

## Medical Gerontology, Review

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### Summary

Gerontology is the study of the aging processes and individuals as they grow from middle age through later life. This is the study of older persons. Populations are aging worldwide. This means that people are living longer, and the number of older persons is increasing. These trends are evident in American society, as well as in many countries around the world. In the U.S. the growth of the elderly population will continue into the future. By the middle of the 21st century, one in five Americans will be over 65, and there will be 15 to 18 million persons over the age of 85. These growth trends will result in a demand for professionals with knowledge and expertise in aging. Healthy ageing is the process of slowing down physically and cognitively while resiliently adapting and compensating in order to optimally function and participate in all areas of life. Gerontology studies physical and pathological changes in the ageing population. During ageing process the changes occur in all organs and systems. The main milestone is to gradually adapt to the body changes and maintain healthy ageing.

**Key words:** *Gerontology, aging, healthy, baby boomers, organs, systems, osteoporosis, pharmacologic care, public health policy.*

### Overview

Gerontology is the study of the aging processes and individuals as they grow from middle age through later life. This is the study of older persons. Geriatric physician is a physician who specializes in the care of elderly. Geriatrics is the study of health and disease in later life (Gilleard, 2007).

Populations are aging worldwide. This means that people are living longer, and the number of older persons is increasing. These trends are evident in American society, as well as in many countries around the world. In the U.S., of those born in 1900 nearly half died before they were 50 years old. People born today can expect to live beyond their 75th year. In 1900 about one in 25 Americans was over 65; today one in eight is over 65. The age group growing fastest in our society and in many other countries is the "very old," people aged 85 and over (Bannister, 2010).

The growth of the elderly population will continue into the future. By the middle of the 21st century, one in five Americans will be over 65, and there will be 15 to 18 million persons over the age of 85. These growth trends will result in a demand for professionals with knowledge and expertise in aging. Expanded career opportunities in gerontology and geriatrics are forecast in many disciplines and professions (Knickman JR, 2002).

This demographic shift is already creating a wave of new fields and opportunities for workers of all ages. Professional certifications, however, are becoming increasingly accepted by employers and clients in many areas, which is great for 50+ workers—faster and cheaper (Hurd M, 2011).

The term Baby boomers indicate the future olds, they are

well educated, are prepared for good old life. They expect much higher quality of life as they age than did their ancestors. Large-scale demographic and social shifts mean that life for those aged over 65 is subject to increasing change and flux. These have affected older people's lifestyles, living arrangements, work patterns, social lives and economic situations. At the same time, those aged over 65 increasingly complain of feeling lonely and unhappy, of experiencing fear of crime or alienation from mainstream society (Knickman JR, 2002).

A centenarian is a person who lives to or beyond the age of 100 years. Because current average global life expectancies are less than 100, the term is associated with longevity. A supercentenarian is a person who has lived to the age of 110 or more, something only achieved by about one in 1,000 centenarians. Even rarer is a person who has lived to age 115 – as of July 2013, there were only 30 people in recorded history who have reached this age (Haber, 2004).

Healthy ageing is the process of slowing down physically and cognitively while resiliently adapting and compensating in order to optimally function and participate in all areas of life. Healthy ageing is about 'optimizing opportunities for good health, so that older people can take an active part in society and enjoy an independent and high quality of life' (Udo, 2016).

Life expectancy is the expected (in the statistical sense) number of years of life remaining at a given age. Because life expectancy is an average, a particular person may well die many years before or many years after their "expected" survival (Vaupel, 2010).

Gerontology include the following:

- ◇ the study of physical, mental, and social changes in older people as they age
- ◇ the investigation of the changes in society resulting from our aging population
- ◇ the application of this knowledge to policies and programs. (Reichstadt, 2010).

Physical changes that occur while aging are not always diseases. In whole slight and step-by-step changes are common and person can adapt to those changes with time. With aging two types of changes appear physiological and pathological changes. Among physiological changes, the most common are the following:

- ◇ a gradual reduction in height and weight loss due to loss of muscle and bone mass,
- ◇ a lower metabolic rate,
- ◇ longer reaction times,
- ◇ declines in certain memory functions,
- ◇ declines in sexual activity and menopause in women,
- ◇ a functional decline in audition, olfaction, and vision,
- ◇ declines in kidney, pulmonary, and immune functions,
- ◇ declines in exercise performance, and multiple endocrine changes (Craik, 1992)

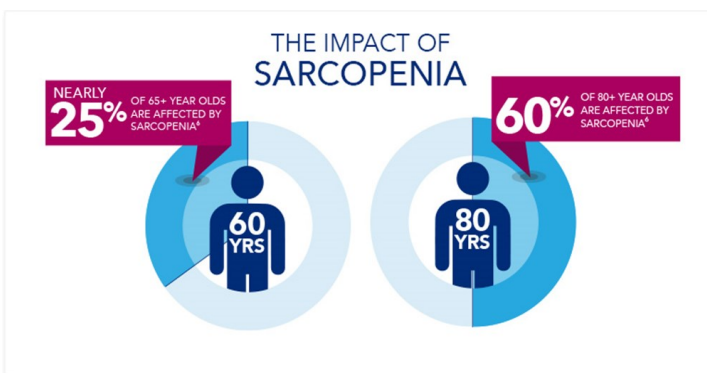
Some age-related changes are common with age such as presbyopia, also called farsightedness, which is caused by the continuous growth of the eyes' lenses and appears to be universal of human aging (Finch, 1990).

The changes occur in all organs and systems. The older person's skin is wrinkled. The skin becomes thinner, drier, less elastic, and more fragile as subcutaneous fat diminishes. The elastin fibers are replaced with collagen fibers and sebaceous and sweat gland activity decreases. Capillary blood flow also decreases which slows wound healing. Fingernails usually thicken, become ridged and brittle, and grow more slowly. Occur lentigenes – that are age spots, also anychogryphosis that is the thickening and distortion of nail plate or onychorhexis - Vertical ridges on the nail plate. (Nursing link, 2015).

Changes in the muscles, joints, and bones affect the posture and gait and lead to weakness and slowed movement. Will occur the age related changes in skeletal muscles – sarcopenia. In addition, vertebrae lose some of their mineral content, making each bone thinner. The spinal column becomes curved and compressed. Osteoporosis is a common problem, especially for older women. Bones break more easily, and compression fractures of the vertebrae can cause pain and reduce mobility. Occurs osteoarthritis – the reason of which is loss of cartilage in joints. (Russ, 2012). Muscle weakness contributes to fatigue, weakness, and reduced activity tolerance. Joint problems are extremely common. This may be anything from mild stiffness to debilitating arthritis. Loss of balance may lead to falls.

Some elderly people have reduced reflexes. This is most often caused by changes in the muscles and tendons, rather than changes in the nerves. Decreased knee jerk or ankle jerk can occur. Involuntary movements (muscle tremors and fine movements called fasciculation are more common in the elderly. Inactive or immobile elderly people may experience weakness or abnormal sensations paresthesia (Russ, 2012).

Illustration 1- The impact of sarcopenia



Source - (Fight Sarcopenia, 2012)

Bone mass or density is lost as people age, especially in women after menopause. The bones lose calcium and other minerals.

Illustration 2- Osteoporosis



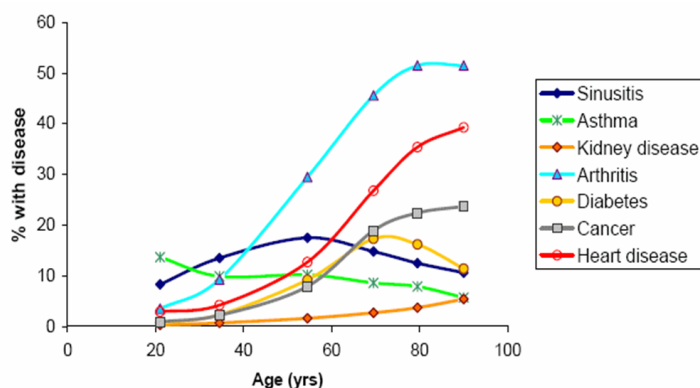
Source - (Smart nutrition, 2015)

A slight increase in the size of the heart, especially the left ventricle, is common. Normal changes in the heart include deposits of the "aging pigment," lipofuscin. The heart muscle cells degenerate slightly. The valves inside the heart, which control the direction of blood flow, thicken and become stiffer. A heart murmur caused by valve stiffness is common in the elderly. The baroreceptors become less sensitive with aging. Due to this fact, many older people have orthostatic hypotension. The capillary walls thicken slightly. This may cause a slightly slower rate of exchange of nutrients and wastes.

Blood vessels become thicker, stiffer, and less flexible. This is probably related to changes in the connective tissue of the blood vessel wall. This makes the blood pressure higher and makes the heart work harder, which may lead to thickening of the heart muscle (hypertrophy). The other arteries also thicken and stiffen. In general, most elderly people have a moderate increase in blood pressure. (Health medicine network, 2012).

The incidence of pathological changes increases with age. Among most prevalent diseases are the following: Type 2 diabetes, heart disease, cancer, arthritis, and kidney disease. With age, the human body becomes more susceptible to certain diseases. The average fasting glucose level rises from 6 to 14 mg/dL for each 10 years after age 50. This is because the cells become less sensitive to the effects of insulin (Booth, 2012).

Illustration 3- Prevalence of selected chronic conditions, expressed in percentages, as a function of age for the US population (2002-2003 dataset)



**Source:** National center of health statistics 2003

Because of age related changes, older persons are at increased risk of:

- ◇ Lung infections, such as pneumonia\_ and bronchitis
- ◇ Shortness of breath
- ◇ Low oxygen level, which reduces the body's ability to fight diseases
- ◇ Abnormal breathing patterns, resulting in problems such as sleep apnea (episodes of stopped breathing during sleep) (Booth, 2012).

Aging also increases the risk of kidney and bladder problems such as bladder control issues - Urinary incontinence is a common and often embarrassing problem. The severity ranges from occasionally leaking urine during coughing or sneezing to having an urge to urinate.

Though it occurs more often as people get older, urinary incontinence is not an inevitable consequence of aging. For most people, simple lifestyle changes or medical treatment can ease discomfort or stop urinary incontinence. Bladder and other urinary tract infections (UTIs), Chronic kidney disease also are common in aging population (DY., 2011).

With aging brain and nervous system, go through natural changes. Brain and spinal cord lose nerve cells and atrophy. Nerve cells may begin to pass messages more slowly than in the past. Waste products can collect in the brain tissue as nerve cells break down. This can cause abnormal changes in the brain called plaques. A fatty brown pigment lipofuscin can also build up in nerve tissue. Breakdown of nerves can affect senses. This leads to problems with movement and safety (Haber, 2004).

Immune system becomes slower to respond. This increases risk of getting sick. Autoimmune disorders may develop. Healing is also slowed in older persons. The immune system's ability to detect and correct cell defects also declines. This can result in an increase in the risk of cancer (Nicholson, 2016).

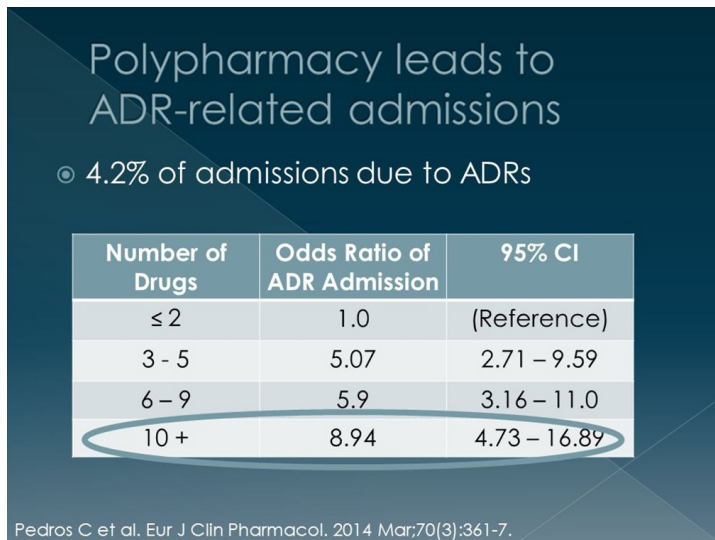
Slowing of thought, memory, and thinking is a normal part of aging. These changes are not the same in everyone. Some people have many changes in their nerves and brain tissue. Others have few changes. These changes are not always related to the effects on the ability to think. Dementia and severe memory loss are not a normal part of aging. They can be caused by brain diseases such as Alzheimer's disease (Peters, 2006).

Age-related hearing loss is called presbycusis. It affects both ears. Hearing may decline, especially of high-frequency sounds. The sharpness of the near vision- visual acuity gradually declines. The most common problem is difficulty focusing the eyes on something close. This condition is called presbyopia. Common eye disorders in the elderly include cataracts, glaucoma, macular degeneration and diabetic and hypertensive retinopathy (Craik 1992).

Pharmacologic care of the elderly is a multifaceted problem. The practitioner should plan and prescribe health care for the aged, with a knowledge of physiologic changes in the elderly, an understanding of the pharmacokinetic and pharmacodynamic mechanisms of iatrogenic drug reactions, and an awareness of the social and ethical issues related to geropharmacology. Polypharmacy is an important issue in elderly patients. It may be defined as the use of multiple medications together. Sometimes this issue cannot be helped, but many times polypharmacy occurs simply because healthcare providers fail to communicate proper patient recommendations to the patient's primary care provider. Effective communication between all of a patient's healthcare providers is key to eliminating this problem. One simple recommendation is to ask every patient to bring all of his or her current medications to each doctor's visit so that the physician can thoroughly review the medications being taken. A common cause of adverse drug reactions in elderly patients is drug interactions. This is not surprising considering that the number of medications taken by many

elderly patients is high. Various studies have documented a direct correlation between number of medications and the risk of an adverse drug reaction. A study from Brazil reported that the potential drug interaction risk when patients are taking 2 to 3, 4 to 5, and 6 to 7 medications are 39%, 88.8%, and 100%, respectively (Permpongkosol, 2011).

Illustration 4- Polypharmacy



Source – Clinical pharmacology, 2014

Patient empowerment is one way to give the geriatric patients necessary information and the opportunity to exercise the degree of control they choose over health care decisions that affect them. If patients are involved in decision-making, they are less likely to make decisions that may lead to ADRs, such as abruptly discontinuing a medication that should be taken for a long period without interruption. It's very important to keep correct Prescribing principles: Monitoring for appropriate prescribing and alerting the prescriber to potential problem areas, deciding that a drug is truly indicated, choosing the best drug, determining appropriate dose for the individual, monitoring for toxicity and effectiveness, and seeking consultation when necessary (Vahdat, 2014).

Nowadays the main concern of Healthcare professionals is how to promote healthy lifestyles for older adults to achieve healthy aging. Because lifestyle is so critical to health, it has been recommended that more visit time be devoted to lifestyle discussions, and that physicians be advised on how to make their counseling more effective. (Physical activity and older Americans: benefits and strategies., 2004).

The recommendation for older adults for healthy lifestyle and physical activity is very similar to that for adults, though it's taken into consideration the age related characteristics. Accordingly, activities that increase the flexibility are recommended, also balance exercises for those who are

at risk of falls. The main point in recommendations for geriatric population is to integrate preventive and therapeutic recommendations.

Promoting physical activity in older mean moderate intensity activity, muscle-strengthening activity, preventing risky behavior and reducing sedentary behavior. (Rose, 2000) (Gardner MM, 2000).

Healthy aging means to adapt smoothly to all changes that occur while going through 60, 70, 80 and beyond. For many people, aging brings anxiety and fear while it means finding new things a person enjoys, learning to adapt to change, staying physically and socially active, and feeling connected to the community. It's very important to cope with the changes and there are several ways to do this: 1. Gratefulness for everything you have, achieved and learned, 2. Expression of feelings, especially to family members and loved ones, 3. Accepting the things that are not under the control. In fact, aging involves physical changes, but it does not mean discomfort and disability. List of physical challenges associated with aging can be overcome by exercising, eating right, and staying active (Reichstadt, 2010).

Everyone has different ways of experiencing meaning and joy, and the activities one may enjoy will change during ageing process. The useful tips for healthy aging are the following:

- ◇ Pick up a long-neglected hobby or try a new hobby
- ◇ Playing grandkids, nieces, nephews, or a favorite pet
- ◇ Learning something new (an instrument, a foreign language, a new game, a new sport)
- ◇ Getting involved in your community, staying socialized (volunteer or attend a local event)
- ◇ Traveling or having weekend trips to new places
- ◇ Spending time in nature (hiking, fishing, camping,)
- ◇ Enjoying the arts (visit a museum, go to a concert or a play)
- ◇ Writing the memoirs

The possibilities are endless. The important thing is to find activities that are both meaningful and enjoyable for elder population (Haber, 2004).

There is need to develop social definitions and public policies that are future focused—that offer meaningful futures to older citizens and that use their capacities to help shape a better future world for everyone. There is need to re-envision the aging policies based on the following premises: The productive potential of the older population constitutes an important social and economic resource (forum, 2009).

## Conclusion

In a whole gerontology is the interdisciplinary field that unites Physiology, pathophysiology, therapy, pharmacology and variety of disciplines in medical field. This all-inclusive approach is welcoming, inviting, and comforting. Gerontology is an important part of our studies of society. The growing senior population in this country has a huge effect on our lives today. Due to the fact the population is aging worldwide, there may exist increasing numbers of political, financial, and social issues that needs to be resolved. Accordingly, it is very important to understand this important stage of adulthood and the increasing influence of this group over our society.

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