

Pulmonary Embolism

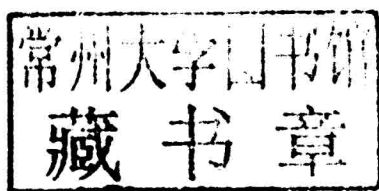
A Cardiopulmonary Disease

Jim Foster



Pulmonary Embolism: A Cardiopulmonary Disease

Edited by Jim Foster



New Jersey

Published by Foster Academics,
61 Van Reypen Street,
Jersey City, NJ 07306, USA
www.fosteracademics.com

Pulmonary Embolism: A Cardiopulmonary Disease

Edited by Jim Foster

© 2015 Foster Academics

International Standard Book Number: 978-1-63242-338-2 (Hardback)

This book contains information obtained from authentic and highly regarded sources. Copyright for all individual chapters remain with the respective authors as indicated. A wide variety of references are listed. Permission and sources are indicated; for detailed attributions, please refer to the permissions page. Reasonable efforts have been made to publish reliable data and information, but the authors, editors and publisher cannot assume any responsibility for the validity of all materials or the consequences of their use.

The publisher's policy is to use permanent paper from mills that operate a sustainable forestry policy. Furthermore, the publisher ensures that the text paper and cover boards used have met acceptable environmental accreditation standards.

Trademark Notice: Registered trademark of products or corporate names are used only for explanation and identification without intent to infringe.

Printed in China.

Preface

This book aims to highlight the current researches and provides a platform to further the scope of innovations in this area. This book is a product of the combined efforts of many researchers and scientists, after going through thorough studies and analysis from different parts of the world. The objective of this book is to provide the readers with the latest information of the field.

This book discusses the cardiopulmonary disease of pulmonary embolism in detail. Pulmonary embolism is a grave and possibly fatal cardiopulmonary disorder, occurring because of partial or complete obstruction of the pulmonary arterial bed. Lately, critical advancements have been made in the detection and remedy of this ailment. This text evaluates this cardiopulmonary disease in the context of current advancements. Risk factors resulting in pulmonary embolus along with a compendium of methodical ways for management of risk stratification have been presented. For the purpose of developing novel strategies for achievement of a greater span of active life and maintaining the continuum of ability to execute critical functions as the goal of new interventional gerontology, the agents causing pulmonary embolus in elderly people have also been evaluated, and the ways for its prevention and cure have been described. The risk of incidence of deep vein thrombosis and pulmonary embolism, obesity due to immobility - dubbed as the disease of this era, irregular and excessive eating, treatment and management have been elucidated. Non-thrombotic emboli have also been elucidated in this extensive book. An effort has been made to update knowledge and constitute an understanding regarding this disorder for bringing a positive change in the treatment and prognosis of the illness till a significant extent. Along with pathophysiological description of the disease, the primary objective of rapid and precise diagnosis has been emphasized, and diagnostic strategies have been elucidated in this text. A statistical study of the vena cava filters - a novel method for prevention of pulmonary emboli recurrences, has also been presented.

I would like to express my sincere thanks to the authors for their dedicated efforts in the completion of this book. I acknowledge the efforts of the publisher for providing constant support. Lastly, I would like to thank my family for their support in all academic endeavors.

Editor

Contents

Preface

VII

Chapter 1	Pulmonary Embolism in the Elderly – Significance and Particularities Pavel Weber, Dana Weberová, Hana Kubešová and Hana Meluzínová	1
Chapter 2	Risk Factor for Pulmonary Embolism Ufuk Çobanoğlu	31
Chapter 3	Risk Stratification of Patients with Acute Pulmonary Embolism Calvin Woon-Loong Chin	49
Chapter 4	Non-Thrombotic Pulmonary Embolism Vijay Balasubramanian, Malaygiri Aparnath and Jagrati Mathur	67
Chapter 5	Venous Thromboembolism in Bariatric Surgery Eleni Zachari, Eleni Sioka, George Tzovaras and Dimitris Zacharoulis	111
Chapter 6	Pathophysiology, Diagnosis and Treatment of Pulmonary Embolism Focusing on Thrombolysis – New approaches Diana Mühl, Gábor Woth, Tamás Kiss, Subhamay Ghosh and Jose E. Tanus-Santos	119
Chapter 7	Ventilation Perfusion Single Photon Emission Tomography (V/Q SPECT) in the Diagnosis of Pulmonary Embolism Michel Leblanc	141

Chapter 8	Quantitative Ventilation/Perfusion Tomography: The Foremost Technique for Pulmonary Embolism Diagnosis Marika Bajc and Jonas Jögi	169
Chapter 9	Risk Stratification of Submassive Pulmonary Embolism: The Role of Chest Computed Tomography as an Alternative to Echocardiography Won Young Kim, Shin Ahn and Choong Wook Lee	189
Chapter 10	Dual Source, Dual Energy Computed Tomography in Pulmonary Embolism Yan'E Zhao, Long Jiang Zhang, Guang Ming Lu, Kevin P. Gibbs and U. Joseph Schoepf	205
Chapter 11	Numerical Analysis of the Mechanical Properties of a Vena Cava Filter Kazuto Takashima, Koji Mori, Kiyoshi Yoshinaka and Toshiharu Mukai	219

Permissions

List of Contributors

Pulmonary Embolism in the Elderly – Significance and Particularities

Pavel Weber, Dana Weberová, Hana Kubešová and Hana Meluzínová
*Department of Internal Medicine, Geriatrics and Practical Medicine
 Masaryk University and University Hospital, Brno
 Czech Republic*

1. Introduction

The development of civilization and extreme technical progress leads to increasing hope of longer survival and makes the average life expectancy longer. Both in absolute and relative numbers the amount of the elderly, very old and long-aged people are increasing (Blackburn & Dulmus, 2007; Ratnaik, 2002). This tendency will continue and it will be emphasized by ageing volumes of people born after the World War 2 in the years 2010 -2015 (Kalvach et al., 2004). The basic survey and knowledge of geriatric medicine will be necessary in the future, especially for professionals such as doctors, nurses, psychologists, social workers, physio- and occupational therapists etc.

Knowledge of at least basic extraordinarities and specifics of geriatric medicine will be of huge practical significance, because in the year 2050 there will live 2 billions of people older than 60 years on the Earth. (Moody, 2009). From this fact it is obvious, that there is an objective need to master the basic knowledge of gerontology and geriatrics among professionals (including doctors of all medical branches).

In this brief chapter it is not possible to include the whole issue dealing with the medical care of old-aged patients with PE, even if this issue deserves the attention because of its practical meaning and close relationship with other branches (internal medicine, surgery etc.). The emergency situations together with polymorbidity and exhaustion of functional reserves in advanced age (Campbell et al., 2008; Friedman et al., 2008) will be more frequent in all of the organ systems – cardiovascular, respiratory, GI (gastrointestinal) tract, endocrine, immune etc. (Bongard & Sue, 2003; Roberts & Hedges, 2009). We refer to the study of the clinical picture description (incl.therapy) of each of critical states in the old age in appropriate specialized chapters in this monograph and in other gerontologic literature (Hall et al., 2005; Stone & Humphries, 2004).

General knowledge of these aspects can substantially influence an approach of intensivists who face an increasing number of old patients in their practice (Brunner-Ziegler et al., 2008; Pathy et al., 2006). Among the aspects we would like to mention there are: global situation, specific problem of geriatric medicine, pharmacotherapy in the elderly, at last but not least problems of ageing organism as reflected in particularities and pitfalls of medical treatment in multi-morbid old patients.

Ageing and its manifestation as currently understood such as frailty, functional disorders and decreasing mental abilities are not standard symptoms of ageing process but they are

mostly consequences of simultaneously on-going diseases (Goldmann et al., 2000; Fauci et al., 2008). The target of new **interventional gerontology** is extension of active life period and sustaining functional abilities for maximum time.

Information about function can be used in a number of ways: as baseline information, as a measure of the patient's need for support services or placement, (Tallis & Fillit, 2003) as an indicator of possible caregiver stress, (Asplund et al., 2000) as a potential marker of specific disease activity, to determine the need for therapeutic interventions, and to indicate prognosis.

2. Comprehensive geriatric assessment (CGA) as basic tool of modern geriatry

Clinical gerontology emphasises an individual approach to old patients (Harari et al., 2007; Soriano et al., 2007). The method of operation is **comprehensive geriatric assessment - CGA** (Gupta, 2008; Gurcharan & Mulley, 2007; Williams, 2008). Apart from somatic aspects of the health status there are significant items to be underlined: self-sufficiency evaluation, knowledge and evaluation of psychic state and social conditions (see tab. 1).

Much of what has been written on evaluation of the older patient is simply attention to the details of careful clinical assessment. Contemporary emphasis on efficiency and effectiveness of clinical care requires thoughtfulness about any extension of the already lengthy evaluation of complex chronic medical problems that commonly cluster in older persons. Brief screening questions rather than elaborate instruments are appropriate for the first encounters (Stuck, 1995); more detailed assessment should be reserved for patients with demonstrated deficits (Applegate et al., 1990).

Subject of assessment	Way of evaluation
Somatic status	Somatic examination, posture, mobility, continence, nutrition, sight, hearing, geriatric syndromes, etc.
Self-sufficiency	ADL- test, ability to keep own household, IADL- test
Mental status	cognitive function – MMSE- test, Clock test; depression scale according Yesavage, etc.
Social status	social contacts, people available to summon help, bereavement, removal, dwelling and loneliness risks

Table 1. Comprehensive geriatric assessment

In its multidisciplinary context the geriatry does not substitute other clinical medical branches in care of an old person but completes them with application of **specific geriatric regimen**, which aims to reinforce the independence and improve self-sufficiency of the older patients (Williams, 2008). Following methods are based on principles of **specific geriatric regimen**.

- Considerate tailor-made diagnostics and treatment aimed at improvement of life quality
- Follow up physiotherapy
- Multi-disciplinary team active approach aimed at improvement of self-sufficiency and/or prevention of dependence

- Social work creating conditions enabling patients to return to home environment (incl. home-care)

Main target of these efforts is improvement in independence and self-sufficiency improvement in older patients (Zavazalova et al., 2007). Geriatric regimen brings benefits especially for patients aged 75+ or even 80+ who are endangered with following risks typical for this age:

- Development of immobilisation syndrome
- Self-sufficiency loss
- Atypical pathway of more diseases influencing simultaneously each other
- Occurrence of early impairment of organ function as a consequence of exhaustion of their functional reserve (lungs, kidneys etc.)
- Maladaptation towards changes
- Ageism (discrimination because of the old age).

Evaluation of the older patient can be time-consuming (Topinkova, 2005), even when it is tailored to the problem. Yet, such initial investment can reduce subsequent morbidity and resource utilization and enhance both patient's and physician's satisfaction. Additionally, the assessment can often be accomplished over several visits. Moreover, much can be gleaned from questionnaires filled out by the patient or caregiver in advance as well as from observation.

3. Geriatric patient – Particularities of health status

Geriatric patients are people of higher age (formally above 65; practically above 75 years), their involuntary and morbid changes (usually multi-morbidity) significantly influenced their functional state, adaptability, ability of regulation, toleration to stress. These patients profit from specific geriatric attitude, they need more complicated coordination of services, often active observation of health and/or functional state, they are in risk of sudden loss of self-sufficiency, danger of delay, adverse effect of remedies is more frequent, institutional care is often needed (geriatric hospitalism), also they are in danger of frequent professional mistakes for atypical symptoms in comparison to clinical picture, which is for certain disease typical in adult middle age (Friedman et al., 2006; Pathy et al., 2006; Williams, 2008). The following principles of geriatric medicine are helpful to keep in mind while caring for older adults:

1. Diseases often present atypically.
2. Many disorders are multifactorial in origin.
3. Not all abnormalities require evaluation and treatment.
4. Polypharmacy and adverse drug events are common problems.

Comorbidities are common in older people, and the diagnostic "law of parsimony" often does not apply. A disorder in one organ system may lead to symptoms in another, especially the one that is compromised by preexisting disease. Since these organ systems are often the brain, the lower urinary tract, and the cardiovascular or musculoskeletal systems, a limited number of presenting symptoms – i.e., confusion, falling, incontinence, dizziness, and functional decline – predominate irrespectively of the underlying disease. Thus, regardless of the presenting symptoms in older people, the differential diagnosis is often similar.

Many abnormal findings in younger patients are relatively common in older people and may not be responsible for a particular symptom. Such findings may include asymptomatic

bacteriuria, premature ventricular contractions, and slowed reaction time. In addition, many older patients with multiple comorbidities may have laboratory abnormalities that, while pathologic, may not be clinically important. A complete workup for a mild anemia of chronic disease in a person with multiple other issues might be burdensome to the patient with little chance of impacting quality of life or longevity.

Ageing is associated with a decline in expectation of healthiness. Those over age 65 generally give more positive evaluations of their healthiness in the face of increasing burden of disease and disability (Kriegsman et al., 1996; Tinetti et al., 2000). The older the person is, the more likely they are to report very good health status (Gross et al., 1996). However, overestimating healthiness (also called normalization) often results in explaining away symptoms or problems as caused by minor illnesses or even by external events. In either case, late recognition and delayed intervention are the usual outcome. Previous neglecting of symptoms by health care professionals is also likely to teach older patients that frailty and loss of independence are normal and to be expected with ageing; again, late detection and intervention are likely, resulting in high cost and discouraging outcomes. Perhaps these attitudes explain the finding of greater pessimism in older persons compared with those middle-aged, even when health status was factored in. *Underreporting of symptoms* is a common theme in discussions of illness behavior of older persons.

The problems identified were common and usually treatable diseases; congestive heart failure, correctable hearing and vision deficits, tuberculosis, incontinence, anemia, bronchitis, claudication, cancers, malnutrition, diabetes, immobility, oral disease preventing eating, dementia, and depression were frequent. Considerable underreporting was also seen among people with chronic diseases. More than a half of chronically ill individuals, who were surveyed in one study, failed to report at least one disease. Older people tend to report inaccurately cardiac disease, arthritis, and stroke (Kriegsman et al., 1996).

The riskiness of underreporting of symptoms by older patients is obvious; late identification of disease (inclusive of PE) leads to late initiation of treatment, usually after substantial morbidity associated with advanced pathology has already occurred and caused major functional losses. Rehabilitation to independence from these losses is difficult; permanent dependence in spite of "successful" treatment may occur.

Majority of all biological functions culminates before the age of 30 y. Some of them gradually continuously decrease afterwards (Masoro & Austad, 2006). This decay is practically of no significance in terms of current everyday activity but it can matter under stress or extended load (Humes, 2000; Hunter et al., 2002).

Seniors as such represent very heterogenous group and from the point of view of fitness, risk and need of help (or specific service) they can be divided to the 3 basic areas with different focus of health attention:

- **Fit seniors** – Seniors in good condition and physical efficiency. Medical attitude towards them should be the same as standards which are valid for adults in middle age. However, there can be also risk of atypical symptoms of diseases in them.
- **Independent seniors** – do not need extraordinary care and services, they can live independently in standard condition, however in stress situations (severe diseases, surgery, injuries, viral infections in epidemics, extreme variation of the weather, sudden change of social state – death of partner, loneliness, moving etc.) they fail.
- **Frail seniors** – are instable and in the risk even in standard condition. These frail seniors usually need help in common daily activities or they are limited in motion, moreover they are confined to bed (Fried et al., 2005; Wawruch et al., 2006). This group

of patients contains those with higher risk of falls, dementia syndrome, with very bad mobility, labile somatic disease (i.e. frail cardiac with repeated cardiac failure or electric instability), also with complicated orientation (visual disturbance and hearing loss), people in social distress and very old above 85 years old, especially when they live alone (Leng et al., 2007; Yaffe et al., 2007).

Health status in ageing is a result of many factors, including the chronic diseases of ageing and many other prevalent conditions that cannot be defined as classic "diseases" because they do not result from a single pathologic cause. Falls, which occur in one third of older adults, result in injuries, fractures, and high risk for disability and mortality. Severe cognitive impairment and urinary incontinence have a substantial adverse impact on an elderly person, as does sensory isolation resulting from hearing and visual impairment; all of these conditions are frequent with aging.

Older patients differ from young or middle-aged adults with the same disease in many ways, one of which is the frequent occurrence of comorbidities and of subclinical disease.

A second way in which older adults differ from younger adults is the greater likelihood that their diseases present with nonspecific symptoms and signs. As a result, the diagnostic evaluation of geriatric patients must consider a wider spectrum of diseases than generally would be considered in middle-aged adults.

4. Biology of ageing

Ageing and advanced age is a terminal phase of ontogenetic development of every individual (Beers et al., 2006; Pathy et al., 2006). **Specific degenerative morphological and functional changes** occur in individual organs at all levels from the cells to whole organism (Heltweg, 2006). Important role in aging is **apoptosis**. In the cell, which may compromise the body (eg, activated leukocyte, as malignant cells), respectively a correction would be difficult to run programmed cell death.

Despite the biologic controversy, from a physiologic standpoint human ageing is characterized by progressive constriction of the homeostatic reserve of every organ system. This decline, often referred to as *homeostenosis*, is obvious by the third decade and is gradual and progressive, although the rate and extent of decline vary. The decline of each organ system appears to occur independently of changes in other organ systems and is influenced by diet, environment, and personal habits as well as by genetic factors.

Even beyond age 85, only 30% of people are impaired in any activity required for daily living and only 20% reside in a nursing home. Yet, as individuals age they are more likely to suffer from disease, disability, and the side effects of drugs, all of which, when combined with the decrease in physiologic reserve, make the older person more vulnerable to environmental, pathologic, and pharmacologic challenges.

This happens in different periods of times and in different speed. It affects any living substance from the moment of its birth (conception). The life expectancy of an individual in nature is species specific and has important inter-individual variability. Ageing speed of an individual is genetically coded – it is presumed that this type of genetics is a multi-factorial one (Masoro & Austad, 2006). Maximum potential life expectancy of a human being attainable under ideal circumstances could be 110 - 120 y. The influence of genetic factor on the life expectancy is considered about 35 per cent. The resting 65 per cent represent an influence of a life style and external environment.

Common and **typical features of ageing** in general:

1. loss of functional parenchyma of individual organs = **involution**
2. decay of physical performance, deteriorated regeneration after load and reduced tolerance towards load
3. influence of one or more diseases
4. disintegrated ageing: big inter- and intra-individual differences (organs and systems)
5. effort to create new own homeostatic mechanisms (which accompanies growing involution) = **adaptability**.

Senile performance decline is a consequence (Beers et al., 2006) of general weakness, impaired locomotion and balance, lower stamina. The life expectancy is significantly influenced by risk factors, contingent metabolic changes and level of resistance to stress. A choice of life style is also essential. Ageing in human population is often connected with increased occurrence of degenerative affections, tumours and Alzheimer's disease (Holmerova et al., 2007).

In fact it should be a period of life in which broad harmonic development of human personality goes on and on. Most people of advanced age should remain independent, self-sufficient and retaining their good psychic condition up to the terminal period of their life (Nemeth et al., 2007).

5. Epidemiology and demography of ageing

In the beginning of the 20th century 3 to 5 per cent of population in European industrial countries (similarly in USA) were people aged 65+ y. This percentage has grown up to 14 – 20 nowadays. Up to the fifties of previous century people died prematurely. During the last hundred years the life expectancy (LE) almost doubled which is one of the greatest achievements of mankind and science in general. Length of human life begins to approach to its biological limit. Probability of achieving advanced age is no longer exceptional, on the contrary it becomes a standard (Fauci et al., 2008; Pathy et al., 2006; Ratnaike, 2002).

Demographically, the ageing population due to changes in mortality and fertility decline – fewer children are born and more people live to old age. Crucial in this is played by more improved standard of living than in the past and progress of medicine.

Absolute and relative growth of number of the elderly both in developed and developing countries is a main feature of population development in the 21st century (Scherl, 2003). We speak about **population ageing**. There are approx. 580 mil. people aged 60+ in the today's world out of which 355 mil. live in developing countries. In 2050 there will be 2 billions of our planet inhabitants aged 60+ y. This age category will overweight children of < 14 y. The most rapid increase during the next decades is envisaged in the 80+ y. group in the industrial countries. It is the ageing of old population (Buttler, 2003). In the USA (fig.1), Canada and majority of European union countries it has been found that the most rapidly increasing group of population is the one of 85+ y.

Ageing in the industrial (developed) countries can be considered:

- prevaillingly gradual
- connected with birth rate decrease
- a consequence of improving life conditions after the industrial revolution
- progress in medicine

In the **developing countries** on the other hand:

- ageing is more rapid
- birth rate decrease is dramatic

- life expectancy grows as a consequence of improving medical care
- ageing leads to enhanced poverty

In 2020 aged 60+ - 70 per cent of them will live in the developing countries. The highest proportion of these elderly is envisaged in Japan (31 per cent), than in Greece and Switzerland (28 per cent), USA (23 per cent), etc.

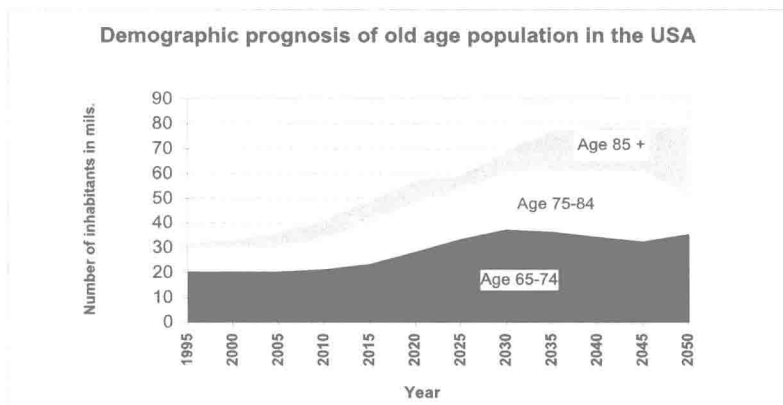


Fig. 1. Demographic prognosis of old age population in the USA

The growth of population aged 65+ in Europe and Northern America during the next 30 years is estimated to reach 24 – 35 per cent. Growing number of the elderly brings also both absolute and relative increase of occurrence of affections which are typical for the advanced age and this becomes a serious worldwide social problem (Seitz, 2003). This covers not only typically somatic diseases such as atherosclerosis, cardio- and cerebrovascular events, heart failure, peripheral vasculopathies, parkinsonism, hypo-thyroides, diabetes, osteoporosis and osteoarthritis, diverticulosis, anemias, etc. but also mental diseases with all manifestations and consequences of dementia, especially the Alzheimer's type (Braunwald et al., 2001; Sinclair & Finucane, 2003).

Analogically to the population ageing in society also medical science has experienced a phenomenon of the so called "**geriatrization of medicine**" which means a significant prevalence of the elderly among all the patients to be treated (Asplund et al., 2000). This aspect penetrates practically all the branches of medicine to begin with the front line up to the various special fields including ophthalmology.

6. Characteristics of ageing

The elderly are highly heterogeneous group, and individuals become more dissimilar as they age. Individuals over 65 years – with or without chronic diseases – vary widely in their physical, behavioral, and cognitive functions.

The **ageing** – is an inevitable physiological process, which is the last ontogenetic period of the human life. People mostly achieve their old age without any enormous problems. They live to their „successful ageing“. in quite comfortable physical, psychical and social balance (Duthie et al., 2007; Williams, 2008). The somatic (diseases), psychical (dementia, depression) and social (loneliness) problems begin to appear apparently after 75th year (more in women) (Barba et al., 2000)

The old age and the disease cannot be considered the same thing no matter how often it happens in both non-professional and professional community. In most cases the individual in old age is self-sufficient and fit until the last period of his/her life (many times until the last days). The dependence on care of the others comes with the disease, which can be both somatic and psychical. In between 65 and 75 years nearly 85% of people do not suffer from any significant modifying or common life restricting disease. Even in the age above 85 years 40% of the elderly can live self-sufficiently their normal life (Gammack & Morley, 2006).

Women live usually 7 – 8 years longer than men (Tallis & Fillit, 2003). The explanation can be found most likely in gender specific genetic factors and also in biological factors of the environment. The differences in surviving between genders has not changed even in contemporary era, when women smoke more often than ever before and perform originally male professions.

In gerontology we speak sometimes about the so-called **male overmortality**. The consequence of this phenomenon is increasing number of widows as the age increases. This is the base for the typical phenomenon in gerontology – the phenomenon of lonely old women. That fact indirectly increases the consumption of both institutional and non-institutional care in the health and social sphere.

The beginning of the **social old age** is usually seen in the moment of entitlement to regular retirement or the actual retirement (Blackburn & Dulmus, 2007; Woodford & George, 2007). The classification of the human age in social sphere is as follows: *the first age* (before productive age, childhood and youth, learning, preparation for profession, acquisition of social experience), *the second age* (productive age, adulthood, biological productivity – breeding, economical and social productivity), *the third age* (postproductive, the old age), eventually *the fourth age* (the period of dependance), which does not take place in every person inevitably. The calendar age is uniquely determined but does not reflect the individual differences of the real health status among the human beings.

The determination of the age zones for the old age is conventional and it is a social frame outgoing from the administrative needs of the social state. In the demographic statistics it is usually worked with the border of 60 or 65 years. Nowadays the beginning of the old age is thought 65 years and the old age itself is considered from 75 years on. From this pattern also the most used division of the old age results:

- 65 – 74 years old belong to group of young seniors, the main problem is the retirement, the free time, activities, self-fulfillment.
- 75 – 84 years, the old seniors, the problem of adaptability, toleration to stress, specific ailment, loneliness. The **age above 75 years**, when the old age begins in the strict sense of the word, it seems to be breaking point of ontogenesis, when more significant changes connected with physiological ageing proceed.
- 85 and more years very old aged seniors („oldest old“) – they are segregated as an individual category for the high occurrence of frail seniors and high risk of sudden rise of dependency.

7. Geriatric syndromes and frailty as golden grail of geriatric medicine

Presentation of illness in older persons less often is a single, specific symptom or sign, which in younger patients, announces the organ with pathology. Older persons often present with nonspecific problems that are in fact functional deficits (Kalvach et al., 2008). Stopping eating and drinking, or the new onset of falls, confusion, lethargy, dizziness, or incontinence

in older patients may be the primary or sole manifestation of diseases with classic signs and symptoms in the young (e.g., pneumonia, myocardial infarction, pulmonary embolus, alcoholism or myxedema). These deficits have been named *geriatric syndromes*; they devastate independence without producing obvious or typical indications of disease. Geriatric syndromes may be defined as a set of lost specific functional capacities potentially caused by a multiplicity of pathologies in multiple organ systems. Comprehensive evaluation (Tinetti et al., 2000) is usually required to identify and treat underlying causes. Although in many instances a geriatric syndrome has several contributing causes, remedying even one or a few may result in major functional improvement.

The most likely explanation for nonspecific presentation is that the additive effects of ageing restrict capacity to maintain homeostasis. Perturbation of homeostasis by disease, trauma, or drug toxicity will be manifested in the most vulnerable organ, or the weakest link, resulting from interactions of biologic ageing and chronic disease. In addition to nonspecific presentation, disease in older patients can present in other atypical ways. Blunting or absence of typical or classic symptoms and signs is well described in many conditions (Doucet et al., 1994; Perez-Gusman et al., 1999; Trivalle et al., 1996).

Health status in ageing is a result of many factors, including the chronic diseases of ageing and many other prevalent conditions that cannot be defined as classic „diseases“ because they do not result from a single pathologic cause. Many of the problems affecting aged individuals should be viewed as geriatric syndromes (GS), that are a collection of signs and symptoms with a number of potential causes (Hazzard, 2007). Only nowadays the causes and effective treatments of these conditions are beginning to be understood.

In spite of indisputable significance of the atypical clinical picture of diseases in the old age, the **crux of geriatric medicine** is involutionarity conditioned *decline of health potential, frailty and related geriatric syndromes and function deficiency* with their multicausal reasons. This status is connected with exhaustion of organ reservoirs – “**homeostenosis**”. Geriatric syndrome is different from the convenient meaning of the word “syndrome” in clinical medicine, where the symptoms are typical for certain disease (Inouye et al., 2007; Pathy et al., 2006). For the geriatric syndromes numerous and various causes are typical which lead to the occurrence of geriatric syndrome at the end. Geriatric syndromology is an essential component of the so-called comprehensive geriatric assessment (CGA) which is extended over the clinical examination in younger non-geriatric population (Gupta, 2008; (Gurcharan & Mulley, 2007; Williams, 2008).

Geriatric giants (Chase et al., 2000; Sherman, 2003;) as geriatric syndromes (GS):

- **immobility** (pressure sore etc.),
- **instability** (dizziness, posture and gait disorders, falls),
- **incontinence**,
- **intellectual disorders** (delirium, dementia and depression),
- **iatrogenia** (dangerous polypharmacy).

They are characterized by their:

- a. Multicausality
- b. Chronic course
- c. Reduced independence
- d. Demanding care and difficult curability

As further geriatric syndromes are respected (44,49):

- **syndrom of hypomobility, decondition and sarcopenia**
- **anorexia syndrom and malnutrition**

- **syndrom of dual combined sensoric deficiency (visual and hearing)**
- **syndrom of dehydration with subsequent manifestation of acute renal failure**
- **syndrom of thermoregulatory disturbance**
- **syndrom of elder abuse, neglect and self-neglect sy**
- **syndrom of geriatric maladaptation**
- **syndrom of terminal geriatric deterioration - FTT („failure to thrive“)**

The above mentioned geriatric syndromes not always threaten patient's life but they essentially influence quality of their following life (Fauci et al., 2008; Salvedt et al., 2002). Patients become fully dependent on other people's assistance (family, friends, neighbours, community services). Not exceptionally they must be admitted to an institutional care (hospitals, nursing homes etc.) because of domestic care system failure or necessity to manage an acute phase of a disease. The expression of the concept of geriatric syndromes in the last decades is a very fundamental step forward in geriatric medicine. The marked part of multi-morbid disabled handicapped seniors can be better understood and earlier and effectively solved (Williams, 2008). GS are more complicated problem with inner connections very often. Their proper identification is made possible by:

- screenig tests and observation
- optimisation of geriatric hospital regime
- optimal coordination of community and institutional services
- influence on anorexia by adjustment of nutrition (proteins 1.3g/kg)
- psychotherapeutical support with elimination of the depression
- lasting physiotherapy (everyday walking at least for 30minutes)
- attempting to influence the disinterest and weariness by interesting daily activity
- using all of the occupational utilities, which can minimise the dependence (walker, rods, crutches, wheelchairs and other – glasses, magnifying glass, hearing aids
- recondition programs
- adjustment of the living (lightning, grab handles on toilet and corridors, the correct hight of the bed and furniture)

The involuntary loss of muscle tissue in the old age is called **sarcopenia** and it is characterized by reduction of muscle tissue, reduction of the force, tenacity, plasticity and speed of contraction (Roubenoff & Hughes, 2000a). The probable cause of sarcopenia in senium (Roubenoff, 2000b) is apart from somatopausis (lowered level of anabolic IGF-1, growth hormone and testosterone) also influence of oxidatory stress and free radicals produced by muscle mitochondrias (Masoro & Austad, 2006). The metabolic result of sarcopenia in the old age is also impaired glucose tolerance and higher risk of diabetes of 2nd type (Fauci et al., 2008; Sinclair & Finucane, 2001).

The meaningful concept which is tightly connected with ageing is **frailty** (Friedman et al., 2008; Rockwood & Hubbard, 2004; Woodhouse & O'Mahony, 1997). This belongs to key characteristics of geriatric patients, the next milestone and the keystone of geriatric medicine. Frailty is a biologic syndrome (Crome & Lally, 2011) of decreased reserves in multiple systems that results from dysregulation that can occur with ageing and is initiated by physiological changes of ageing, disease, and/or lack of activity or inadequate nutritional intake.

It is rather more multidimensional concept than just the expression of a degree of dependence in the everyday life activities. Frailty is basically connected with the grow of fatal somatic ailments and lowering of functional reserve of the old person, which is wasting away excessively without any fundamental cause disease (Juraskova et al., 2010). **Frailty** can be

defined as a status of reduced physiological reserves connected with increased inclination towards invalidisation (falls, fractures, daily life restrictions, loss of independence – Leng, 2007; Walston, 2006). Apart from the clinical observations there is elevation of CRP, leukocytes (monocytes), IL-6, IL-1 and TNF. Frailty is not the synonym of multi-morbidity or disability, multi-morbidity can cause this and disability can be the consequence (Fried et al., 2005).

Frailty is understood mainly as a risk of sudden deterioration of the status of very risky person. (above 80 years, living alone or with handicapped spouse, with serious somatic or psychical disease).

The outcome for those defined frail seniors is the long term need of help of institutions and community (nursing service). The risks of the development of frailty (Friedman et al., 2006; Szanton et al., 2010) are represented by hypomobility in pre-senium, social isolation, depression, bad subjective feeling of the own health etc.

The concept of frailty is at least coming nearer to the term risky geront, used in the past. The emphasis is put on the retrieval of these people because they can not show their frailty out. Both (the ageing and physical frailty) are conditioned by the decline of proteosynthesis in the muscles, decline of immune function, elevation of the mass of fat in the body and lowering of the amount of body water, lowering of the bone mineral density, loss of the whole body mass and strength.

The main etiological and patogenetic mechanisms (Leng et al., 2007; Walston et al., 2006) of the syndrome of frailty are:

- the inflammation or hypercoagulation
- oxidative stress
- insulin resistance
- anorexia with loosing of the weight and malnutrition
- sarcopenia
- fall of efficiency of lower hints
- loosing of spontaneous action – nutrition, hydration, movement, behavioral and social
- dysfunction of autonomic nervous system (falls, sarcopenia, decubital ulcer and healing – with the consequence like loosing the weight, incontinence, delirium, disturbance in thermoregulation etc.)
- apathy – as the consequence of lack of the dopamine in CNS (depression, dementia)
- depression, anxious status, organic psychosyndrome
- development of cognitive deficiency
- menopause and andropause as the consequence of hormone deficiency with the development of the syndrome ADAM and PADAM, somatopause as the result of lack of IGF-1
- chronic pain
- hypomobility with the sedentary lifestyle
- chronic stress
- functionally important consequences of chronic diseases which limit in an activity (hemiparesis, severe diabetic neuropathy, respiratory or heart insufficiency, hard anemia of chronic diseases)
- adverse effects of the medicaments

8. Polypharmacy in the elderly

Polypharmacy is a common problem in the elderly. Particularly in those who have multiple comorbidities. Their therapy should be guided by the estimated life expectancy and