, retinal bleeding,
12. Undergoing surgical operation in the recent term,
13. Uncontrolled diabetes,
14. Multiple drug use (over 5 and non-indication drugs),
15. Starting to risky medications (antidepressant, antiepileptic, antipsychotic, sedative hypnotic, urinary incontinence drugs, 1. generation antihistaminic drugs, antihypertensives, etc...)

### **Special Situations in Elderliness**

#### **Dementia and Depression**

Exercise is known to alleviate stress and anxiety and alleviate depressive symptoms. It was found that there is an inverse relationship between endurance exercises and depression. Resistance exercises are beneficial to the elderly patients with depression. In the research of Nurse's Health, with attendance of 19 thousand persons aged 70-81, it was observed that the elderly, who are active and do physical activity and walk for long term, had better cognitive test scores and there were positive changes in their walking functions. Although exercise recommendations in these patient groups are similar to other patient groups, aerobic, strengthening and balance exercise programs should be determined personally according

to the functional status and cognitive level of the elderly and exercise intensity should be increased gradually. These exercises should be performed under the supervision of the patient's relatives or caregivers, particularly for those whose cognitive functions are impaired so that the elderly are not able to do basic daily activities. Glasses, hearing aids or other support devices must be used during these activities. Necessary arrangements should be made in the room or around in terms of things that may pose a risk, suitable flooring and illumination.

To prevent functional inability of dementia cases, various pharmacological and non-pharmacological treatment strategies were tested and it was shown that physiotherapy and rehabilitation applications and exercise therapy, in particular, are among the most important methods. Exercise therapy increases the mental and physical capacities of people with dementia and their functional abilities as well. The functional problems seen in these cases make the individual more dependent. However, functional independence with exercise therapy could be maintained for a long time.

As in all geriatric cases, falling and the risk of falling are the most important issues causing mortality and morbidity in patients with dementia. It is aimed to prevent the patients from these risks by using balance and fall prevention exercise treatments. Exercise trainings for dementia is generally composed of the exercises with aerobic nature including the parameters of balance, strengthening, fall prevention and flexibility.

**Exercise Program Content;** In view of the clinical course of the disease, the individual's medical condition, history and functional capacity, a separate exercise program should be established for each individual. As in many studies, the exercises should absolutely cover the parameters of balance, strengthening, fall avoidance and flexibility which have aerobic nature. At the same time, warm-up exercises at the start of the exercise program and cool-down exercises at the end of the exercise program should be explained to the individual and/or caregiver to prevent possible injuries and internal problems.

### **Fragility**

Fragility is seen in 10-25% of elderly people aged 65 and over, while this rate increases to 30-45% in those aged 85 and over. There are many defined criteria related to fragility and the most accepted criterion is the fragility criteria defined by Fried. Main factors constituting the criteria are muscle strength, walking speed and decrease in physical activity level, fatigue and unexpected weight loss. According to a study investigating the fragility prevalence and factors with involvement of 1126 elderly in 13 centers in Turkey, age, female gender, low level of education, being housewife, living with family, sedentary life, comorbid disease, daily use of 4 or more medicines, avoiding going out, applying to emergency or hospitalization at least once in a year, nonfunctional ambulation and malnutrition significantly increase the risk of fragility.

Nutritional deficiency, multiple drug use, prolonged bed rest, fear of falling, delirium, confusion and hip fracture are common problems in the fragile elderly. The decreasing level of physical activity adversely affects growth hormones, digestive enzymes, metabolic and cardiovascular systems and all these adverse effects take place as a constitutive factor in the formation of fragility.

Since activity deficiency and muscle weakness are defined as major determinants in the development of fragility, exercise is one of the effective methods to slow down or reverse this process. Exercise; improves muscle strength and joint flexibility, corrects posture and balance. It ensures increase in mobility and performance in daily living activities, improvement in walking, decrease in falls and increase in bone mineral density and general well-being. The elderly could benefit from Tai-Chi, walking on mat and Pilates exercises, as well as stretching, balance, strength and resistance exercises. "Health and Aging Study" conducted in Canada refers that exercise reduces mortality, improves cognitive state and leads to improvement in overall health status at the beginning level of fragility.

In a randomized controlled study covering 150 old individuals aged 78 and over and with sedentary lifestyle and light to moderate physical fragility, the effect of exercise on fragility was examined. It was noted that the control group benefited from the program of flexibility exercises lasting 9 months. At the end of the study, it was determined that the functional decrease in the exercise group improved. Strength training in fragile elderly individuals starts from 20-30% of 1 maximum repeat and advances to 80%. It should be given 3 days a week, 1-3 sets and 8-12 repeats.

### **Sarcopenia**

Contrary to the resistant exercises, aerobic exercises have a much greater effect on increasing muscle mass and strength and reducing the development of sarcopenia. Even resistance exercises once a week lead to improvement in muscle strength. More vigorous and regular resistance exercises can lead to more increase in both muscle cross-sectional area and muscle strength. Increases in muscle strength can reach to 100%.

Sarcopenia is, first of all, defined as continuous and involuntary loss of skeletal muscle mass. As a result of the studies, the definition was changed over time. It is recently defined as "loss of skeletal muscle mass due to aging resulted in decrease in skeletal muscle strength, aerobic capacity and consequently functional capacity. Annual muscle mass loss can reach 1-2% from middle age, while this rate is estimated as 3% per year in elderly. The decrease in muscle strength is faster. Compared to a 20-year-old young, muscular protein synthesis is reduced by 38% in a middle-aged adult (aged 50) and by 55% in an older adult (aged 70 and over).



### **Balance Disorders and Falls**

Falling refers to a situation where an individual stands still below his/her own level as result of carelessness without any coercive force, syncope or stroke. Recurrent fall is defined as 2 or more falls within a certain time period, mostly within 6-12 months.

Fall in elderly patients is an important health problem. Most falls can be corrected and occur with the interaction of multiple risk factors. Elderly people are often not aware of the risk of falling and do not share these risk factors with physicians. The incidence of falls and the severity of complications due to falls increase after the age of 60. 35-40% of elderly individuals aged 65 and over, who are generally considered as healthy, expose to 1 fall per year. In a cross-sectional study conducted in Turkey, this rate was found to be 28.5%.

Falls are one of the most serious and frequently encountered home accidents among elderly people and are the main causes of hospitalization in hospitals and nursing homes, although they do not often cause serious injuries. With the increase in the elderly population, fall-related injuries are increasing faster than expected.

In Turkey, 60% of the falls seen in 65-year-olds were found in the home environment, 30% in social areas and 10% in health care institutions.

It is an important health problem resulting in traumatic complications such as falls, fractures and soft tissue injuries that greatly affect the elderly population and negatively affecting mobility and functional independence. Even no physical complication is observed after falling, the feeling of insecurity and fear directs the person to a passive and sedentary position and leads to deterioration in quality of life. The falls threaten the independence of the elderly individual by leading to a restriction in mobility, dependence in daily living activities and an increase in the need for placement in the nursing home, regardless of other health problems. As in other geriatric syndromes, it develops since the individual's ability to compensate for functional losses in many areas is disrupted.

### **Which Dimensions of Physical Activity are Important in Reducing the Risk of Falling?**

Physical activity programs may vary depending on the following factors.

- Physical activity type
- Frequency of involvement in physical activity
- Duration of physical activity in each session
- Intensity of physical activity training program

The studies that resulted in the decrease of the fall were generally applied together with balance training, strength and cardiovascular fitness training. The minimum level of physical activity required to see the beneficial effects of decreased falling rates is tried to be determined by new studies. In studies showing a significant decrease in fall rates, it is generally stated that the frequency of physical activity is 1-3 times a week and it is performed for 15-60 minutes.

Physical activity programs include balance activities of different types. These programs increase the balance performance and reduce the risk of falling. Those are:

- Balance activities while standing (with change of supporting surface, feet separate/adjacent, heel-toe posture or standing on one foot),
- Activities carried out by adding arm and head movements to other balance activities (turning the head from one side to the other in heel-toe posture),
- Balance activities with dual activities (walking and talking or tossing a ball while standing on a thin line),
- Changing the sensory wishes of the activity (eyes closed or standing on the soft floor)
- Quick walk by making sudden changes in walking direction,
- Practicing activities at different speeds in various areas

In order to improve balance, physical activity programs should be made difficult according to personal abilities. The content of the program may be integrated into the home or group program, depending on the type of program to be implemented according to the participants' abilities.

### **Evidence on the Beneficial Effects of Physical Activity**

#### **Benefits with strong evidence**

- Reduction of the risk of premature death,
- Reduced risk of heart disease,
- Reduced stroke risk,
- Reduced risk of type 2 diabetes,
- Improvement in high blood pressure,
- Improvement in blood lipid profile,
- Reduced risk of metabolic syndrome,
- Decreased colon and breast cancer,
- Prevention of weight gain,
- Protection of weight with a healthy diet,
- Improving cardiopulmonary performance,
- Prevention of falls,

- Reduced depression,
- Improvement in cognitive functions,

**Benefits with moderate-strong proof**

- Improvement in functional capacity,
- Decrease in abdominal obesity,

**Benefits with moderate proof**

- Maintaining body weight after weight loss,
- Reduced risk of hip fracture,
- Increased bone mineral density,
- Improvement in sleep quality,
- Reduced risk of lung and endometrial cancer.

**Exercise Prescriptions:**

Exercise prescriptions should be organized individually according to the risk status of patients. They include:

**Low Risk Group;** Those who have a chronic disease, no cognitive impairment, no functional disability- are independent in daily living activities,

**Medium Risk Group;** Those who have two or more chronic diseases, moderate cognitive impairment, light function-abilityloss (those who use walking stick, walkers, etc.) and are partially dependent in daily living activities,

**High Risk Group;** Those who have two or more chronic diseases, significant cognitive impairment, advanced function-ability loss or are bed-dependent or fully dependent on daily living activities,

**Exercise Prescription for Low Risk Group**

Sample Case;

- A 70-year-old female patient,
- She has hypertension under medication control,
- She lives alone in her house,
- She is independent in instrumental daily living activities and able to maintain social relations.
- She takes antihypertensive drug, aspirin 100 mg and Vitamin D,
- Her cognitive functions are normal,

Exercise prescription; may be strengthening, balance, flexibility and aerobic exercises by considering warm-up and cool-down periods. Those who cannot perform these exercises may be recommended walking as type of safe exercise.

The elderly person here is the person within active ageing period despite chronic illness and could do moderate intensity exercise for 150 minutes a week so that he/she can maintain his independence. For moderate intensity exercises, the age of the individual, as year, is subtracted from 220. The target pulse is determined by calculating 70% of the value obtained.

**220-70 (age): 150**

**150x70/100:105 beats/minute**

It is recommended to do the exercise at a rate that allows it to talk to the one next to him/her.

Warm-up: Head-neck and shoulder movements, breathing exercises and walking at low speed.

Exercise time: 30 minutes

Cool-down: Head-neck and shoulder movements, breathing exercises, walking at low speed.

Recommendation: When an unexpected situation develops during physical activity and exercise, finish your activity and ensure that you reach a relative (for example, having a card in your pocket with contact details of your family member or friend and information about the drugs you are taking).

Strategies that encourage lifestyle change are crucial for more physical activity and exercise. Although it is recommended to walk 30 minutes a day, these changes could be achieved with strategies such as getting off the bus 1 stop earlier or using stairs instead of elevators.

### **Exercise Example for Moderate Risk Group**

Sample Case;

- A 75-year-old male patient,
- He has hypertension, diabetes and coronary artery disease and is under medication control,
- He no longer smokes,
- He lives in his own house with his wife,
- He is semi-independent in instrumental daily living activities, restricted in his social relations,
- He is using 6 drugs,
- His cognitive functions slightly impaired,

Exercise prescription; may be light and moderate intensity strengthening, balance, flexibility and aerobic exercises, observing the warm-up and cool-down periods. Those who cannot perform these exercises may be recommended walking as type of safe exercise.

He could do exercise for 150 minutes a week to maintain his independence. For light and moderate intensity exercise, age (as year) is subtracted from 220. 60% of the resulting value is set as the target pulse.

**220-75 (age): 145**

**145x60/100:87 beats/minute**

Warm-up: Head-neck and shoulder movements, breathing exercises and walking at low speed.

Exercise time: 30 minutes

Cool-down: Head-neck and shoulder movements, breathing exercises and walking at low speed.

Recommendation: When an unexpected condition develops during physical activity and exercise, you should end your activity and someone should accompany you during exercise. Environmental safety should be ensured when doing exercises in the home. Exercises should be done next to a chair or wall to avoid falling. It is recommended to use the auxiliary tools (cane, walker, etc.) and to carry information cards containing identification information, diseases and medicines used outside the house.

### Exercise Example for High Risk Group

#### Sample Case 1;

- A 85 year-old female patient,
- She has dementia, is fragile and fell once in the last 6 months,
- She has 3 chronic diseases under medication control,
- Her wife is dead, she lives at home with his son,
- She is dependent on the daily living activities, not able to maintain her social relations,
- She is using 8 medications,
- Her cognitive functions are impaired.

Exercise prescription

Considering the warm-up and coo-down periods: Fragile elderly should do strengthening training starting from 20%-30% of 1 maximal repeat proceeding to 80% according to the patient's condition. 3 days a week, 1-3 sets and 8-12 repeats. Light intensity exercises are preferred. For light intensity exercise, age (as year) is subtracted from 220. 50% of the resulting value is set as the target pulse.

**220 - 85 (age): 135**

**135x50/100: 68 beats/minute**

Warm-up: Head-neck and shoulder movements and breathing exercises,

Exercise period: 20-30 minutes

Cool-down: Head-neck, shoulder movements, breathing exercises,

Recommendation: Auxiliary tools and equipment should be used while she uses during physical activity and exercise (cane, walker, etc.), precautions to avoid the risk of falling should be taken (suitable shoes, arrangement of the surrounding and preference of walking on a straight way, etc.). It is possible to walk inside; however, walking outside the house should also be preferred. During physical activity and exercise, the person MUST be accompanied by someone.

**Sample Case 2;**

- 90 year-old female patient,
- She is fragile and experienced 2 strokes,
- She is nourished with Percutaneous Endoscopic Gastrostomy (PEG), has Stage-1 pressure sore and 4 chronic diseases,
- Her husband is dead, she lives in her own house with the caregiver,
- She is fully confined to bed,
- She is taking 9 medicines,
- Her cognitive functions are impaired.

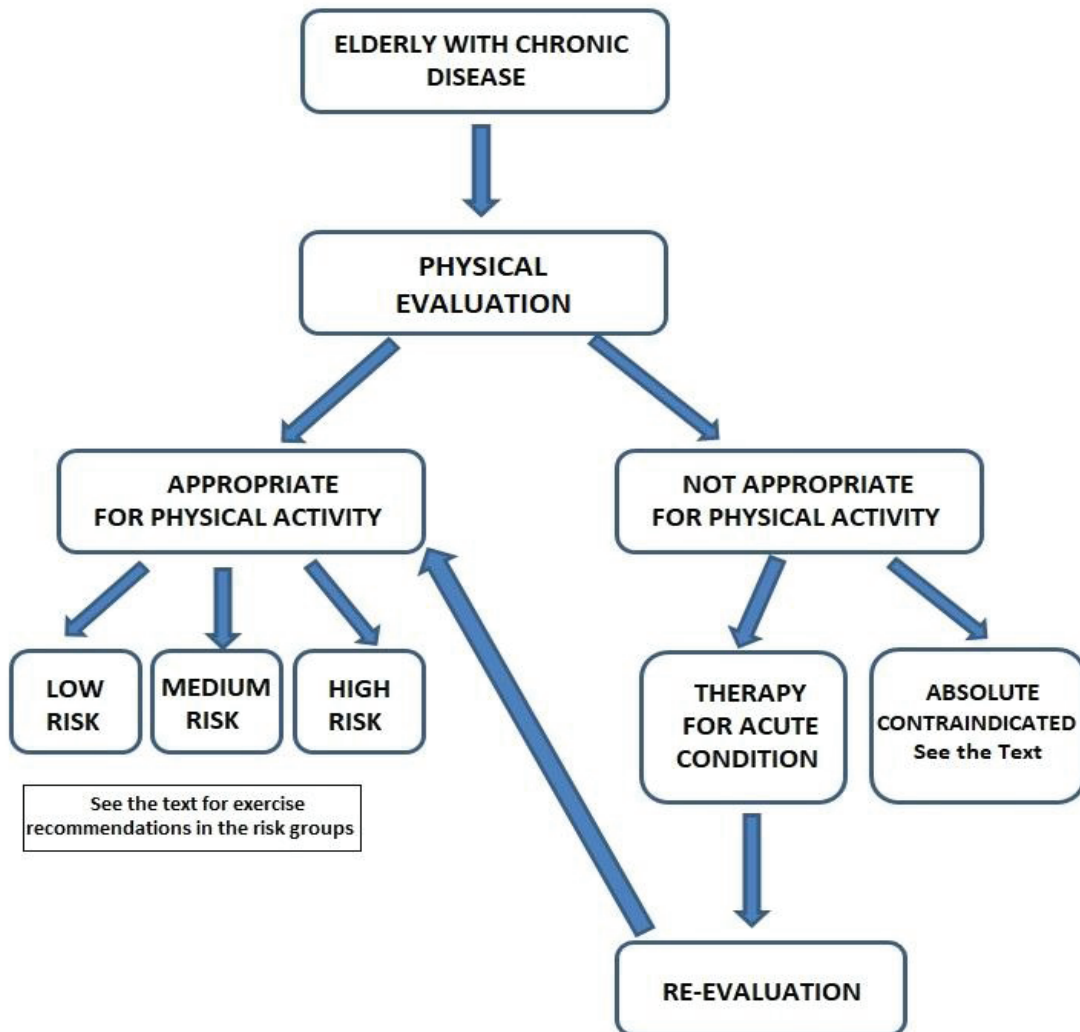
**Exercise prescription**

Light intensity, if required, passive, active-assisted and active exercises should be performed. Respiration exercises, positioning and normal joint movement (passive, active-assisted, active) could be done.

Exercise period: Exercises should be started as 2-3 sessions during the day with 5-6 repeats and increased until reaching 10 tertian repeats. Monitoring cards could be created for positioning.

Recommendation: Considering the condition of the elderly, exercises and positions should be planned and caregiver should be trained in this regard and the caregiver should contact with relevant health care team, if necessary.

**THE ALGORITHM OF DIRECTING ELDERLY TO PHYSICAL ACTIVITY**



**Figure 9.** The Algorithm of Directing Elderly to Physical Activity

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# SECTION 14

## SUDDEN DEATH AND INJURIES IN SPORTS

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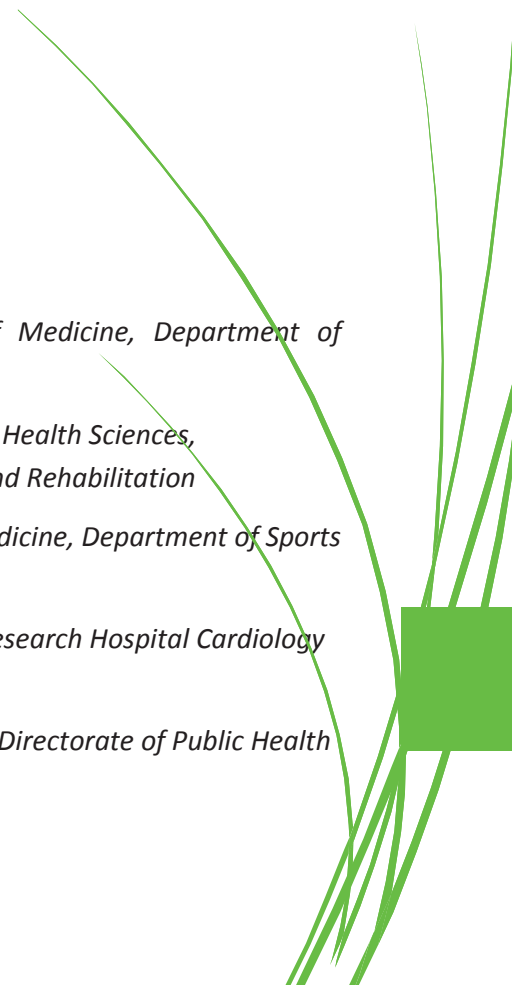
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## **A** BSTRACT

According to the World Health Organization (WHO) 2008 Report, sedentary lifestyle is the 4<sup>th</sup> most common cause of death among the major risk factors of deaths from non-communicable diseases across the world, leading to the death of about 5.3 million people every year. According to the World Health Organization (WHO) 2008 Report, 31% of adults aged 15 years and over are not active enough. According to the "Chronic Disease Risk Factor Survey" conducted by the Ministry of Health in 2011, 87% of women and 77% of men do not perform sufficient physical activity across Turkey. These ratios suggest that sedentary lifestyle is serious for Turkey.

It is unquestionable that more active participation of the individuals of all ages is of great importance for public health. For this reason, exercise should be increasingly used and recommended as an important remedy in the prevention of obesity, diabetes and early-age cardiovascular disease, which are increasing in all age groups. In spite of all these, the inability to make appropriate and standardized health assessments and, if necessary, the proper planning of the person-specific exercise can sometimes lead to serious health problems.

The most important of these health problems that can be seen related to sports are sudden death events that can occur in sport fields or other living spaces. Although sudden death events are rarely seen, this tragic event can create serious negativity and sensitivity in society. Therefore, although encouragement of participation in sport and regular exercise is required, it is also a requirement to establish clinical screening and standards to prevent sudden death.

**INTRODUCTION**

**Defining Sudden Death**

Sudden death, according to the definition of the World Health Organization, is the death cases developing within six hours after the start of the symptoms, while the international society of forensic medicine defines this period as 1 hour. In these definitions, the symptom may be any cardiac complaint and/or finding, the first and only symptom may be sudden cardiac arrest in many cases. Some of the sudden deaths due to sports and exercise can develop in the sporting area, and a significant part of them occur in non-sports habitats, even in resting conditions.

**Sudden Death Frequency and Etiology**

According to the experience of the United States of America and Italy, which have researches much more than any country, sudden death is reported as 0.8-1 in 100.000 cases. It is also a known fact that the frequency of sudden death events increases as the age progresses. It is accepted that males are under more risk for sudden death due to the frequency of sports involvement and the phenotypic influence of some cardiovascular problems. Cardiovascular problems are the most common cause of sudden death, while they may vary in some sources. Apart from cardiovascular causes, physical conditions for sports and exercise and neurological, hematological and respiratory problems that are silent in cases are reported to possibly be both a facilitating and a primer cause. Knowing these etiologic causes is critical when recommending appropriate sports for individuals. The causes of sudden death which may occur during sports due to traumatic and non-traumatic reasons are indicated in Table 32.

**Table 32.** Sudden Deaths in Sports and Physical Activity

Catastrophic brain injuries
Cervical spinal cord injuries
Associated with diabetes complications
Heat stroke associated with effort
Dehydration and hyponatremia during exercise
Effort-related sickling crisis
Fatal blows in contact sports
Stroke of lightning
Sudden cardiac arrest

### Causes of Non-cardiac Traumatic Sudden Death

- **Catastrophic brain injuries**

Mild traumatic brain injury (Cerebral concussion) is often seen in athletes who use both helmets and not. Even rarely, subdural and epidural hematomas and malignant cerebral edema (such as secondary impingement syndrome) resulting from direct trauma give rise to more death than cerebral concussion. When these injuries occur, brain edema or blood accumulation (or both) increases the intracranial pressure. If this condition is not treated quickly, brainstem herniation and cardiorespiratory arrest may occur. Catastrophic brain injuries in American football players resulting in death take the second place after the cardiac injuries. Deaths due to brain trauma are seen almost in all sports branches other than American football. While mortality rate reaches up to 50% especially in catastrophic brain injuries such as second impact syndrome, morbidity is close to 100%.

### Protection and Recommendations

For the avoidance of catastrophic brain injuries, skull fractures, intracranial hemorrhages and generalized cerebral edema (second impact syndrome) in sports;

1. Following the consciousness, keeping the airway open and following vital signs as part of the first intervention, applying stabilizing equipment for both head and neck by following Glasgow coma score in order to protect the athlete suffering trauma from sudden death
2. Transferring required cases to health institutions in a controlled manner where further intervention and assessment could be performed after the first intervention
3. Providing athletes, coaches and parents with education on traumatic brain injuries and prevention
4. Ensuring the use of sports-specific, standardized and certified equipment
5. Using comprehensive, objective assessment methods after injury
6. Monitoring and following the symptoms.

- **Cervical Spine Injuries**

Catastrophic cervical spinal cord injuries occur when the region is exposed to high-intensity trauma, resulting in distortion of the tissue. Sudden death is encountered especially in injuries above C5. Sudden deaths occur due to cardiorespiratory functions being affected by trauma in this region. Supporting the respiratory and circulatory functions is what should be firstly done in these injuries. Complex biochemical events occur in the first 24-72 hours and the risk of death is very high.

**Protection and Recommendations**

1. Following the consciousness, keeping the airway open and following vital signs as part of the first intervention, using stabilizing collar (neck protector) for both head and neck by following Glasgow coma score in order to protect the athlete suffering trauma from sudden death
2. Avoiding the move of the cervical region during transfer
3. Transferring required cases to health institutions in a controlled manner where further intervention and assessment could be performed after the first intervention
4. Providing athletes, coaches and parents with education on traumatic brain injuries and prevention
5. Ensuring the use of sports-specific, standardized and certified equipment
6. Using comprehensive, objective assessment methods after injury

**Cardiovascular Problems That Could Cause Sudden Death**

While hypertrophic cardiomyopathy is the most common cardiovascular disease that may cause sudden death among the adolescent age group, it is followed by coronary artery anomalies, canalopathies, other organic causes and other unidentified arrhythmias. Coronary artery atherosclerosis is in the first place over the age of 35 years. The main mechanism of sudden cardiac death is arrhythmias (ventricular tachycardia, ventricular fibrillation). Briefly describing these problems and classifying them is crucial in preventing sudden deaths. Cardiovascular diseases that may cause sudden death in all age groups during sports are shown in Table 33.

**Table 33.** Cardiological Causes of Sudden Cardiac Death

Cardiomyopathies	Hypertrophic Cardiomyopathy (Most common) Dilated Cardiomyopathy Restrictive Cardiomyopathy ARVD * (the most common in Italy)
Coronary Artery Abnormalities	ALCAPA** ARCAPA*** Rooted in other sinus Kawasaki disease Premature atherosclerosis (aged <35 years rare)
Canalopathies	Long QT syndrome Brugada syndrome CPVT**** Short QT syndrome
Conduction Disorders	High grade 2. degree block Full AV block
Preexcitation Syndromes	Wolf Parkinson White Syndrome
Outflow Tract Obstruction	Aortic Stenosis Aortic Coarctation
Heart Tissue Inflammation	Myocarditis Endocarditis Pericarditis
Trauma	Commotio cordis
Other	Aortic Dissection (Marfan Syndrome) Ehlers Danlos Syndrome Mitral Valve Prolapse Pulmonary Hypertension After Heart Transplantation Postoperative congenital cardiac disease Use of cocaine and stimulants

\* ARVD: Arrhythmogenic right ventricular dysplasia, \*\* ALCAPA: Abnormal left coronary artery rooted in the pulmonary artery, \*\*\*ARCAPA: Abnormal right coronary artery rooted in pulmonary artery \*\*\*\* CPVT: Catecholaminergic polymorphic ventricular tachycardia



### **Hypertrophic Cardiomyopathy**

Hypertrophic Cardiomyopathy (HCM) is accepted as the most common cause of sudden death in the young aged athletes group. The importance of HCM in the frequency of sudden death is due to being the most common genetic transmission disease. As the number of individuals participating in the sports is increasing day by day, this table poses a higher risk. It is sometimes very difficult to distinguish physiologic hypertrophy (athlete's heart) resulting from cardiac adaptation from this pathological hypertrophy. It could be asymptomatic in the individuals with HCM just like the individuals carrying physiological hypertrophy of the heart of athlete and it manifest itself with a sudden death at first. However, some individuals may also experience symptoms such as dizziness, palpitations, shortness of breath, chest pain, and syncope during exercise. HCM differential diagnosis should absolutely be considered for the athletes who describe these symptoms, have death at a young age in the their own families and HCM history and have a suspicion of systolic murmur on physical examination. Sudden death in HCM occurs most frequently in male athletes and in sports such as football and basketball, which require frequent stopping and sudden action.

### **Protection and Recommendations**

Patient with HCM diagnosis at the young age group, cardiac arrest, continuous ventricular tachycardia or syncope attacks recurrent with exercise, short duration recurrent ventricular tachycardia attacks in Holter monitoring, advanced left ventricular hypertrophy (>30 mm), hypotensive blood pressure response to exercise and sudden death in the family and death story associated with HCM are high risk criteria for sudden death. Individuals with these criteria should be closely monitored, not involve in competition sports and should be directed to appropriate cardiology centers for implantation of automatic intracardiac defibrillator. It should be aimed not to increase the work load on the heart during the given exercises to the cases other than patients with advanced clinical stage with poor prognostic criteria and with low functional capacity. Isometric exercises, high weighted strengthening exercises (exercises including valsalva maneuver), high intensity and severity aerobic exercises should not be preferred for upper extremity muscles. It should be remembered that light aerobic exercises may be safer for these patients.

### **Coronary Artery Anomalies**

Although it is a rare congenital disease that affects approximately 1% of the population, it takes the second place among sports-related sudden death causes in the young age group. Although it is claimed to be responsible for 1.2% of sudden deaths due to reasons out of sports in the normal population, it is responsible for 12-19% of sudden deaths in the athletes group. The malformation that is the most common and causes sudden death most frequently is coronary arteries rooted in the abnormal sinus valsalva. The one among these anomalies that most causes sudden death of the athletes is the left main coronary artery rooted in the right sinus valsalva.

The right coronary artery, rooted in the left sinus valsalva, is also an anomaly that may cause sudden death. Furthermore, if either right or left coronary artery is rooted in pulmonary artery instead of aorta, sudden death may occur by causing ischemia. Since this patient group is asymptomatic or symptoms are atypical, it becomes difficult to make a correct diagnosis. Another critical problem is that the resting electrocardiography (ECG) and exercise test results are not diagnostic in some patients. A monitoring physician should be alerted by difficulty in breathing, chest pain, pressure, burning, and syncope attack recurrent by unexplained exercise for a young athlete and this physician should suspect that the underlying cause may be a coronary artery anomaly.

### **Protection and Recommendations**

The most important stage of diagnosis is the suspicion of the disease. Transthoracic or transesophageal echocardiography or multislice computed tomography may help detect coronary arteries rooted in the abnormal origin or suspect malformation. However, with the standard screening tests applied, most malformations of athletes cannot be safely identified. Definitive diagnosis is made by coronary arteriography in suspected cases. Athletes with coronary anomalies should be prohibited from exercising competition sports in order to reduce the risk of cardiac events. The most common approach to restore distal coronary flow in patients with abnormal coronary arteries is by-pass grafting. As a result of clinical assessment and examination, the cases found with significant myocardial ischemia should be excluded from competition sports and should avoid from vigorous intensity sportive activities.

### **Myocarditis**

Myocarditis is one of the causes of sudden death associated with exercise in young athletes. However, a definitive diagnosis may not be possible in most cases even with a myocardial biopsy/autopsy. As a result of the autopsy studies, about 6% of the athletes of competition sports demonstrated acute inflammatory changes in the myocardium or idiopathic scar areas thought to be due to healed myocarditis. Myocarditis is an inflammatory disease caused mainly by enteroviruses and adenoviruses. In addition, it should be remembered that pancreatitis cases, which may occur during acute rheumatic fever and become an endemic problem in some part of Turkey, may encounter with sudden death due to severe valve problems and heart failure during exercise. Sudden cardiac death may occur in patients with active myocarditis or recovering myocarditis due to deterioration of the electrical stability of the left ventricle. If an athlete had experienced fully healed myocarditis, he/she does not have to leave active sports life.

**Protection and Recommendations**

Athletes should be followed closely for 6 months from the onset of clinical findings. When cardiac measures and functions return to normal, competitive sports and high intensity exercises should not be allowed again until arrhythmias in stress testing and ambulatory monitorization disappear.

**Coronary Artery Disease**

Regular exercise has an important place in preventing the development of atherosclerotic coronary artery disease. Coronary artery disease is the most common cause of sudden cardiac death associated with exercise in individuals aged 35 and above. In a study conducted in the Veneto region of Italy, Corrado et al. reported that atherosclerotic coronary artery disease is one of the leading causes of sudden death in young athletes as well. In these cases, the disease was frequently shown to occur in the left anterior descending coronary artery. Maron et al. suggest in a study that premature coronary artery disease is responsible for 10% of sudden deaths among the young-age athlete group. This disease is usually caused by familial dyslipidemias and causes myocardial ischemia or infarctions in the second or third decade. Athletes with tendon xanthomas and family history of sudden death or cardiac disease at early ages should be carefully evaluated for coronary artery disease.

**Protection and Recommendations**

Individuals with familial hyperlipidemia and who underwent ischemic cardiac event should be directed to regular exercise to prevent sudden death. During this guidance, recommended exercise should be safe and moderate intensity and performed at appropriate pulse range, considering the severity and involvement of the disease, functional capacity and the medications used. Involvement in competitive sports is not recommended for patients with symptomatic coronary artery disease. According to the results of advanced tests in asymptomatic individuals, the decision to participate in competitive sports should be given individually.

**Intramural coronary artery**

The complete flexion of the left anterior descending coronary artery by the myocardium is an anatomic variation that can cause sudden death during exercise in young healthy individuals. While the myocardial fibers surrounding the coronary cause stenosis in the diastole, this stenosis reaches critical dimensions during systole and causes myocardial ischemia. Beta blockers may reduce stenosis in coronaries and increase blood flow, reducing ischemia and anginal symptoms.

**Protection and Recommendations**

As a result of clinical evaluation and examination, the cases found with significant myocardial ischemia should be excluded competitive sports and should avoid from high-intensity sports activities.

**Marfan Syndrome and Aortic Rupture**

Marfan syndrome is responsible for 7% of sudden deaths in young athletes due to rupture of the aortic aneurysm resulting from a decrease in elastic fibers in the aortic media layer. Athletes with physical findings such as arachnodactyly, scoliosis, pectus excavatum, highly arched palate, joints with increased flexibility and lens dislocation should be evaluated in terms of Marfan syndrome. However, it should not be forgotten that cardiovascular findings may also occur without evidence of skeletal system.

**Protection and Recommendations**

The primary determinant factor for allowing athletes with diagnosis of Marfan syndrome to perform competitive sports is the presence and degree of aortic dilatation. In the presence of aortic dilatation, the athlete must expose to a detailed medical evaluation before being allowed to participate in the competitions.

**Valvular Heart Disease**

Aortic valvular stenosis is a cause of sudden death in young adults in the normal population. Since the typical murmur could be recognized easily as part of evaluations before involvement in competitive sports, diagnosis of the disease could be made at early ages compared to other pathologies and involvement of the athlete in competitive sports is hindered, preventing disappointing results. Although mitral valve prolapses is common in the general population, it is a rare cause for sudden death in young athletes.

**Protection and Recommendations**

In the case of moderate and advanced Aortic stenosis, if there is effort-related syncope, chest pain, severe arrhythmia, spontaneous ischemia finding in ECG, competitive sports and moderate to vigorous aerobic and isometric exercises should be avoided. If patients with mitral valve prolapse have cardiomegaly due to chest pain, syncope, complex ventricular arrhythmias and mitral regurgitation or they have sudden death story in their families, a limitation in physical activities is recommended.

**Arrhythmogenic Right Ventricular Dysplasia**

Although reported that it is among the rare causes of sudden deaths among young athletes according to previous studies, it is the most common cause in North Italy. Sometimes it is difficult to make the diagnosis of the disease. In the ECG, abnormal T waves may be seen in precordial derivations. Although seen rare, Epsilon waves are disease-specific finding. If echocardiography cannot help with the diagnosis, magnetic resonance imaging can sometimes be diagnostic, showing infiltration with myocardial fat tissue.

**Protection and Recommendations**

Exercise is an important clinical factor in arrhythmogenic right ventricular dysplasia for the development of sudden death. The presence of severe ventricular arrhythmias previously documented on this table, the presence of syncope, the presence of sudden death in the early ages in the family and the presence of radiologically extensive degeneration are accepted as important risk factors. It is necessary to avoid moderate and vigorous intensity exercises in individuals with a definite disease diagnosis.

**Channelopathy**

Genetically most common channelopathy is long QT syndrome. Abnormal extension of repolarization time in long QT syndrome paves the way for a ventricular arrhythmia called Torsade de Pointes. Values higher than 450 msn in males and 460 msn in females are considered as long QTc. However, in approximately 40% of individuals with genetically positive Long QT, the QTc values are within normal limits. Additionally, 5 to 10% of normal individuals have QTc values above 460 msn. For these reasons, making the long QT diagnosis by only evaluating the ECG may lead to some problems. ECG findings become meaningful with certain symptoms, positive family history and genetic testing or with very high QTc values. Avoidance of stimulants and exercise, beta-blockers, left cardiac sympathetic denervation and Internal Cardiac Defibrillator (ICD) are the treatment options to be selected according to the conditions.

Brugada syndrome is another ion channel defect in which reentrant type tachycardias are observed due to timing difference within right ventricular epicardium and between epicardium and endocardium. Although symptom is observed in characteristic ST elevation in derivations seeing the right ventricular in electrocardiography, ECG findings may be subtle in most cases. Provocation tests with top-level ECG or sodium channel blockers can make characteristic ST elevation apparent. ICD treatment is needed in symptomatic cases.

Short QT syndrome is a relatively newly defined channelopathy. As a result of some mutations, the period of repolarization in some regions of the atrium and ventricle is shortened abnormally, thus establishing a ground for the formation of serious arrhythmias both at the atrium and the ventricle. QT time under 360 ms in ECG should be stimulant. However, final diagnosis could be made by combining ECG findings with various recurrent symptoms and positive family history.

Catecholaminergic Polymorphic Ventricular Tachycardia (CPVT) is an ion channel defect characterized by exercise/stress induced syncope and sudden death. The defect is in the intracellular calcium channels. The major obstacle to recognition of the disease is the absence of pathologic findings other than moderate bradycardia and non-specific T-wave changes on ECG during rest. ECG findings and symptoms could be detected during the exercise test. Even during the exercise test, typical changes may not occur until the target cardiac rate is reached. Mono or bidirectional ventricular tachycardia monitoring is typical for CPVT following ever-increasing ventricular extra systoles with increasing heart rate.

#### **Protection and Recommendations**

Since Catecholaminergic Polymorphic Ventricular Tachycardia and Long QT type 1 are directly associated with exercise, absolute exercise restriction should be made. Patients with Long QT type 1 should especially avoid swimming. Depending on the genetic and phenotypic features of the channelopathy, exercise restriction recommendations should be personalized. However, it is necessary to avoid moderate and vigorous intensity exercises in individuals with a definite disease diagnosis and in high risk group.

#### **Cardiac Conduction System Abnormalities**

In the absence of other structural cardiac causes, congenital or subsequent abnormalities in the cardiac conduction system can lead to sudden death in athletes and other young individuals by forming cardiac blocks and bradyarrhythmias. Wolff-Parkinson-White Syndrome (WPW) is a disease that causes sudden death in less than 0.1%. Death often occurs as result of occurrence of rapid ventricular response by conducting the atrial fibrillation, which is often caused by increased sympathetic activity during exercise, through accessory path and degeneration of ventricular fibrillation.

#### **Protection and Recommendations**

Athletes with WPW syndrome should be evaluated for the development of atrial fibrillation and development of other arrhythmias with exercise test and 24-hour Holter monitoring and vigorous intensity exercise should be restricted until the end of the electrophysiological study and treatment.

**Congenital Cardiac Conditions**

Major vessel transposition, Fallot tetralogy, pulmonary vascular disease and left ventricular outflow tract obstruction are the groups with the highest risk of sudden death. Patients who underwent Fallot tetralogy, atrial switch and Fontan operation in the postoperative long term are at risk for serious arrhythmia and sudden death.

**Protection and Recommendations**

The exercise program, which may be suitable for the severity of the disease, patient's functional capacity, planned treatment type and follow-up, should be planned.

**Sudden Death after Blunt Chest Trauma (Comotio Cordis)**

Comotio Cordis is used to describe acute cardiac arrest accompanied by severe arrhythmias following blunt traumas that correspond to the area in the projection surface of the heart that corresponds to the vulnerable period in which the heart's electrical sensitivity increased. Nowadays, due to ever increasing concern with contact and defense sports, its importance became more prominent.

**Protection and Recommendations**

It is a frequently confronted problem, since people, who engage in contact sports or sports with the risk of blunt blows, are not sufficiently taught the rules related to these sports and protective equipment are not used. It is vital to bring the rules trainings and the necessity of using equipment to protect from sudden death.

**Other reasons**

Causes, such as Kawasaki disease, are much less common cause of sudden death and account for about 6% of all cases. In 2% of athletes who died of sudden death due to exercise, no evidence of structural cardiac disease was found although heart was carefully examined in autopsies. It is suggested that some part of these cases are related to cocaine and ergogenic aids (Table 30).

**Protection and Recommendations**

The athletes should be reminded that the unlawful recommendations for ergogenic support and performance increase may threaten their health. The use of these products should be banned on behalf of healthy sport, especially from childhood.

### General Approach to Prevention of Sudden Death and Screening

The most effective method to prevent sudden death in people to do sports and exercise is pre-sports screen tests. Both the American and the Italian experience emphasize the importance of investigating the cardiac system and complaints, particularly after recording whether or not the individuals have a complaint. In addition, it is an unchanging approach in terms of diagnosis to make a physical examination involving assessment of all systems to be performed in a rigorous manner. However, there is no international consensus on what to do after these two important assessments. The American Heart Association does not accept any other method of screening other than history and physical examination. Despite this approach, some sports federations in the United States use electrocardiography (ECG) and echocardiography as part of routine examinations for athletes. Another important experience related to the subject is Italian data. Although the Italian approach routinely used echocardiographic evaluation other than ECG until the early 2000s, then they removed the echocardiographic evaluation from routine examination as they found this approach high cost-effective. In relation to the articles after Italian experience, the European Society of Cardiology published an important guide in relation to the subject in 2005. In addition to the story and physical examination, this guide suggested only routine ECG evaluation. Although there are not enough studies related to this topic in Turkey, there are some publications related to clinical proposals. In these publications, an evaluation flow chart is proposed in the pre-sport evaluation based on whether or not the physical activities to be done by individuals are competitive. According to these recommendations, an evaluation should be made in accordance with proposal of European Society of Cardiology for the individuals not involved in the group of competitive sports, while stress test and echocardiographic evaluation should be included in the group of competitive sports and symptomatic athletes.

1. Complete personal and familial medical history is very important.
2. It is recommended that the physical examination should be designed to detect or suspect cardiovascular diseases that may cause sudden death, in particular.
3. American Heart Academy did not recommend the routine use of ECG because of concerns such as low prevalence of diseases, low sensitivity, high false positive rate, poor cost and concern about the need to evaluate the results by a competent person. This assumption was not approved by the European Society of Cardiology (ESC) and it is still debated whether the ECG is necessary for athletes' screening.



**Personal Story Questions**

1. Have you ever fainted or been about to faint during or after exercise?
2. Have you ever felt any discomfort, pain, tension and pressure in your chest during exercise?
3. Did you feel excessive fatigue, difficulty in breathing or shortness of breath during exercise?
4. Did your doctor mention high blood pressure, high cholesterol?
5. Did your doctor mention that you have a murmur or other cardiac problem?

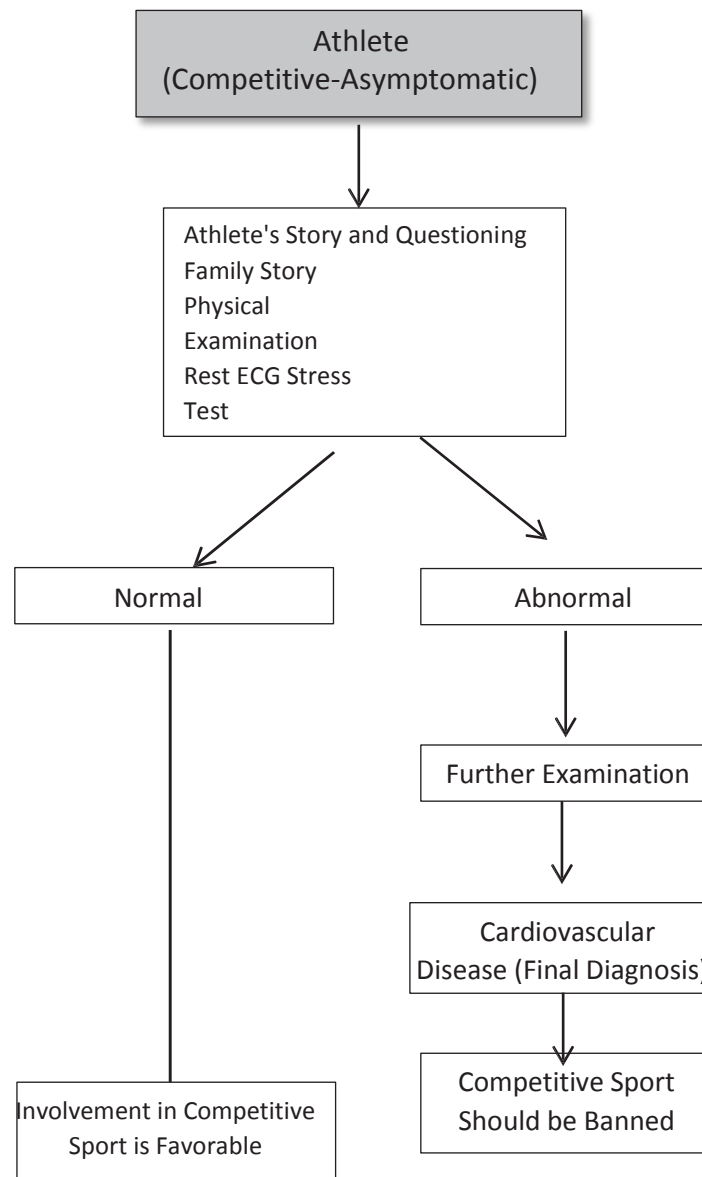
**Family History Questions**

1. Is there any person in your family having a history of unexpected or unexplained sudden death under the age of 50, death due to drowning, an unexpected traffic accident while driving or a cardiac problem or sudden infant death syndrome?
2. Have you any close relatives with a disability due to cardiac disease under the age of 50?
3. Is there any person in your family having hypertrophic cardiomyopathy, Marfan syndrome, arrhythmogenic right ventricular dysplasia, long QT, short QT, Brugada syndrome or catecholaminergic polymorphic ventricular tachycardia, cardiac pacemaker or defibrillator?

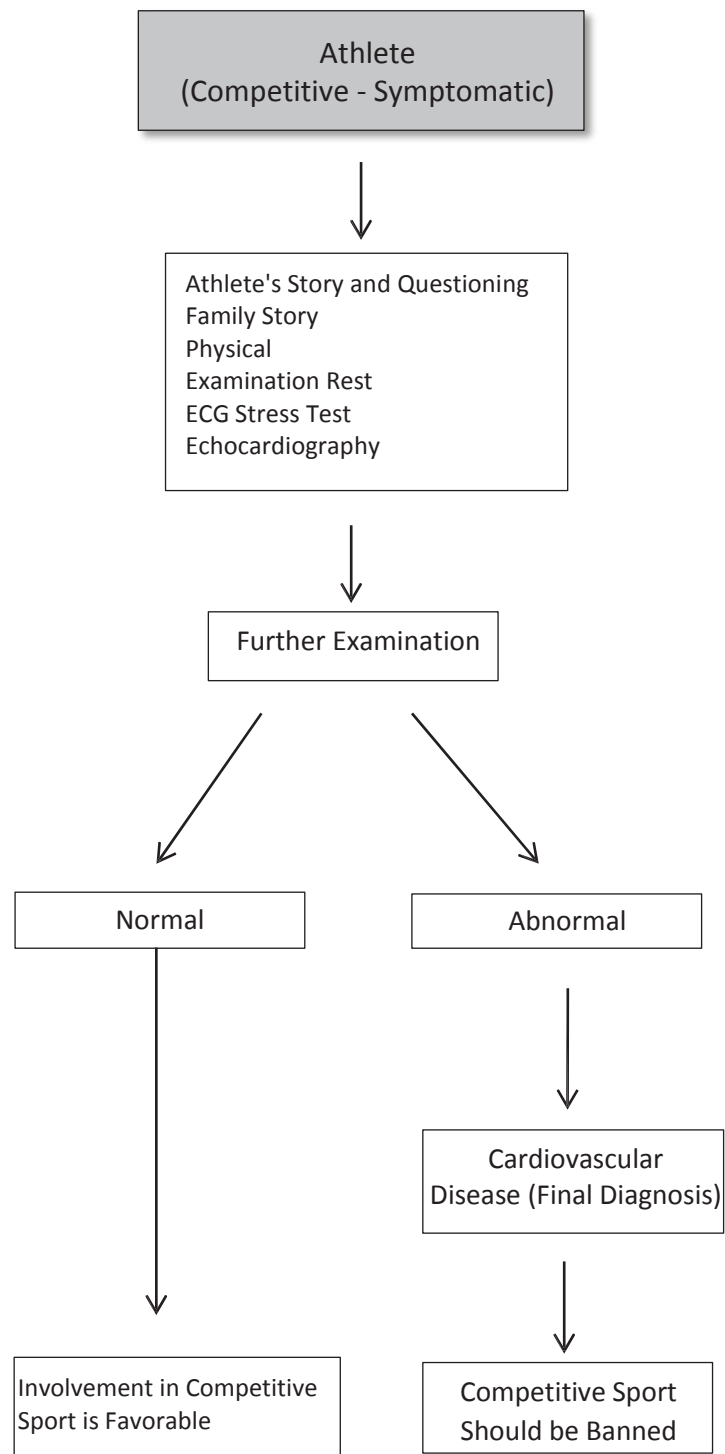
**Cardiovascular Physical Examination**

1. Dynamic auscultation (both standing and in bed or with a Valsalva maneuver)
2. Radial and femoral pulse palpation to exclude aortic coarctation
3. Marfan physical stigmas, kyphoscoliosis, highly arched palate, pectus excavatum, arachnodactyly, total length of upper extremity longer than the height, increased laxity in joints, myopia, mitral valve prolapses, and aortic insufficiency
4. Bracial arterial blood pressure (sitting position)

Despite all these approaches, there is not yet a golden test or parameter other than the approaches already mentioned. For these reasons, especially those with symptoms and signs should be evaluated with advanced examination methods. The recommendation algorithm, previously published in terms of Turkey's evaluation standards, is shown in Figures 10 and 11.



**Figure 10.** Cardiovascular Risk Evaluation in Competitive Athletes without Cardiovascular Symptom. (legally cited from Anatolian Journal of Cardiology No. 2011; 11: 351-9)



**Figure 11.** Cardiovascular Risk Evaluation in Athletes with Cardiovascular Symptom.  
(legally cited from Anatolian Journal of Cardiology No. 2011; 11: 351-9)

**Final Implications**

- Each individual should be evaluated in terms of health in a systematic way before starting the sport and this procedure should be repeated periodically.
- The individuals, who are or will be doing sports and exercises, should be repeatedly taught the rules and principles that can prevent the health problems associated with sportive activities.
- The unquestionable use of protective garment and equipment conforming to the standards associated with sports and physical activity should be made obligatory.
- The complaints of individuals doing sports during and after the sports should be paid attention and evaluated.
- The places for competitive sports should be equipped with team and equipment that can respond to the possible sudden cardiac arrest and injuries that during the events.
- Trainers and professionals should receive first aid training.
- Automatic defibrillators should be available at appropriate places in the sports areas and social areas outside and the trainers and professionals should be up to do using them.
- Individuals engaged in sports should be warned and prevented from using an additional substrate and substance other than natural and healthy nutrition.
- Evaluations before sport should be made precisely and in accordance with guidelines, certificate of compliance with sports should be given after such evaluation.
- Before recommending a sport to the individuals with a definitive diagnosis of cardiovascular problem, the diagnosis should be reviewed whether or not it poses a contraindication to the exercise.
- Exercises to be recommended for individuals with a definitive diagnosis of cardiovascular problems should be planned according to the individual's stage of disease pattern, level of functional capacity and high risk factors.

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Saęlıklı Beslenme ve Hareketli Hayat  
Daire Bařkanlıęı  
Adnan Saygun Caddesi No:55 Sıhhiye,  
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