# *Geriatric Special Offer*

**Expires October 31, 2021**

***This Special Offer includes:***

**Aging and Long-Term Care**
**Osteoporosis: Diagnosis and Management**
**Alzheimer Disease**

NetCE
Continuing Education

# *Aging and Long-Term Care*

## HOW TO RECEIVE CREDIT

- Read the enclosed course.
- Complete the questions at the end of the course.
- Return your completed Evaluation to NetCE by mail or fax, or complete online at www.NetCE.com. (If you are a behavioral health professional or Florida nurse, please return the included Answer Sheet/Evaluation.) Your postmark or facsimile date will be used as your completion date.
- Receive your Certificate(s) of Completion by mail, fax, or email.

***Faculty***

**Alice Yick Flanagan, PhD, MSW**, received her Master's in Social Work from Columbia University, School of Social Work. She has clinical experience in mental health in correctional settings, psychiatric hospitals, and community health centers. In 1997, she received her PhD from UCLA, School of Public Policy and Social Research. Dr. Yick Flanagan completed a year-long post-doctoral fellowship at Hunter College, School of Social Work in 1999. In that year she taught the course Research Methods and Violence Against Women to Masters degree students, as well as conducting qualitative research studies on death and dying in Chinese American families. (A complete biography appears at the end of this course.)

***Faculty Disclosure***

Contributing faculty, Alice Yick Flanagan, PhD, MSW, has disclosed no relevant financial relationship with any product manufacturer or service provider mentioned.

***Division Planner***

Jane C. Norman, RN, MSN, CNE, PhD

***Division Planner Disclosure***

The division planner has disclosed no relevant financial relationship with any product manufacturer or service provider mentioned.

***Audience***

Contributing faculty, Alice Yick Flanagan, PhD, MSW, has disclosed no relevant financial relationship with any product manufacturer or service provider mentioned.

***Accreditations & Approvals***

JOINTLY ACCREDITED PROVIDER™ INTERPROFESSIONAL CONTINUING EDUCATION

In support of improving patient care, NetCE is jointly accredited by the Accreditation Council for Continuing Medical Education (ACCME), the Accreditation Council for Pharmacy Education (ACPE), and the American Nurses Credentialing Center (ANCC), to provide continuing education for the healthcare team.

As a Jointly Accredited Organization, NetCE is approved to offer social work continuing education by the Association of Social Work Boards (ASWB) Approved Continuing Education (ACE) program. Organizations, not individual courses, are approved under this program. State and provincial regulatory boards have the final authority to determine whether an individual course may be accepted for continuing education credit. NetCE maintains responsibility for this course.

NetCE has been approved by NBCC as an Approved Continuing Education Provider, ACEP No. 6361. Programs that do not qualify for NBCC credit are clearly identified. NetCE is solely responsible for all aspects of the programs.

This course, Aging and Long-Term Care, Approval #202406-1935, provided by NetCE, is approved for continuing education by the New Jersey Social Work Continuing Education Approval Collaborative, which is administered by NASW-NJ. CE Approval Collaborative Approval Period: September 1, 2020 through August 31, 2022. New Jersey social workers will receive 3 Clinical and Social & Cultural Competence CE credits for participating in this course.

NetCE is recognized by the New York State Education Department's State Board for Social Work as an approved provider of continuing education for licensed social workers #SW-0033.

This course is considered self-study, as defined by the New York State Board for Social Work. Materials that are included in this course may include interventions and modalities that are beyond the authorized practice of licensed master social work and licensed clinical social work in New York. As a licensed professional, you are responsible for reviewing the scope of practice, including activities that are defined in law as beyond the boundaries of practice for an LMSW and LCSW. A licensee who practices beyond the authorized scope of practice could be charged with unprofessional conduct under the Education Law and Regents Rules.



*A complete Works Cited list begins on page 27.*

***Mention of commercial products does not indicate endorsement.***

NetCE is recognized by the New York State Education Department's State Board for Mental Health Practitioners as an approved provider of continuing education for licensed mental health counselors. #MHC-0021.

This course is considered self-study by the New York State Board of Mental Health Counseling.

NetCE is recognized by the New York State Education Department's State Board for Mental Health Practitioners as an approved provider of continuing education for licensed marriage and family therapists. #MFT-0015.

This course is considered self-study by the New York State Board of Marriage and Family Therapy.

***Designations of Credit***

NetCE designates this continuing education activity for 3 ANCC contact hours.

AACN Synergy CERP Category B.

Social Workers participating in this intermediate to advanced course will receive 3 Clinical continuing education clock hours.

NetCE designates this continuing education activity for 3 NBCC clock hours.

***Individual State Nursing Approvals***

In addition to states that accept ANCC, NetCE is approved as a provider of continuing education in nursing by: Alabama, Provider #ABNP0353 (valid through 11/21/2021); Arkansas, Provider #50-2405; California, BRN Provider #CEP9784; California, LVN Provider #V10662; California, PT Provider #V10842; District of Columbia, Provider #50-2405; Florida, Provider #50-2405; Georgia, Provider #50-2405; Kentucky, Provider #7-0054 (valid through 12/31/2021); South Carolina, Provider #50-2405; West Virginia, RN and APRN Provider #50-2405.

***Individual State Behavioral Health Approvals***

In addition to states that accept ASWB, NetCE is approved as a provider of continuing education by the following state boards: Alabama State Board of Social Work Examiners, Provider #0515; Florida Board of Clinical Social Work, Marriage and Family Therapy and Mental Health, Provider #50-2405; Illinois Division of Professional Regulation for Social Workers, License #159.001094; Illinois Division of Professional Regulation for Licensed Professional and Clinical Counselors, License #197.000185; Illinois Division of Professional Regulation for Marriage and Family Therapists, License #168.000190; Texas State Board of Social Work Examiners, Approval #3011.

***Special Approvals***

This activity is designed to comply with the requirements of California Assembly Bill 1195, Cultural and Linguistic Competency.

***About the Sponsor***

The purpose of NetCE is to provide challenging curricula to assist healthcare professionals to raise their levels of expertise while fulfilling their continuing education requirements, thereby improving the quality of healthcare.

Our contributing faculty members have taken care to ensure that the information and recommendations are accurate and compatible with the standards generally accepted at the time of publication. The publisher disclaims any liability, loss or damage incurred as a consequence, directly or indirectly, of the use and application of any of the contents. Participants are cautioned about the potential risk of using limited knowledge when integrating new techniques into practice.

***Disclosure Statement***

It is the policy of NetCE not to accept commercial support. Furthermore, commercial interests are prohibited from distributing or providing access to this activity to learners.

***Course Objective***

The purpose of this course is to provide the tools necessary for social workers, counselors, mental health professionals, and allied health professionals to successfully assess and care for older adults, an increasingly large portion of the U.S. population.

***Learning Objectives***

*Upon completion of this course, you should be able to:*

1. Review the demographic profile and associated myths of the elderly population in the United States.
2. Discuss age-related biologic and physiologic changes experienced by older adults.
3. Identify psychologic and social challenges and adjustments commonly encountered in the elderly population, with particular attention to elderly subpopulations, including custodial grandparents, racial/ethnic minority elders, gay and lesbian elders, and elderly women.
4. Outline the impact of long-term care on older adults and their care providers.
5. Describe assessments for depression, suicide, substance abuse, and elder abuse that specifically target older adults.
6. Discuss interventions that are sensitive to the biopsychosocial needs of the elderly and are appropriate ethically and legally.


Sections marked with this symbol include evidence-based practice recommendations. The level of evidence and/or strength of recommendation, as provided by the evidence-based source, are also included so you may determine the validity or relevance of the information. These sections may be used in conjunction with the course material for better application to your daily practice.

## INTRODUCTION

Western society holds many myths about aging and the elderly. These myths can be positive or negative and stem from ageism. Ageism is defined as societal stereotypes, prejudice, and/or discrimination toward an outgroup that is associated with their chronologic age. More often than not, these myths can have negative consequences on individual, family, workplace, and/or societal levels [188]. Generally, Americans tend to attribute more problems to advanced age than are actually reported, such as being dependent on others for financial support, transportation, and medical care. There is an image of the elderly as being highly dependent or living in nursing homes [50]. In the workforce, elderly workers are often believed to be untrainable [52]. Yet, simultaneously, these years are often viewed as the "golden years," when one retires, travels, and has a certain amount of leisure time. It is difficult for the public, and healthcare professionals, to reconcile these seemingly opposing views of aging.

When 41 female nurses were asked about their fears of aging, and specifically of growing old as a woman, they used terms like: "dependency," "ill health," "loneliness," "loss of dignity," and "looking old" [1]. Cross-culturally, these myths are remarkably similar. For example, college students in Taiwan reported believing that older adults (e.g., older teachers) are resistant to change, not motivated to learn new things, and not willing to listen to new ideas [4]. Okoye and Obikeze conducted focus groups with 800 Nigerian youths, and the participants described the elderly as dependent, sickly, child-like, conservative, and suspicious [33]. In a study of adults in Colombia, individuals with negative stereotypes about the elderly were also more concerned about aging [53]. This gives some insight into societal perceptions about the elderly and aging. Qualms and fears toward aging often stem from negative cultural images and stereotypes of aging [1].

### DEFINITION OF AGING

There is no one agreed upon definition of aging. One approach defines aging according to four key dimensions [86]:

- Aging is universal. All species experience the phenomenon of aging.
- Aging is intrinsic. External factors are not the primary cause of origin.
- Aging is progressive. It occurs progressively throughout the life cycle.
- Aging is deleterious. There will be negative physical ramifications.

It is important to distinguish chronologic aging from physiologic aging. All persons, without exception, grow old chronologically. However, physiologic aging is unique process and varies from person to person. It involves changes in how an individual responds to internal and external stressors as well as inalterable variables, such as genetic predisposition [7]. In addition, studies are now focusing on aging as a process and underscoring the concept of successful aging [89].

Several subtly different terms are commonly employed when exploring aging. Successful aging refers to the physical and biologic advantages of remaining engaged throughout life. Active aging describes being active and engaged and maximizing opportunities to promote a good quality of life. Productive aging emphasizes integrating older adults into society and recognizing their unique contributions [189]. The World Health Organization uses the term healthy aging to describe the process of maintaining one's functional abilities throughout life [190].

## AN OVERVIEW OF THE ELDERLY IN THE UNITED STATES

### CURRENT TRENDS AND PROJECTIONS

The age at which one is considered "older" or "senior" is always evolving and is influenced by culture and societal life expectancy. In England in 1875, old age was defined as 50 years or older, as stated in the Friendly Societies Act [88]. Today, most developed countries in the world use the chronologic marker of 65 years as a definition of old age; in some cases, the age of 62 years is used as a chronologic marker because, in the United States, one could receive social security benefits starting at this age [87]. However, Mohanty notes that using the criterion of age at retirement or when one becomes eligible to receive retirement benefits is not universal, given the fact that there are so many in the world who live in areas in which there are no formal definitions of retirement [88]. Using these chronologic markers to define old age is arbitrary, but they can be useful when studying the group as a whole [2]. The elderly can be further divided into various segments: the young-old, defined as 65 to 74 years of age; middle-old, defined as 75 to 84 years of age; and the oldest-old, defined as those who are 85 years of age and older [3]. In 2010, there were 53,364 persons 100 years of age and older in the United States [94]. Worldwide, in 2015, there were more than 500,000 centenarians, and it is estimated by 2050, there will be 3.7 million, with the greatest growth in China [90]. In the United States, it is projected that there will be 9.7 centenarians per 10,000 people by 2050 [90].

According to the U.S. Census, there were 52.4 million Americans 65 years of age or older in 2018, which translates to 16% of the U.S. population [42; 31]. Maine led the country in older population, with 20.6% of the state's population comprised of those 65 years of age or older, followed by Florida at 20.5% [91; 42]. By 2060, it is estimated that nearly 114.3 million Americans will be 65 years of age or older [31]. This is due to the aging of the "baby boomer" generation (i.e., those born between 1946 and 1964).

The average life expectancy has continued to increase; it is estimated that by 2060, 19.7 million Americans will be 85 years of age or older [42]. In 2017, the average life expectancy in the United States was 79.7 years of age, but it is projected to be 85.6 years of age by 2060. In 2060, the youngest baby boomers will be 96 years of age [42; 41]. The oldest-old are one of the fastest growing population groups in the United States.

### COMMON MYTHS OF AGING

As mentioned, society holds several myths about the elderly. Many of these myths may be easily disputed based on data from the U.S. Census and other studies.

- **Myth**: Most older adults do not have enough money and end up becoming destitute.

  **Fact**: As of 2017, 9.2% of Americans 65 years of age and older lived in poverty. This population is also more likely to have health insurance coverage than the general population. As of 2017, 93% were insured by Medicare [92].

- **Myth**: Most older adults live alone and are isolated.

  **Fact**: In 2018, 70% of men and 46% of women 65 years and older were married. An estimated 28% lived alone [92]. According to a survey conducted in 2009, 9 out of 10 individuals 65 years of age and older stated they talked to family and friends on a daily basis [93]. In 2016, an estimated 20% of the U.S. population lived in a household comprised of two adult generations or a grandparent or at least one other generation, compared with 12% in 1980 [93; 43]. This multigenerational household trend particularly affects those 65 years and older, with 21% of these individuals living in multigenerational households in 2016. This group was second only to individuals 25 to 29 years of age (33%) [43]. Several factors have contributed to this trend, including growing racial and ethnic diversity and adults getting married later [93; 43].

- **Myth**: Many older Americans end up living in nursing homes.

  **Fact**: In 2016, only about 3.1% of adults 65 years of age and older lived in nursing homes. Of those who reside in nursing homes, they tend to be the oldest-old (10.6% of those 85 years of age and older) [44].

- **Myth**: Most older adults engage in very minimal productive activity.

  **Fact**: In 2019, 20% of persons 65 years and older were employed or actively looking for work, and this population represents approximately 8% of the total labor force in the United States [49]. The elderly are more engaged in self-employed activities than younger persons. In 2016, 16.4% of those 65 years of age and older were self-employed, compared with an average of 5.5% of those 16 years to 64 years of age [103].

- **Myth**: Life satisfaction is low among the elderly.

  **Fact**: Field examined data from the Berkeley Older Generation Study and found that many elders are quite satisfied with their life [9]. More than one-third (36%) of persons older than 59 years of age and 15% of those older than 79 years of age stated they were currently experiencing the best time in their lives. A 2009 survey found that 60% of individuals 65 years of age and older stated they were very happy. A 2012 survey found that 65% of individuals 65 years of age and older indicated that the past year of their life has been normal or better than normal, and more than 80% of respondents agreed with the statement, "I have a strong sense of purpose and passion about my life and my future" [105]. Most of the factors that predict happiness for the young, such as good health and financial stability, also apply to the elderly. Older adults tend to report higher levels of well-being in part due to the quality of their social relationships [191].

- **Myth**: Old people feel old.

  **Fact**: According to a 2009 telephone survey, only 21% of individuals 65 to 74 years of age stated they felt old, and only 35% of those 75 years of age and older reported feeling old. Another study in 2018 showed that individuals 50 years of age report feeling 10 years younger, and also found that as age increased individuals felt approximately 20% younger than their actual age [110].

## BIOLOGIC PROCESSES AND PHYSICAL WELL-BEING IN OLDER ADULTS

Biologic and physiologic changes are part of aging. Although it is not known why these changes occur, biologic theories of physiologic aging include [3; 7; 86; 95; 121; 140; 143]:

- Wear and tear: Aging is genetically determined, and as a result, the tissues and muscles eventually deteriorate.
- Cross-linkage: The body's proteins attach to other structural substances, thus decreasing elasticity in the skin and causing other physical changes in the organs and slowing of physiologic processes.
- Autoimmune: As the body ages, it is unable to recognize the difference between healthy and diseased cells, causing it to react against itself.
- Cellular aging: The replication of cells slows as a result of aging.
- Apoptosis theory: Aging is due to inevitable pre-programmed cell death in our bodies. Apoptosis is a normal process in the body, but it is speculated that if dysregulated apoptosis could lead to Alzheimer disease, Parkinson disease, or cancer.

- Free radical: As free radical exposure increases in older organisms, the antioxidant system is not able to counteract the free radicals that have been generated and accumulated during the life of the cell, resulting in cellular death. Experimental findings have not conclusively supported this theory.
- Evolutionary: Humans' developmental life cycles are affected by mutation and selection. In other words, all biologic dimensions are affected by mutation, and there will be variations among human beings. This will lead to a natural selection of those who are more fit to survive in an environment. Aging leads to vulnerability.

The losses in the physical arena for the elderly can be numerous, which may then compound and/or have implications in social and psychologic arenas. Studies have shown that brain tissues atrophy due to natural cell degeneration, with the volume of the brain decreasing by 15% or more between adolescence and old age [122]. Crews notes that the health status of older persons with vision and hearing loss is poorer compared with those without vision or hearing loss [10]. Rates of heart disease, hypertension, hip fractures, and stroke are higher among those with sensory loss [10]. In a study of more than 1,000 elders, 53.7% of those with impaired vision also had hypertension, compared with 43.1% of those without impaired vision. Of those with impaired hearing, 27.6% experienced heart disease, compared with 18.6% of those without a hearing loss [10]. Interestingly, the rates double when persons have both hearing and vision impairment. Almost one-fifth (19.9%) of persons with both impairments had experienced a stroke, while only 8% with no sensory loss had experienced a stroke [10].

Mobility is affected by muscle atrophy associated with advanced age. Muscle strength, for example, can decline 30% to 40% between 30 and 80 years of age [11]. This can lead to falls, which are common among the elderly. It is estimated that half of Americans 75 years of age and older experience some form of functional disability that affects their mobility (Auais et. al., 2019). Women tend to experience more disabilities throughout the life span than men (Auais et. al., 2019). Thirty percent of those 65 years of age and older have fallen within the last 12 months, and 50% of persons older than 80 years of age have experienced a fall in the last 12 months [11]. The causes of these falls vary and include environmental factors, sensory losses, medical factors, and psychiatric conditions, such as depression or cognitive impairments [11; 12]. Most falls among the elderly occur in the morning. This is not surprising given that the majority of activity and movement occur during this time [146]. Loss of ambulatory mobility is also common after hospitalization among older adults. This phenomenon, known as hospital-associated disability, is present in previously independent and ambulatory adults who have impaired mobility upon hospital discharge. It occurs among 16% to 65% of adults 65 years and older [123]. Infrequent ambulation and bed rest are the most commonly cited causes [123].

With the increase in life expectancy, there is also an increase in the incidence of acute and chronic illnesses, such as cardiovascular diseases and hypertension. As a part of the aging process, the composition of vascular structures changes, affecting how peripheral arteries dilate and constrict [13]. The result is often hypertension, which affects 1 billion individuals worldwide [14]. Epidemiologic studies have noted that 12% to 14% of adults 65 years of age and older have hypertension [13]. However, it is important not to use age as the only criterion to determine the type of treatment for hypertension among the elderly. Frail elders should be assessed and treatment tailored for their specific needs [163].

Arthritis is also a leading cause of disability among older adults, accounting for 29% of chronic disease diagnoses in the United States [5; 193]. Arthritis may refer to rheumatoid arthritis or osteoarthritis. Rheumatoid arthritis is a systemic autoimmune disorder that attacks the joints, causing inflammation in the hands, feet, and other parts of the body [15]. Osteoarthritis breaks down the cartilage of joints, such as the shoulder, knee, hip, and ankle, causing pain and limitation of movement [15]. Osteoarthritis is one of the most common pain disorders in the United States and is the leading cause of disability among elders [124]. The knee is most commonly affected area, and experts predict that 3.5 million total knee replacements will be done annually by 2030 [124]. Because chronic arthritis pain and depressive symptoms are often comorbid, it is important for practitioners to assess these patients' mood and mental state. In a four-year longitudinal study with 299 elders living in a retirement community, strong social support and intact cognitive functioning were protective against chronic pain-related depression [164].

Sleep problems are also more common among the elderly, primarily stemming from changes in the sleep cycle that occur with age (e.g., decreased time spent in slow-wave sleep) [125; 194]. Sleep difficulties, such as insomnia, are correlated with impaired physical and psychologic well-being and quality and length of life [96]. In a longitudinal study with elderly individuals in the United Kingdom, 44.7% complained of sleep dysfunction. Those who had greater restrictions of activities of daily living, greater numbers of reported physical illnesses, poor social support, higher levels of depression, and were widowed, divorced, or separated were more likely to report sleep complaints. One year later, of those who reported no sleep problems at baseline, an additional 21.4% reported increased impairment in obtaining adequate rest or sleep [96]. Depression was the strongest predictor of sleep problems. Ultimately, insomnia can increase the risk for other medical and psychologic complications in addition to adversely affecting a patient's quality of life [125; 194]. Practitioners might suggest increasing activities such as walking, running, resistance exercise, and tai chi, as some studies have shown that the sleep quality of older adults can improve when these activities are included in daily life [165].

## HIV/AIDS

In industrialized countries, it is estimated that 10% to 15% of human immunodeficiency virus (HIV) infections occur in adults 50 years of age and older, and approximately one of every nine new HIV diagnoses in the United States occur in those 50 years of age or older [17; 18; 126]. This prevalence may be higher in developing countries [18]. In 2016, there were an estimated 6,812 newly diagnosed cases of HIV among adults 50 years of age and older, accounting for 17% of total diagnoses in the United States. Of these, 841 diagnoses occurred in persons 65 years of age and older. In 2015, approximately 47% of all individuals with living with HIV were 50 years of age and older, and 2,749 people 55 years of age and older died from HIV disease [97]. However, older adults are not generally considered an at-risk group. This has led to a lack of targeted education and screening among older adults. For example, only 32% of state departments of public health websites contained information about HIV/AIDS in elderly individuals [167].

Older adults living with HIV experience a variety of other medical conditions that place them at even further risk for frailty and other diseases of aging. Among older persons with HIV, more than half are considered pre-frail and experience challenges with instrumental activities of daily living (e.g., cooking, cleaning, managing finances, doing laundry) [195].

Because the symptoms of HIV infection (i.e., fatigue, weight loss, memory loss) are similar to those of other age-related illnesses, such as dementia, and because many older adults harbor the misconception that they are not at risk, this population frequently goes untested for the virus [17]. When these individuals do seek medical help, symptoms are often attributed to other disorders, such as Alzheimer disease or a respiratory disorder [17]. It has been argued that women 50 years of age and older are more vulnerable to HIV infection during heterosexual encounters than men or younger women for several reasons [19]. Older women often do not insist on condom use because there is no longer the risk of pregnancy. Furthermore, male-to-female transmission of HIV is higher than female-to-male transmission [19]. Due to divorce or being widowed, increasing numbers of older people are becoming sexually active with multiple partners. This increase in sexual activity can also be partially attributed to older men more commonly using medication in order to maintain erections [20; 21]. Vaginal drying and thinning associated with menopause and aging can result in small tears or cuts during sexual activity, which also raises women's risk for infection with HIV [22]. Lusti-Narasimhan and Beard note that older women are generally more vulnerable to sexually transmitted infections because menopause affects the lining of the vagina, making it less protective to infection [127]. Furthermore, as one ages, the immune system also declines.

Ultimately, practitioners should be vigilant when working with older adults with HIV due to age-related comorbidities. Perhaps due in part to the misconception that the elderly are not sexual beings, practitioners often do not have conversations with their elderly clients about HIV/AIDS and other sexually transmitted infections [168]. In addition, polypharmacy is common in the older population, and drug interaction with HIV medications should be considered [128]. Generally, older adults metabolize antiretroviral medications slower, which could place them at risk for higher levels of toxicity [126]. Older adults who are diagnosed with HIV/AIDS are also at greater risks for being diagnosed with cancers [126].

## CHALLENGES AND ADJUSTMENTS ASSOCIATED WITH AGING

### PSYCHOLOGIC THEORETICAL FRAMEWORKS

#### Disengagement Theory

Disengagement theory, originally proposed by Cumming and Henry, maintains that successful aging involves whole or partial disengagement [23; 196]. In other words, as individuals age, they must accept a decline in status and forfeit some of their social and leadership roles [23]. The goal is to help older individuals disengage so they can die more peacefully [169]. However, this theory is controversial, particularly in Western society, where work is central in defining one's identity. Furthermore, other theorists argue that it is not disengagement or alienation from society that defines successful aging; rather, some assert that new activities may be assumed for those roles that are given up [24]. According to this theory, for elders to successfully journey through the aging process they must remain active [24].

**Gerotranscendence Theory**

The gerotranscendence theory was developed by Lars Tornstam in reaction to the tenets of disengagement theory. Tornstam posited that older people do not retreat into themselves and withdraw socially. Instead, aging can be viewed from a positive perspective, as older adults become less occupied with themselves, material things, and achievement. They redefine themselves in terms of the world and their relationships with others [129]. This theory assumes that gerotranscendence is a natural developmental process that yields greater life satisfaction. As part of this process, a person's values and worldviews evolve to become more spiritual [197].

This theory is not a revised version of disengagement theory, which focuses on pursuits of external things [169]. Instead, this theory emphasizes inner-development. For example, an older adult may appear to be disengaging and withdrawing by not participating as many social activities, and a practitioner might even speculate a diagnosis of depression. However, according to gerotranscendence theory, it is possible that the elder is simply becoming more deliberate and reflective [170]. In an interview study of 14 older adults between 80 and 96 years of age, themes that emerged were consistent with this theory [130]. The study participants discussed reconnecting with the past and past generations, focusing less on themselves, and worrying less about money and material possessions.

**Erikson's Stages of Development**

Erik Erikson, a prominent developmental theorist, had a more optimistic view of aging, focusing on the positive ways of overcoming the various crises one encounters throughout life [25; 26]. Erikson postulated eight stages of psychosocial development. Each stage provides the individual with a choice of two alternatives to consider and accept; one is an opportunity for growth, while the other results in unhappiness. In late adulthood, individuals confront the challenge of integrity versus despair. During this stage, individuals reflect on their lives, and determine if they have lived a life of purpose. If so, the individual will feel contentment, having attained integrity [26].

Attainment of integrity is defined as the ability to examine all of one's life experiences and find a sense of peace and accomplishment. However, despair will be experienced by those who have not lived a meaningful life. In these cases, death is either viewed as welcome, a means to end a miserable life, or is feared because one can no longer compensate for past failures [27]. This theory, as in other stage theories, recognizes that psychologic and social growth continue throughout an individual's life [171]. In one study of women who graduated from college in 1964, generativity and ego integrity appeared to increase starting at 43 years of age, continuing past 72 years of age, without any decline [198].

**Peck's Developmental Tasks of Aging**

Peck's Developmental Tasks of Aging is another theoretical framework to understanding aging, maintaining that older adults must complete three development tasks to achieve happiness [28]. First, shifting from a work-role preoccupation to self-differentiation is necessary. As many older persons retire, a new identity and social role must be created. New interests should be explored, and ultimately, individuals should realize that their identities are worthwhile regardless of their occupation [28].

The second task involves shifting from body preoccupation to body transcendence [28]. Those who transcend preoccupations with health issues, physical changes, and youth-based beauty ideals will be more satisfied with life.

Finally, the third task is the shift from self-preoccupation to self-transcendence. As death becomes more of a reality, persons may become depressed. However, others accept it with a healthy and positive attitude; this improves the quality of life [28].

### Activity Theory

Activity theory asserts that older adults must remain embedded in social activities and relationships in order to accomplish their goals [169]. Starting from middle age and progressing into the later developmental years, being intrinsically linked with others, activities, and tasks that are viewed as meaningful are believed to produce physically, psychologically, and emotionally good health [98]. In other words, sedentariness does not promote wellness for elders [169]. This theory has been criticized for being overly simple, as it does not take into account the social environment [199].

### Socioemotional Selectivity Theory

Socioemotional selectivity theory focuses on elders' changed mentality, worldviews, and social networks. As individuals age, their goals may change from being knowledge-oriented to being more emotion-related [171]. According to this theory, the elderly become more purposeful with whom they interact, looking for and prioritizing emotionally rewarding relationships [200]. Conflicts tend to be avoided, knowing that their remaining time is short [171].

### Age Stratification Theory

The historical context of an elder's life forms the basis for the age stratification theory. Individuals and their generational cohort may respond, behave, and adhere to certain worldviews due to the historical, social, and cultural events that occurred during their lifetimes. These experiences then shape how individuals view social roles, cope with stressors, and respond to various events [98].

## DEPRESSION AND SUICIDE

An estimated 7% of the elderly population worldwide experiences depression [201]. Depression can affect the elderly and is more prevalent among those who have experienced the loss of friends and family members [29]. The death of a spouse is a stressful event that may precipitate depression and may predict the onset of illness and earlier death [3]. Older women tend to experience greater depression and, once depressed, tend to stay depressed for longer periods of time compared with their male counterparts [131]. Older women with long, stable marriages were more likely to experience depression compared with women who had been married for a short period of time or whose marital quality was not as good [131]. In one study, older adults who are socially isolated are more likely to experience depression, fatigue, and sleep disturbances [202].

Depression is a concern among older adults because it can place them at greater risk for developing medical illnesses. The converse is also true; those who have medical illnesses or disability are also at risk for depression [30; 203]. For example, older adults with high blood pressure and depression are three times more likely to experience a stroke compared with older hypertensive individuals who are not depressed [29]. It is interesting to note that older persons with rheumatoid arthritis or osteoarthritis experience higher levels of depressive symptoms [30]. As individuals age, it is more likely they will experience some form of chronic pain. Adults between 45 and 64 years of age are more likely to report that they experience physical suffering lasting more than 24 hours [172].

The highest rates of depression in the elderly occur in those who have had strokes, coronary artery disease, cancer, Parkinson disease, and Alzheimer disease [84]. Recurrence rates are also very high. Although it is a misconception that the elderly are more depressed than the general public, they may still be at risk. It is important to assess each person individually.

It is also crucial to remember that older person may not necessarily display dysphoria and feelings of sadness. Instead, depressive symptoms may be manifested somatically. Older adults who experience sadness or loss of pleasure in the things they normally enjoy are more likely to attribute these symptoms to aging rather than depression [203].

Suicide is also a concern, as individuals 65 years of age and older account for 18% of all suicides in the United States [32; 173]. It is important to note that the rate of suicide is higher among older persons who are divorced or widowed [32]. Men 75 years of age and older are the most vulnerable, with a rate of 39.7 deaths per 100,000 persons [99].

Practitioners should be mindful that older adults are less likely to express emotional pain compared with their younger counterparts and are also less likely to endorse suicidal ideations [132]. It is important to account for risk factors more common in an older population, such as chronic illness, pain, loneliness, and social isolation, some of which may not be part of suicide risk assessments [132].

## GRIEF, MOURNING, AND BEREAVEMENT

Although the terms "grief," "mourning," and "bereavement" are often used interchangeably, they have specific and unique meanings. Grief is a normal reaction to a loss, while mourning is the expression of grief and the process by which individuals adjust to the loss. Bereavement is the period of time during which grief and mourning occur [35; 133]. Psychosocial support is essential for individuals who have lost loved ones and can help to decrease the risks of morbidity, substance abuse, and mortality commonly found among widows/widowers and other persons who have lost a loved one [36].

### Grief

Grief comprises a range of feelings, thoughts, and behaviors in the realm of the physical, emotional, and social domains [35]. Individuals may have trouble sleeping, changes in appetite, or other physical symptoms or illness. Studies have shown that widowers may be at risk of poor nutrition and inadequate caloric intake, and widows who were financially dependent on their spouse are vulnerable to falling into a state of poverty [174]. Emotions can include sadness, anxiety, guilt, and anger. A return to work, activities with friends, and taking care of family are beneficial behaviors in the social domain. The issue of grief becomes more prevalent among older adults as they inevitably face the death of family members and friends. In a qualitative study with older adults 62 to 88 years of age, the participants described experiences that were laced with emotional distress [134]. They also talked about how their grief was unique and did not meet traditional expectations in terms of intensity and severity.

In cases of terminal illness, grief counseling should begin before death occurs, with a focus on life meaning and contributions [37]. Awareness and understanding of the mediators of grief responses can assist in recognizing individuals who may be at increased risk for adapting poorly to the loss. These mediators are [38]:

- Nature of attachment (how close and/or dependent the individual was with regard to the deceased)
- Mode of death (the suddenness of the death)
- Historical antecedents (how the individual has handled loss in the past)
- Personality variables (factors related to age, gender, ability to express feelings)
- Social factors (availability of social support; involvement in ethnic and religious groups)
- Changes and concurrent stressors (number of other stressors in the individual's life, as well as coping styles)

### Mourning

Satisfactory adaptation to loss is dependent on tasks of mourning [38]. In the past, "stages" of mourning were discussed; however, the stages were not clear-cut and were not always followed in the same order. The tasks associated with mourning include [38]:

- Accepting the reality of the loss
- Experiencing the pain of the loss
- Adjusting to the environment in which the deceased is missing (external, internal, and spiritual adjustments)
- Finding a way to remember the deceased while moving forward with life

After an individual's death, the family should be encouraged to talk about the deceased, as this promotes acceptance of the death. A wide range of emotions is normal during the mourning process. Explaining the process can help family members understand that experiencing these emotions is a necessary aspect of grieving. Frequent contact with family members after the loved one's death can ensure that the family is adjusting to the loss. Referrals for psychosocial and spiritual interventions should be made as early as possible to optimize their efficacy.

Older adults who lose a spouse will not only mourn the loss but also be confronted with their own mortality. They also have to cope with assuming new roles and potentially learning new tasks. Those who had been married a long time may feel they have lost a part of themselves [133].

### Bereavement

Bereavement can trigger a host of physical and psychologic issues because of its highly stressful nature [100]. An estimated 10% to 15% of individuals who have experienced a loss of a loved one will experience depression, prolonged grief disorder, and bereavement-related post-traumatic stress disorder [204]. In one study of persons 50 years of age and older who lost a parent, there was a 83% likelihood of body mass index (BMI) loss compared with counterparts who had not lost a parent [175]. Loss of a spouse resulted in a 37% increased risk of BMI loss compared with those who had not lost a spouse.

How bereavement services are provided vary. Programs usually involve contacting the family at regular intervals to provide resources on grieving, coping strategies, professional services, and support groups [36; 37; 39]. Notes or cards are especially beneficial at the time of the first holidays without the deceased, significant days for the family (deceased's birthday, spouse's birthday), and the anniversary of the death. Bereavement services should extend for at least one year, but a longer period may be necessary [36; 39].

## ALCOHOL AND SUBSTANCE ABUSE

Alcohol and substance abuse/dependence in the elderly are generally hidden problems. However, between 2002 and 2006, substance use rates almost doubled among those 50 to 54 years of age. It is estimated that slightly more than 10% of the elderly abuse prescription drugs, with up to 5 million elderly individuals projected to have drug use disorders and 4.4 million requiring substance abuse treatment by 2030 [101; 135; 176]. It is estimated that more than 80% of patients 57 to 85 years of age are taking at least one prescription medication daily. In addition, more than 50% are taking more than five medications daily [177]. Several factors contribute to the invisibility of these disorders.

First, many elderly individuals do not disclose alcohol or substance abuse because they are ashamed. This is compounded by healthcare professionals' reluctance to ask older adults about substance abuse, mostly due to the prevalent images of young people misusing substances [40]. Additionally, the symptoms of alcohol and substance abuse can mimic or resemble conditions associated with aging, thereby masking an underlying drinking or substance disorder [40]. Finally, some older adults may be isolated, with minimal social contacts or networks to intervene in cases in which alcohol or substance use has become a problem.

A study comparing the 12-month prevalence of alcohol use, high-risk drinking, and *Diagnostic and Statistical Manual of Mental Disorders* (DSM)-IV alcohol use disorder from 2001–2002 to 2012–2013 showed significant increases in the number of individuals 65 years of age that met those criteria. Alcohol use among the elderly increased from 45.1% to 55.2% (a 22.4% increase), high-risk drinking increased from 2.3% to 3.8% (a 65.2% increase), and alcohol use disorder according to the DSM-IV criteria rose from 1.5% to 3.1% (a 106.7% increase) [120].

Late-onset alcoholism is common in the elderly, and several risk factors may contribute to the development of alcohol use disorders in older age. Some may use alcohol to self-medicate to mitigate physical symptoms, such as difficulty sleeping or chronic pain. Chronic illnesses and depression are also risk factors [205]. Mourning a loved one, loss of social supports, and loneliness can also instigate alcoholism later in life [102]. In general, late-onset alcoholism is more common among older women than older adult men [136]. It is also more prevalent among older adults in higher socioeconomic brackets. Compared with early-onset alcoholism, individuals with late-onset alcoholism tend to experience less psychosocial and legal consequences as a result of the substance abuse [136].

Rigler argues that the DSM criteria for alcohol use disorder may be difficult to apply to older adults [45]. For example, age-related physiologic changes may change the individual's response to alcohol, increasing their sensitivity and levels of tolerance. Because of this, they may not spend a lot of time or expend a great amount of energy in activities related to alcohol or substance consumption [46]. Thus, these persons would not meet the DSM criteria for alcohol use disorder as they require smaller amounts of alcohol to become intoxicated. In addition, the DSM criterion of giving up activities or responsibilities as a result of substance use may not be appropriate for older adults because they may have fewer regular activities resulting from diminished vocational or social responsibilities [46]. Unfortunately, there are few evidence-based substance abuse treatment approaches that are targeted for older adults. Practitioners tend to simply adapt treatments created for younger populations for older adults [135].

## ELDER ABUSE

The 2015 White House Conference on Aging identified elder abuse as a top priority in public health [178]. Elder abuse refers to "any knowing, intentional, or negligent act by a caregiver or any other person that causes harm or a serious risk of harm to an older adult" [47]. There are three general categories of elder abuse, which appeared for the first time in the 1987 Amendments to the Older Americans Act [48]. These three categories of elder abuse are: domestic elder abuse, institutional abuse, and self-neglect or self-abuse [48].

Definitions of elder abuse vary based upon state statutes. However, the National Center on Elder Abuse has identified seven types of behavior associated with elder abuse [47; 206]:

- Physical abuse: Use of physical force that results in injury, pain, and impairment, such as slapping, punching, kicking, or restraining

- Sexual abuse: Nonconsensual contact of any form
- Emotional abuse: Infliction of distress, anguish, and/or pain through verbal or nonverbal acts
- Financial/material exploitation: Illegal or improper use of an elder's resources, property, funds, and/or assets without the consent of the elder
- Caregiver abandonment/neglect: Refusal or failure to provide goods or services to an older adult, including denying food or medical-related services
- Abandonment: Desertion of an elderly person by the individual who has physical custody or who is the primary caretaker
- Self-neglect: Behaviors of elderly persons that jeopardize their own safety and/or physical health

Epidemiologic studies of the prevalence of elder abuse indicate a prevalence of between 2% and 10%, with 1.7% experiencing more than one type of abuse [48; 137; 207]. In a survey study with 3,005 adults between 57 and 85 years of age, 0.2% disclosed to physical abuse in the last year, 9% reported verbal abuse, and 3.5% indicated financial abuse [138]. These prevalence rates may be lower than the actual rate given the amount of under-reporting due to fear of reprisals, embarrassment/shame, and hopelessness [179]. A study of 441 elderly Michigan individuals living in nursing homes found that 21% of family members reported some type of elder neglect in the last year [139]. The factor most predictive of neglect was limited ability to engage in activities of daily living. Cognitive impairment also appears to be predictive of elder abuse [179].

## SPECIAL POPULATIONS

### GRANDPARENTS PARENTING

Typically, older adults do not think about parenting at their particular life stage; however, there has been an increase in grandparents parenting in the last decade. In 2016, it was estimated that 7.2 million children younger than 18 years of age in the United States resided with a grandparent; more than 2.5 million grandparents were responsible for the basic needs of one or more grandchildren younger than 18 years of age [144]. Between 2006 and 2015, there was an 8.3% increase in custodial grandparents [8]. The reasons for grandparents taking over parenting responsibilities of their grandchildren are numerous, ranging from parents' substance abuse, divorce, health and mental health concerns, reported child abuse, and death of a parental figure [180; 208]. Many grandparents assume these roles so their grandchildren do not enter the foster care system.

Often, grandparents are placed in these new roles without much preparation, making the task more difficult. Some older adults may feel uncomfortable addressing issues such as drugs, sexually transmitted infections, gangs, and school violence [54]. Some studies indicate that these new parenting roles, particularly if the grandchildren have physical or mental health problems, trigger anxiety and negative well-being for grandparents [55]. In one study, Ross studied 50 African American grandparents raising grandchildren, and a majority (94%) reported increased stress [56]. Those grandparents who were involved in counseling and special school programs reported less stress. In a separate study of African American custodial grandparents, sleep disorders were common, with most linking the lack of sleep or poor sleep quality on the stresses of parenting their grandchildren [16]. A separate survey of custodial grandparents showed that 95% of respondents had one or more concerns regarding finances, legal issues, and/or physical health.

Respondents also indicated that they had limited social supports and community resources, compounding the stress experienced [145].

Stress also results from the financial constraints associated with raising grandchildren. In the United States, more than 20% of grandparents raising grandchildren have incomes below the federal poverty level [57]. The unanticipated costs of raising children in retirement years may severely impact financial independence, as these individuals may already be living on a tight budget. With additional medical costs and, at times, costs associated with other therapies, many grandparents may experience caregiving burden [57]. Inadequate or inappropriate housing for children may also be an issue [209]. Custodial grandparents who are unable to work may have difficulty applying for Temporary Assistance for Needy Families (TANF) [34]. The TANF family grant offers financial support based on the income of the entire family, but it also has a work requirement for the grandparent [34].

The additional stress in assuming primary care of grandchildren may also be a contributing factor to the poorer physical health of custodial grandparents. Grandparents who are caring for their grandchildren report worse self-reported health symptoms, such as more body pain and general health perception, compared with their counterparts not providing care to their grandchildren [51]. Although there are negative effects, there are also positive outcomes for custodial grandparents. Some view it as a second chance to rectify mistakes they feel they made as parents [141]. In a study of custodial grandmothers, some reported enjoying parenting the second time because they felt they had more experience, had learned from past mistakes, and could now offer wisdom. In many respects, this created a sense of freedom, relaxation, and confidence [142]. Some grandmothers felt they had more time and attention to give to their grandchildren compared with raising their own children, when they had additional demands such as work [142]. Some custodial grandparents took on the role because they wanted to be useful in a time of need for their children [210]. In a mixed-methods study, grandparents related having peace of mind knowing that their grandchildren's basic needs were met. Aside from the knowing that their grandchildren will be secure, they also described how they enjoyed the simple pleasures of partaking in activities with them [210].

## ELDERLY ETHNIC MINORITIES

The elderly population in the United States is far from homogeneous in terms of race and ethnicity. Minority populations have increased from 7.2 million in 2007 (19% of the elderly population) to 11.8 million in 2017 (23% of the elderly) and are projected to increase to 27.7 million in 2040 (34% of the elderly) [92]. In 2017, the largest racial/ethnic minority groups were African American (9%), Hispanic (8%), Asian American and Pacific Islanders (4%), and Native Americans and Alaskans (less than 1%) [92].

Given the discrimination and oppression that racial and ethnic minority elders may have experienced over the years, they may be reluctant to seek mainstream health and mental health services. In addition, some may be limited in English proficiency, which is often another barrier to help-seeking and compliance with health and mental health services. Practitioners should be aware of the dynamics that stem from the result of cultural differences in values, belief systems, health beliefs, attributions of causation to illness and problems, and communication styles [104]. Not understanding cultural differences can lead practitioners to take on a deficit or pathology perspective when viewing their clients.

## ELDERLY WOMEN

In examining historical trends, there are gender differences in longevity rates; women tend to live longer than men [5; 92]. For example, women who reach 65 years of age are expected to have a life expectancy of an additional 20.6 years; men who reach 65 years of age have an average life expectancy of 18.1 years [92]. As such, there are significantly more older women (28.3 million) than men (22.6 million) [92]. This longer lifespan has social and economic ramifications. In general, elderly women are more likely to be widowed, living alone, and experience greater poverty than their male counterparts. According to the U.S. Census, 32% of women 65 years of age and older are widowed compared with 11% of men in this same age-group [92]. Approximately 34% of elderly women and 21% of elder men live by themselves [92]. Despite some of these negative social trends, a qualitative study of 15 urban elderly women related stories of survival, strength, and resilience [106]. The themes that emerged in these narratives were that of being able to rebound from adversity and tapping into social network systems that stemmed from their churches, community, and family.

## GAY AND LESBIAN ELDERLY

There are an estimated 2.4 million lesbian, gay, bisexual, and transgender (LGBT) individuals 50 years of age and older, a number that is expected to double by 2030 [183]. The overall predominant attitude about sexuality is that it is a private matter, and the general myth is that elderly individuals are sexless [107]. Therefore, the unique needs of gay, lesbian, and transgendered/transsexual elderly are often ignored or unacknowledged. Furthermore, in a heteronormative society, older adults may have experienced (and continue to experience) discrimination [184]. Elderly homosexuals experience intersecting oppression stemming from ageism as well as homophobia. Older gay men, for example, are stereotyped as "dirty," "lecherous," and "oversexed" [108]. These stereotypes lead to discrimination, marginalization, and oppression and affect health, mental health, and social services. Chronic minority stress results in health disparities among older LGBT older individuals, including greater risk of cardiovascular disease, depression, and premature cognitive decline [211]. One of the major fears associated with aging in the gay community is decline in health status and not being able to access services that accommodate to gays' and lesbians' needs and concerns [107]. Lesbians tend to express concern about lack of recognition of same-sex partners and lack of services that are sensitive and relative to gays and lesbians. Gay men tend to fear being alone in later life. Discriminatory housing policies in assisted living facilities are also a concern [212]. It has been hypothesized that, due to the discriminatory policies affecting gay and lesbian individuals' access to different types of services, older gay and lesbian women are more vulnerable to needing long-term care than their same-age heterosexual counterparts [147; 212]. After controlling for race, age, and education, researchers found that women living with female partners were more likely to need help with bathing or dressing compared with women living with or married to male partners. Similarly, men living with male partners were more likely than men living with or married to female partners to need help with errands.

It is important to use the lifespan perspective to understand the experiences of older gay and lesbian adults [148]. Their reality is shaped by a culture that has historically criminalized, medicalized, and pathologized same-sex relationships. Therefore, they have historically been socially isolated and ostracized by their families and friends [109]. In addition, access to care and social services have been adversely impacted, which then has led to health disparities [148].

## LONG-TERM CARE

In the United States, there were 1.3 million adults residing in nursing homes at the end of 2016 [149]. As age increases, the percentage of those residing in nursing home also increases. Only 16.5% of residents are younger than 65 years of age, 18.2% are 65 to 74 years of age, 26.7% are 75 to 84 years of age, and 38.6% are 85 years of age and older. Women are highly represented among nursing home residents, comprising 64.6% of this population. In addition, the majority (75.1%) are non-Hispanic white, followed by black (14.3%), and Hispanic (5.4%) [149]. Among residents in nursing homes, the majority require assistance with activities of daily living, including bathing (96.7%), dressing (92.7%), walking or locomotion (92%), toileting (89.3%), transferring in or out of bed (86.8%), and eating (59.9%) [149]. In addition, it is estimated that the number of older adults with significant physical or cognitive disabilities will increase from 6.3 million in 2015 to 15.7 million in 2065 [149].

In 2018 in the United States, 56% of those 65 years and older required long-term services [213]. Institutions providing long-term care to older individuals often provide a variety of services, including personal, social, and medical services. Key factors that predict elders entering a nursing home include [111]:

- Non-Hispanic white race
- Lower income bracket
- Restricted activities of daily living
- Cognitive impairments or a history of falls
- Chronic diseases (e.g., diabetes, cardiac conditions, stroke)
- Limited social supports (e.g., widowed, divorced, few or no children)

Although nursing homes remain an integral factor in long-term care, there have been concerted efforts to move away from institutionalized care and to home- or community-based options [80]. This may be in part due to most individuals' wishes to remain in their own homes for as long as possible, receiving more patient-centered and responsive care. It is important to note that family members provide the majority of care to older individuals. In 2015, 34.2 million people in the United States provided unpaid care to an adult 50 years of age or older [81].

Providing long-term care is complicated, as integrated psychosocial and medical care is often required. Specialized assessment tools, including the Resident Assessment Instrument, are available in order to assist in the development of care plans for residents in long-term care facilities [82].

Ten ethical issues have been identified has having significance in geriatrics and long-term care [79]:

- Beneficence: The main concern should be for the well-being of the client or patient.
- Non-maleficence: Harm should be avoided
- Futility of treatment: Interventions should be consistent with the individual's goals.
- Confidentiality: All laws should be conformed to in regards to confidentiality.
- Autonomy and informed consent: All patients have the right to self-determination, including the right to refuse treatment. Persons should also be encouraged to complete a healthcare directive and to name a proxy in the event that they are incapacitated.
- Clinician-patient relationship: All clinicians should strive to create a therapeutic alliance with the patient.
- Truth telling: Communication should be honest and thorough, and medical terminology should not be used to obscure the truth.

- Justice: An objective decision-making process should be used.
- Non-abandonment: Clinicians have the responsibility of ensuring that patients are provided with adequate therapy. If a therapeutic relationship must be terminated, it may not end until time has been given for the patient or his or her proxy to make other arrangements.
- Limited resources: Make decisions and allocate limited healthcare resources in a nondiscriminatory and objective manner.

For elders and their family members who believe their rights have been violated or who have complaints about their long-term care services, all states have an Ombudsman Program under the Title VII Older Americans Act that is overseen by the Administration on Aging [112]. Volunteers from this program work with elders and families to advocate on their behalf to provide information about long-term care, to investigate complaints, and to promote changes in institutions in order to improve the quality of life for long-term care residents.

## ASSESSMENT TOOLS FOR OLDER ADULTS

This section will touch on key assessment tools in the areas of depression, suicidality, substance and alcohol abuse, and elder abuse. Elderly patients should be routinely screened for these conditions, in spite of some practitioners' discomfort with asking questions about sensitive topics. These population-appropriate assessments may be included in other health screening tools [58].

### SCREENING TOOLS FOR DEPRESSION

Structured instruments like the Center for Epidemiologic Studies Depression-Revised scale (CESD-R) and the Beck Depression Inventory are brief self-reports that measure signs and symptoms of depression [59; 60; 166]. These practical tools are easily accessed and administered by practitioners. However, they are self-reports and can be unreliable, particularly for those with impaired memory. The CESD-R is a 20-item instrument consisting of closed-ended questions; the Beck Depression Inventory is a 21-item rating inventory. These assessment tools were not developed specifically for older adults.


The Institute for Clinical Systems Improvement asserts that clinicians should routinely screen all adults for depression using a standardized instrument. (https://www.icsi.org/wp-content/uploads/2019/01/Depr.pdf. Last accessed May 15, 2020.)

**Strength of Recommendation/Level of Evidence**: Strong recommendation/low-quality evidence (The work group feels that the evidence consistently indicates the benefit of this action outweighs the harms. This recommendation might change when higher quality evidence becomes available.)

In addition to these tools, a specific assessment measure for older adults, the Geriatric Depression Scale (GDS), has been developed [85]. Available in both a short and long form, this scale consists of 15 to 30 closed-ended questions. The GDS is recommended when screening older adults who are functioning well cognitively or are only slightly cognitively impaired for depressive symptoms [84; 203].

If a practitioner finds that an older individual scores positively for depression, the patient should be further evaluated in a clinical interview to determine whether the symptoms are of sufficient intensity, number, and duration to meet the criteria for major depression or dysthymia.

## SCREENING TOOLS FOR COGNITIVE IMPAIRMENT

Older adults are more likely to experience cognitive decline, and presence of the early signs of impairment should prompt immediate intervention [83]. Patients who display symptoms of changes in psychologic status may be evaluated for dementia or cognitive impairment using the Mini Mental State Examination (MMSE). The MMSE consists of 11 items that assess five areas of cognitive function: orientation, registration, attention and calculation, recall, and language. A maximum score is 30, and any score less than 24 indicates cognitive impairment [83]. Because the MMSE takes little time to administer, it may be integrated into practice relatively easily.

The Mini-Cog is also another quick screening tool used to assess for cognitive impairment. It involves a three-item recall and a clock drawing test and takes about three to five minutes to administer. The patient is given three unrelated words to remember, then is asked to draw the face of a clock, with the time of 10 minutes after 11 o'clock. After drawing the clock, the patient is asked to repeat the original three words. He or she receives one point for each recalled word [150]. A score of 0 indicates likelihood of cognitive impairment, and a score of 3 indicates no concern of cognitive impairment. If the score is 1 or 2, the results of the clock drawing test are taken into account; an abnormal drawing is suggestive of cognitive impairment. This test has a sensitivity rate of 99% and classified a group of subjects correctly 96% of the time [150]. In a study of elderly veterans, researchers found that the majority of participants with no documented diagnoses of dementia failed the Mini-Cog [151]. The authors concluded that this simple screening tool can easily be incorporated into standard assessments.

The Montreal Cognitive Assessment (MoCA) assesses for memory, orientation, language, abstraction, executive functioning (i.e., ability to remember instructions, focus, and handle and execute multiple tasks), and constructional praxis (i.e., skill to join parts to make a whole). Some prefer this assessment because it detects milder forms of cognitive impairment compared with the MMSE [214]. It consists of 30 items and takes approximately 10 minutes to administer. More information on the MoCA is available at https://www.mocatest.org.

In addition, the Alzheimer's Association has published a cognitive assessment toolkit intended to allow practitioners to detect cognitive impairment quickly and efficiently during the Medicare annual wellness visits. The toolkit is available online at https://www.alz.org/media/documents/cognitive-assessment-toolkit.pdf.

## ASSESSMENT TOOLS FOR SUICIDALITY

Asking questions about thoughts and/or intent to harm oneself is often uncomfortable for practitioners [61]. However, it can be done in a nonconfrontational manner that conveys caring and respect. It is also recommended that cultural sensitivity be at the forefront of practitioners' minds when assessing for risk of suicide. Individuals from certain cultural backgrounds may view suicide as sinful [61; 152]. Taking this into consideration, questions include: With this much stress, have you thought of hurting yourself? Do you think life is worth living? Have you ever thought of killing yourself? How would you do it? Do you have the tools to carry out your plan? What would stop you or what has stopped you from carrying out your plan?

| CAGE QUESTIONNAIRE |
|---|
| Have you ever felt you should **C**ut down on your drinking? |
| Have people **A**nnoyed you by criticizing your drinking? |
| Have you ever felt bad or **G**uilty about your drinking? |
| Have you ever had a drink first thing in the morning to steady your nerves or get rid of a hangover (**E**ye-opener)? |

*Source: [64]* *Table 1*

When suicidal ideation is known or suspected, a more direct approach, using forced choice questioning, may be helpful [62]. Shea recommends inquiring about specific symptoms with an emphasis on overestimation in order to prevent individuals from underestimating the symptoms [62]. For example, a clinician might ask: "Do you think about hurting yourself 20 hours a day?"

The Geriatric Suicide Ideation Scale (GSIS) is targeted to older adults to specifically measure for suicidal ideations. It consists of 31 items in four subscales: suicidal ideation, death ideation, loss of personal and social worth, and perceived meaning of life [215].

The Depression and Suicide Screen (DSS) may also be useful. It consists of five items, is simple to administer, and can be used in health and mental health settings. The DSS requires patients to answer yes or no to following questions [113]:

- Is your life pretty full? If no, score 1 point.
- Do you still enjoy doing the things you used to do? If no, score 1 point.
- Do you think it is too much trouble to do the things you used to do? If yes, score 1 point.
- Do you feel that you are a useful person who is needed by others? If no, score 1 point.
- Do you feel tired without any specific reason? If yes, score 1 point.

A score of 2 or greater is considered sensitive for depression and/or suicidality.

## SCREENING TOOLS FOR ALCOHOL ABUSE

There are several screening tools available for assessing older adults with problem drinking. The Drug Abuse Screening Test (DAST) is a 28-item questionnaire consisting of yes or no responses. The Short Michigan Alcohol Screening Test (SMAST) is a 13-item questionnaire with a similar response format. These instruments are commonly used but may not be appropriate for the elderly population. However, a longer version of the SMAST, the Michigan Alcohol Screening Test-Geriatric (MAST-G) was specifically developed in order to accurately assess alcohol abuse and dependence in older adults [46]. The MAST-G consists of 24 items, which may limit its incorporation into regular screening procedures. As opposed to the standard MAST, this version focuses more on drinking in response to grief and changes in drinking patterns over time.

The CAGE Questionnaire for Alcohol Abuse is a brief, easy-to-administer screening device that is easily incorporated into a medical or psychosocial assessment; it is the most widely used instrument in clinical practice (***Table 1***) [63]. The CAGE Questionnaire consists of four closed-ended items that assess an individual's perception of their drinking habits. Affirmative responses to any one item indicate a potential problem with alcohol abuse [64]. However, this tool does not identify those who may be in the early stages of alcohol abuse [63].

In general, patients will be willing to answer questions if they perceive that the practitioner is caring and nonthreatening. Responses to the screening questions will be most accurate when patients believe their responses will be kept confidential and will help with their health diagnosis [136].

## SCREENING FOR ELDER ABUSE

There is no one single tool that is considered the criterion standard to assess and measure elder abuse [179]. One tool, the Indicators of Abuse form, is available for practitioners to use when observing and interviewing the client and family members for elder abuse [65]. This tool is not dependent upon self-reporting but is based on observation and assessment. Researchers have been able to isolate caregiver characteristics that are strongly related to elder abuse [65]. These characteristics include the caregiver's personal and emotional problems, financial dependence of a caregiver on the elder, and the caregiver's general lack of knowledge about the elder's health and psychologic concerns. Furthermore, elder abuse was also correlated with family conflict, the elder's lack of social support, and history of past abuse (though not by the caregiver) [65]. Using these findings, the Indicators of Abuse form was developed. Based on observations and lengthy interviews with both the elder and family members, it asks practitioners to estimate how large the problem is in two areas: dimensions related to the caregiver (e.g., behavior problems, financial status, alcohol/substance problem, or marital/family conflict) and dimensions related to the elder (e.g., social isolation, unrealistic expectations, suspicious falls/injuries, or behavior problems) [65].

Another good assessment instrument is the Elder Abuse Suspicion Index (EASI). It is a five-item tool that provides practitioners a very quick sense whether there is suspicion about the potential presence of elder abuse [114]. It was originally developed for physicians, but it may be used by practitioners in diverse disciplines. The screening questions are:

- Have you relied on people for any of the following: bathing, dressing, shopping, banking, or meals?
- Has anyone prevented you from having food, clothes, medication, glasses, hearing aids, or medical care, or from being with people you wanted to be with?
- Have you been upset because someone talked to you in a way that made you feel shamed or threatened?
- Has anyone tried to force you to sign papers or use your money against your will?
- Has anyone made you afraid, touched you in ways that you did not want, or hurt you physically?

The Brief Abuse Screen for the Elderly (BASE) is another instrument, consisting of only five questions, that takes less than one minute to complete [153]. This tool is designed for the practitioner to complete to determine level of suspicion—the patient is not questioned directly. It is ideally suited for practitioners to use in conjunction with a patient screening tool [153].

Assessing for elder abuse does not only involve asking questions to the elderly client. It is also about asking oneself difficult self-evaluative questions, such as: "Do I hold ageist attitudes? How are these attitudes translated when I conduct an assessment? Do I believe that older adults can be abused, even sexually abused?" Pervasive ageist attitudes held by practitioners can result in a failure to acknowledge that elder abuse (particularly sexual abuse) can occur [154]. This can impact whether certain assessment questions are even asked.


The U.S. Preventive Services Task Force concludes that the current evidence is insufficient to assess the balance of benefits and harms of screening for abuse and neglect in all older or vulnerable adults. (https://jamanetwork.com/journals/jama/fullarticle/2708121. Last accessed May 15, 2020.)

**Strength of Recommendation**: I (Evidence is lacking, of poor quality, or conflicting, and the balance of benefits and harms cannot be determined.)

## GENERAL GUIDELINES FOR INTERVENTIONS

Wellness and purpose have become important emphases when working with older adults [66]. In the past, aging was associated with disability, loss, decline, and a separation from occupational productivity. Although client growth and positive change and development are values that practitioners embrace, the unconscious acceptance of societal myths and stereotypes of aging may prevent practitioners from promoting these values in elderly individuals [115]. In a study of 200 older adults residing in assisted living facilities, participants scored low on levels of depression and high for successful aging, despite having a variety of chronic health conditions [155]. Researchers also found few differences between the young-old and the old-old subgroups in terms of their ratings of successful aging. More than half of the residents exercised regularly, which had both physiologic and social benefits. It is important not to assume that older adults will automatically decline, and it is important to give these patients a sense of purpose and activities that promote successful aging. In a qualitative study conducted by Griffith, Caron, Desrosiers, and Thibeault, older adults defined meaningful occupational roles in a variety of ways [67]. For some, meaningful occupations involved using a skill they are good at; for others, meaningful occupations help to express an identity they value. According to Penick, there is no empirical evidence that older adults do not desire purposeful activities and goals, although their goals may be different from those in other stages of the developmental life cycle [68]. A study conducted by Greenfield and Marks found that elders who were not engaged in activities that promoted a sense of identity were more likely to experience negative psychologic well-being and less sense of a purpose in life [69]. However, those who were engaged in meaningful activities, like formal volunteering, were more likely to experience positive psychologic well-being. Consequently, caring for older adults necessitates a focus on wellness, goals, and purpose, which requires practitioners to shed stereotypical views of aging. Environments that provide older adults with opportunities to explore and formulate new goals are vital [68]. In assessments of older individuals, practitioners should encourage older adults to talk about what gives meaning to their lives and to identify goals based on their social interests [68]. Furthermore, Koenig and Spano argue that the concept of hope may have to be redefined given the context of the lives of elders [115]. For example, if hope is defined as achievement and control, this may be problematic for elders. However, if hope is reconceptualized to mean strengthening existing coping skills and capabilities to transcend challenges, then elders can be empowered to focus on their strengths versus their deficits.

Reminiscence interventions may also be beneficial for older adults. As a therapeutic intervention, reminiscing allows older adults to recall and relive past events in order to integrate their experiences [156]. However, this approach consists of more than simply recalling past memories; these interventions emphasize the importance of the reflective process in assisting individuals to define and redefine themselves [185]. Some counselors use photographs, videos, autobiographies, or other materials to help trigger memories. These concepts are reflected in nursing homes and other long-term care facilities that encourage residents to display family photos or create memory books [186]. This type of intervention can improve self-esteem, mood, cognition, and behavioral functioning. In reminiscence groups with caregivers participation, caregivers reported learning more about the patients and appreciating their lives and experiences [156].

One study evaluated a spiritual reminiscence group consisting of patients with mild-to-moderate dementia in Taiwan over six weeks [185]. Those who participated in the intervention showed increases in hope, life satisfaction, and spiritual well-being compared with the control group. Another study found that older adults who participated in a reminiscence intervention experienced greater levels of problem solving and social support seeking and were less likely to use avoidance coping compared with the control group [216].

## ENGAGEMENT

Coping with loneliness can involve increasing the number of social contacts or intensifying certain specified relationships and lowering individuals' expectations about relationships [157]. Loneliness and social isolation impact older adults' mental and physical well-being. For example, living alone, loneliness, and social isolation are correlated with falls among older adults [219].

Increasing or intensifying social networks can involve various approaches. Cattan and White identified three key aspects of interventions for older adults that support active engagement: group activities that provide support (e.g., support for bereavement), interventions targeted to a specific subgroup (e.g., widowers), and activities or interventions emphasizing elders' control [70]. Several interventions for older adults that focus on decreasing social isolation have been identified and may be classified into four general categories [71]. The first type of intervention to address isolation is one-on-one telephone support services, whereby a counselor checks in with elders periodically. Second, teleconferencing, whereby a group of elders are brought together via a phone conference, has been found to be a cost-effective and useful intervention. Third, face-to-face support groups were found to be beneficial in reducing social isolation, particular groups that last for at least five months [71]. Lastly, with increasing Internet accessibility, e-mails and Internet support groups can also be beneficial for older individuals. Older adults who have access to and use computers have more social support and are less likely to experience loneliness [217]. A study exploring the use of videoconferencing with frail elders in Australia found that the patients preferred videoconferencing with a pain specialist over a face-to-face consultation [116]. A systematic review found that social connectedness and support were increased in elders who used Internet technologies, although the effects were short term [187]. As discussed, loneliness is often intertwined with other variables, such as shyness or limited resources. Therefore, interventions should not simply focus on providing venues for older adults to meet; interventions and programs that focus on people's expectations about friendships and relationships are equally important [157].

## AUTONOMY AND EMPOWERMENT

Autonomy is a quality valued by all, but it may be even more important for persons whose movements are restricted by physical limitations, which is often the case with older individuals. Autonomy refers to the freedom and ability to act on one's own behalf [72]. It is described as having two attributes: independence and control. Independence entails the physical ability to act as one wishes; control is defined as perception of one's ability to exert power [72]. Control also refers to self-determination, or the ability to choose for oneself or formulating and executing a plan for oneself [117]. When older adults perceive they are losing their sense of autonomy, they are more vulnerable to becoming apathetic, depressed, powerless, and indecisive [158]. Family members become more involved as well [181]. For those living in nursing home facilities, it is crucial to provide them with choices and to empower them to make those choices, even simple decisions such as which foods to eat, activities to engage in, and clothes to wear [158].

Autonomy is central in promoting a sense of empowerment. Empowerment is the process by which individuals or groups perceive they can make positive changes or impact within their own lives related to interpersonal relationships and an array of social, political, and economic arenas [73]. In one small study of older adult women, the participants expressed the importance of relationships in the feeling of empowerment, including the significance of mutuality, problem solving based on collectivism, and mutual support and action [73]. Cox and Parsons recommend small group interventions, particularly for older women, that emphasize self- and mutual-help, meaningful relationships, and problem-solving skills [73].

With these overall themes in mind, Silverstone offers several practice guidelines when caring for older individuals [74]:

- Assessment and diagnosis of an older adult's needs should take place within the context of the individual, family, and environment.
- Differential features of practice with older adults should be listed. These features may include health, mental health, loss, control, spirituality, and adaptive behaviors. Listing these different areas should help practitioners consider the array of domains to be covered in psychosocial assessments. It also assists practitioners to identify areas in which they may need to seek additional education and/or information.
- Collaboration with members from multidisciplinary teams is vital in order to address areas of importance to older adults.
- Practitioners should seek evidence-based literature to inform their practice.

## ETHICAL PRACTICE WITH ELDERS

General societal misconceptions regarding the elderly can influence practitioners' ethical decision-making capabilities when working with older adults [75]. The first misconception is that older adults are helpless victims and must be rescued [75]. Another misconception is that older adults cannot change at this stage in their lives. Some may also believe that because this life stage is characterized by decline, older individuals are not able to better themselves or heal [75]. If practitioners are influenced, consciously or unconsciously, by this bias, it can then affect or motivate their decision-making processes.

### PROMOTING AUTONOMY AND SELF-DETERMINATION

The ethical principle of beneficence mandates the duty of practitioners to do good and avoid harm [76]. The balance of good and harm is continuously evaluated. All persons have the right to self-determination, and it should be assumed that all adults (with some exceptions) have the capability to make decisions. Practitioners are responsible for encouraging (but not pressuring) the client to be autonomous [77]. Family members and practitioners may pressure older adults to use certain devices (e.g., electronic pill dispensers, data-gathering devices, robotic pets) because they appear to be beneficial and life-improving [218]. However, if an individual does not want to use the device, it is important consider if the pressure compromises his or her autonomy. A four-step process to assist practitioners to promote beneficence and client autonomy has been developed [76]:

- Discuss each client's values and preferences.
- Evaluate care plans related to physical safety, independence, and each client's values and preferences.

- Protect the client's autonomy by considering the client's values and preferences and weighing them with potential negative consequences of implementing any care regimen.
- Support each client's values and preferences, even if they conflict with the practitioner's own value system.

The violation of clients' autonomy and self-determination can be very subtle. Practitioners should consider the role of power dynamics between the two parties and how the practitioner's expert status inadvertently reinforces a hierarchical relationship [118]. In a study of 21 older adults receiving in-home nursing care, one of the main themes that emerged was the elders' need to be treated as people—as unique individuals and not cases [159]. The participants reported wanting to be treated with respect and dignity and wanting to make decisions about their care. Furthermore, older adults with chronic conditions eventually learn to live with and have established competencies and routines to manage it. They are still active in their decision making and want to continue to be [160].

Informed consent is the direct expression of the principle of autonomy. The three criteria for informed consent are competence, voluntariness, and being informed [182].

## CAPACITY

Decision-making capacity refers to an individual's ability to understand, appreciate, reason, and ultimately express choices. There are different categories of decision-making capacity, such as personal, medical, and financial [119]. It is important for practitioners not to assume that elders cannot make their own decisions, as this would be based on the ageist assumption that with age comes a lack of mental capacity. However, practitioners should remember that some losses may be associated with the normal process of aging. Loss of hearing, for example, can lead to miscommunication and a sense of isolation, anxiety, or paranoia. Therefore, effective communication, regardless of client disabilities, is key in helping elders make informed choices [78]. It is also important to remember that assessing an older adult's level of capacity should be continuous [161].

The issues of an elder's mental capacity and self-determination come into play with informed consent, particularly if cognitive impairments are present. Informed consent involves three dimensions: the communication of the information, the opportunity to ask questions, and the process of making a decision [162]. As stated, an elder's self-determination should be promoted. It must involve not only the communication of the information but also giving older adults the opportunity to ask questions about their care, the intervention, and/or services provided to them and empowering them to make the decision. However, there may be times when an elder cannot give informed consent. One way to assess if the elder understands the intervention is to have him/her reiterate what the intervention entails [6]. However, there are a few options when an elder's capacity is compromised. First, a surrogate caregiver could provide consent. Second, double informed consent could occur, whereby the surrogate caregiver gives informed consent and the elder client gives assent. Finally, it is possible to obtain early informed consent from the elder via legally binding documentation of wishes prior to any cognitive impairment [6].

Several tools are available to assess capacity, including [161]:

- Aid to Capacity Evaluation
- MacArthur Competence Assessment Tool for Treatment
- The Assessment of Capacity for Everyday Decision-Making
- Semi-Structured Clinical Interview for Financial Capacity

These tools evaluate different dimensions of capacity, highlighting the lack of consensus on the criteria to determine capacity.

### CONFIDENTIALITY

The ethical principle of confidentiality is defined as the preservation of client privacy. When older individuals are at risk of harming themselves or being harmed by others, as in the case of elder abuse or cognitive impairment, the issue of confidentiality becomes a challenge. Surveillance devices offer the benefit of monitoring the whereabouts of an older adult with dementia at the cost of reduced privacy. The decision of whether or not to use these devices should consider the extent of the older person's cognitive deficits and his/her ability to make decisions [218]. In the case of elder abuse, the ethical intervention is dependent upon state and national laws. Therefore, practitioners should be well-versed in their state's laws regarding elder abuse, advance directives, and other relevant issues. In addition, practitioners should clearly present the limitations of confidentiality to the client.

## CONCLUSION

Age-sensitive practice is crucial and will continue to grow more important as the nation's demographic shifts and life expectancy increases. The older segment of the population is extremely diverse in terms of the span of developmental, social, and psychologic needs. Resilience and potentiality rather than decline and deficits should be emphasized throughout all assessments and interventions. Practitioners should explore their beliefs and values to determine if any normative ageist assumptions about the elderly are present. Instead of viewing the elderly as a group with many problems, diseases, and pathologies, a strength perspective that emphasizes their rich and diverse life experiences should be infused into clinical practice. In order to facilitate the best care for older adults, the promotion of knowledge and skills in these areas is vital.

## FACULTY BIOGRAPHY

**Alice Yick Flanagan, PhD, MSW**, received her Master's in Social Work from Columbia University, School of Social Work. She has clinical experience in mental health in correctional settings, psychiatric hospitals, and community health centers. In 1997, she received her PhD from UCLA, School of Public Policy and Social Research. Dr. Yick Flanagan completed a year-long post-doctoral fellowship at Hunter College, School of Social Work in 1999. In that year she taught the course Research Methods and Violence Against Women to Masters degree students, as well as conducting qualitative research studies on death and dying in Chinese American families.

Previously acting as a faculty member at Capella University and Northcentral University, Dr. Yick Flanagan is currently a contributing faculty member at Walden University, School of Social Work, and a dissertation chair at Grand Canyon University, College of Doctoral Studies, working with Industrial Organizational Psychology doctoral students. She also serves as a consultant/subject matter expert for the New York City Board of Education and publishing companies for online curriculum development, developing practice MCAT questions in the area of psychology and sociology. Her research focus is on the area of culture and mental health in ethnic minority communities.

### *Works Cited*


1. Bernard M. Backs to the future? Reflections of women, ageing, and nursing. *J Adv Nurs*. 1998;27(3):633-640.
2. World Health Organization. Definition of an Older or Elderly Person: Proposed Working Definition of an Older Person in Africa for the MDS Project. Available at https://www.who.int/healthinfo/survey/ageingdefnolder/en. Last accessed April 5, 2020.
3. Hutchison ED. *Dimensions of Human Development: The Changing Life Course*. 4th ed. Thousand Oaks, CA: Sage Publications, Inc.; 2010.
4. Chen H, Wang Y. Age stereotypes of older primary teachers in Taiwan. *Educ Gerontol*. 2012;38(5):362-371.
5. He W, Sengupta M, Velkoff VA, DeBarros KA. *65+ in the United States: 2010*. Washington, DC: U.S. Census Bureau; 2014.
6. McGuire J. Ethical considerations when working with older adults in psychology. *Ethics Behav*. 2009;19(2):112-128.
7. Ennis J. The physiology of ageing. *Practice Nurse*. 2013;43(3):38-42.
8. U.S. Census Bureau. Facts for Features: National Grandparents Day 2019. Available at https://www.census.gov/newsroom/stories/2019/grandparents-day.html. Last accessed May 5, 2020.
9. Denmark FL. Myths of aging. *Eye on Psi Chi*. 2002;7(1):14-21.
10. Crews JE. The role of public health in addressing aging and sensory loss. *Generations*. 2003;27(10):83-90.
11. Oliver D. Older people who fall: why they matter and what you can do. *Br J Community Nurs*. 2007;12(11):500-507.
12. Delaune MF, Ciolek C. Falls in community dwelling older adults: examination and evaluation. *Magazine of Physical Therapy*. 2007;15(11):34-41.
13. Wong J, Wong S. Evidence-based care for the elderly with isolated systolic hypertension. *Nurs Health Sci*. 2005;7(1):67-75.
14. Klymko KW. Assessment: cognitive assessment in elderly African American adults with hypertension. *J Gerontol Nurs*. 2005;31(11):15-20.
15. Ashford JB, LeCroy CW. *Human Behavior in the Social Environment: A Multidimensional Perspective*. 5th ed. Belmont, CA: Brooks Cole; 2012.
16. Pandey A, Littlewood K, Cooper L, et al. A sleep profile of grandparents raising grandchildren from kin tech: a randomized controlled trial. *Sleep*. 2016;39:A191.
17. Inelmen EM, Gasparini G, Enzi G. HIV/AIDS in older adults: a case report and literature review. *Geriatrics*. 2005;60(9):26-30.
18. Gavazzi G, Herrmann F, Krause KH. Aging and infectious diseases in the developing world. *Clin Infect Dis*. 2004;39(1):83-91.
19. Spearman MS, Bolden JA. Identification of factors that reduce rates of detection of HIV/AIDS among women 50 years and older. *J Afr Am Stud*. 2005;9(2):51-59.
20. AIDS InfoNet. Fact Sheet Number 616: Older People and HIV. Available at http://www.aidsinfonet.org/uploaded/factsheets/128_eng_616.pdf. Last accessed April 1, 2020.
21. Haile B. The forgotten tenth: AIDS in the older generation. *Res Initiat Treat Action*. 1998;4(3):15-16.
22. National Institute on Aging. AgePage: HIV, AIDS and Older People. Available at https://www.nia.nih.gov/health/hiv-aids-and-older-people. Last accessed April 1, 2020.
23. Cumming E, Henry W. *Growing Old: The Process of Disengagement*. New York, NY: Basic Books; 1961.
24. Havighurst RJ. Flexibility and social roles of the aged. *AJS*.1954;59(4):309-313.
25. Erikson EH. *Identity: Youth and Crisis*. New York, NY: WW Norton & Co.; 1968.
26. Crandell T, Crandell C, Vander Zanden JW (eds). *Human Development*. 10th ed. New York, NY: McGraw-Hill Higher Education; 2011.
27. Zastrow C, Kirst-Ashman KK. *Understanding Human Behavior and the Social Environment*. 10th ed. Belmont, CA: Cengage Learning; 2015.
28. Peck R. Psychological developments in the second half of life. In: Neugarten BL (ed). *Middle Age and Aging*. Chicago, IL: University of Chicago Press; 1968: 88-92.
29. Comer RJ. *Abnormal Psychology*. 9th ed. New York, NY: Worth Publishers; 2015.
30. Wrosch C, Schulz R, Heckhausen J. Health stresses and depressive symptomology in the elderly: a control-process approach. *Curr Dir Psychol Sci*. 2004;13(1):17-20.
31. U.S. Census Bureau. U.S. Census Bureau Releases National Population Projections Reports on Life Expectancy and Alternative Migration Scenarios. Available at https://www.census.gov/newsroom/press-releases/2020/population-projections.html. Last accessed March 27, 2020.
32. U.S. Department of Health and Human Services. The Surgeon General's Call to Action to Prevent Suicide. At A Glance: Suicide Among the Elderly. Available at https://www.sprc.org/resources-programs/surgeon-generals-call-action-prevent-suicide. Last accessed April 1, 2020.
33. Okoye UO, Obikeze DS. Stereotypes and perceptions of the elderly by the youth in Nigeria: implications for social policy. *J Appl Gerontol*. 2005;24(5):439-452.

34. Van Etten D, Gautam R. Custodial grandparents raising grandchildren: lack of legal relationship is a barrier for services. *J Gerontol Nurs*. 2012;38(6):18-22.
35. Banendt J, Duberstein PR, Prigerson HG. Bereavement care. In: Berger AM, Shuster JL Jr., Von Roenn JH (eds). *Principles & Practice of Palliative Care & Supportive Oncology*. 4th ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2013: 719-729.
36. National Consensus Project for Quality Palliative Care Consortium Organizations. Clinical Practice Guidelines for Quality Palliative Care. Available at https://www.nationalcoalitionhpc.org/wp-content/uploads/2018/10/NCHPC-NCPGuidelines_4thED_web_FINAL.pdf. Last accessed April 1, 2020.
37. Librach SL, Abrahams P. Grief and bereavement: a practical approach. In: *Ian Anderson Continuing Education Program in End-of-Life Care*. Toronto: University of Toronto; 2000.
38. Worden JW. *Grief Counseling and Grief Therapy*. 4th ed. New York, NY: Springer; 2008.
39. Abrahm JL. *A Physician's Guide to Pain and Symptom Management in Cancer Patients*. 3rd ed. Baltimore, MD: Johns Hopkins University Press; 2014.
40. Deblinger L. Alcohol problems in the elderly. *Patient Care*. 2000;3(10):68.
41. U.S. Census Bureau. Living Longer: Historical and Projected Life Expectancy in the United States, 1960 to 2060. Available at https://www.census.gov/content/dam/Census/library/publications/2020/demo/p25-1145.pdf. Last accessed March 27, 2020.
42. U.S. Census Bureau. State Population by Characteristics. Available at https://www.census.gov/data/tables/time-series/demo/popest/2010s-state-detail.html. Last accessed March 27, 2020.
43. Pew Research Center. A Record 64 Million Americans Live in Multigenerational Households. Available at https://www.pewresearch.org/fact-tank/2018/04/05/a-record-64-million-americans-live-in-multigenerational-households/. Last accessed March 27, 2020.
44. U.S. Census Bureau. The Population 65 Years and Older in the United States: 2016. Available at https://www.census.gov/content/dam/Census/library/publications/2018/acs/ACS-38.pdf. Last accessed March 30, 2020.
45. Rigler SK. Alcoholism in the elderly. *Am Fam Physician*. 2000;61:1710-1716.
46. Menninger JA. Assessment and treatment of alcoholism and substance-related disorders in the elderly. *Bull Menninger Clin*. 2002:66(2):166-183.
47. National Center on Elder Abuse. Frequently Asked Questions. Available at https://ncea.acl.gov/FAQ.aspx. Last accessed April 2, 2020.
48. National Center on Elder Abuse. Statistics and Data. Available at https://ncea.acl.gov/What-We-Do/Research/Statistics-and-Data.aspx. Last accessed April 2, 2020.
49. Plews L. Older Americans in the Workforce. Available at https://unitedincome.capitalone.com/library/older-americans-in-the-workforce. Last accessed March 30, 2020.
50. Ouchida KM, Lachs MS. Not for doctors only: ageism in healthcare. *Generations*. 2015;39(3):46-57.
51. Neely-Barnes SL, Graft JC, Washington G. The health-related quality of life of custodial grandparents. *Health Soc Work*. 2010;35(2):87-97.
52. Nelson TD. The age of ageism. *J Soc Issues*. 2016;72(1):191-198.
53. Ramírez LF, Palacios-Espinosa X. Stereotypes about old age, social support, aging anxiety and evaluations of one's own health. *J Soc Issues*. 2016;72(1):47-68.
54. Hayslip B Jr, Kaminski PL. Grandparents raising their grandchildren: a review of the literature and suggestions for practice. *Gerontologist*. 2005;45:262-269.
55. Sands RG, Goldberg-Glen RS. Factors associated with stress among grandparents raising their grandchildren. *Fam Relat*. 2000;49(1):97-105.
56. Ross MET. Stress and coping in African-American grandparents who are raising their grandchildren. *Nurs Health Sci*. 2004;6(2):163-164.
57. Ellis R, Simmons T. Coresident Grandparents and Their Grandchildren: 2012. Available at https://www.census.gov/content/dam/Census/library/publications/2014/demo/p20-576.pdf. Last accessed April 2, 2020.
58. Willenbring M, Spring WD Jr. Evaluating alcohol use in elders. *Aging*. 1990;361:22-27.
59. Radloff LS. The CES-D Scale: a self report depression scale for research in the general population. *Appl Psychol Meas*. 1977;1(3):385-401.
60. Beck AT, Ward CH, Mendelson M, Mock J, Erbaugh J. An inventory for measuring depression. *Arch Gen Psychiatry*. 1961;4:561-571.
61. Stovall J, Domino FJ. Approaching the suicidal patient. *Am Fam Physician*. 2003;68(9):1814-1818.
62. Shea SC. *The Practical Art of Suicide Assessment: A Guide for Mental Health Professionals and Substance Abuse Counselors*. New York, NY: John Wiley and Sons; 2011.

63. Piazza NJ, Martin N, Dildine RJ. Screening instruments for alcohol and other drug problems. *J Ment Health Couns*. 2000;22(3):218-227.
64. Mayfield D, McLeod G, Hall, P. The CAGE questionnaire: validation of a new alcoholism instrument. *Am J Psychiatry*. 1974;131(10):1121-1123.
65. Reis M. The IOA screen: an abuse-alert measure that dispels myths. *Generations*. 2000;24(2):13-16.
66. Greene RR, Cohen HL. Social work with older adults and their families: changing practice paradigms. *Fam Soc*. 2005;86(3):367-374.
67. Griffith J, Caron CD, Desrosiers J, Thibeault R. Defining spirituality and giving meaning to occupation: the perspective of community-dwelling older adults with autonomy loss. *Can J Occup Ther*. 2007;74(2):78-90.
68. Penick JM. Purposeful aging: teleological perspectives on the development of social interest in late adulthood. *J Individ Psychol*. 2004;60(3):219-233.
69. Greenfield EA, Marks NF. Formal volunteering as a protective factor for older adults' psychological well-being. *J Gerontol B Psychol Sci Soc Sci*. 2004;59(5):S258-S264.
70. Cattan M, White M. Developing evidence-based health promotion for older people: a systematic review and survey of health promotion interventions targeting social isolation and loneliness among older people. *Internet Journal of Health Promotion*. 1998;13.
71. Findlay RA. Interventions to reduce social isolation amongst older people: where is the evidence? *Ageing Soc*. 2003;23:647-658.
72. Jacelon CS. Older adults and autonomy in acute care: increasing patients' independence and control during hospitalization. *J Gerontol Nurs*. 2004;30(11):29-36.
73. Cox EO, Parsons RR. Empowerment-oriented social work practice: impact on late life relationships of women. *J Women Aging*. 1996;8(3-4):129-143.
74. Silverstone B. Social work with the older people of tomorrow: restoring the person-in-situation. *Fam Soc*. 2005;86(3):309-319.
75. Golden RL, Sonneborn GS. Ethics in clinical practice with older adults: recognizing biases and respecting boundaries. *Generations*. 1998;22(3):82-87.
76. Coverdale J, McCullough LB, Molinari V, Workman R. Ethically justified clinical strategies for promoting geriatric assent. *Int J Geriatr Psychiatry*. 2006;21(2):151-157.
77. Hyland D. An exploration of the relationship between patient autonomy and patient advocacy: implications for nursing practice. *Nurs Ethics*. 2002;9(5):472-482.
78. Jordan LC. Elder abuse and domestic violence: overlapping issues and legal remedies. *Am J Fam Law*. 2001;15(2):147-156.
79. Feinsod FM, Wagner C. Ten ethical principles in geriatrics and long-term care. *Annals of Long-term Care*. 2008;16(4):38.
80. Weissert WG, Cready CM, Pawelak JE. The past and future of home- and community-based long-term care. *Milbank Q*. 2005;83(4).,
81. Family Caregiver Alliance. Caregiver Statistics: Demographics. Available at https://www.caregiver.org/caregiver-statistics-demographics. Last accessed April 5, 2020.
82. Department of Veterans Affairs. Resident Assessment Instrument/Minimum Data Set (RAI/MDS). Available at https://catalog.data.gov/dataset/resident-assessment-instrument-minimum-data-set-rai-mds. Last accessed April 5, 2020.
83. Kurlowicz L, Wallace M. The Mini Mental State Examination. *Try This: Best Practices in Nursing Care to Older Adults*. 1999;3:1-2.
84. Institute for Clinical Systems Improvement. Depression, Adult in Primary Care. Available at https://www.icsi.org/guideline/depression/. Last accessed April 1, 2020.
85. Agency for Healthcare Research and Quality. Geriatric Depression Scale. Available at https://integrationacademy.ahrq.gov/sites/default/files/Update%20Geriatric%20Depression%20Scale-30_0.pdf. Last accessed April 5, 2020.
86. Viña J, Borrás C, Miquel J. Theories of ageing. *IUBMB Life*. 2007;59(4/5):249-254.
87. Social Security Online. Retirement Planner: Benefits by Year of Birth. Available at https://www.ssa.gov/planners/retire/agereduction.html. Last accessed March 26, 2020.
88. Mohanty RK. Theorizing social gerontology amidst multidisciplinary concerns: an overview of contesting connotations and counter claims. *Indian Journal of Gerontology*. 2013;27(2):354-381.
89. Nimrod G, Ben-Shem I. Successful aging as a lifelong process. *Educ Gerontol*. 2015;41(11):814-824.
90. Stepler R. World's Centenarian Population Projected to Grow Eightfold by 2050. Available at http://www.pewresearch.org/fact-tank/2016/04/21/worlds-centenarian-population-projected-to-grow-eightfold-by-2050. Last accessed March 26, 2020.
91. Population Reference Bureau. Which U.S. States have the Oldest Populations? Available at https://www.prb.org/which-us-states-are-the-oldest/. Last accessed March 26, 2020.
92. Administration on Aging. 2018 Profile of Older Americans. Available at https://acl.gov/sites/default/files/Aging%20and%20Disability%20in%20America/2018OlderAmericansProfile.pdf. Last accessed March 27, 2020.

93. Pew Research Center. The Return of the Multi-Generational Family Household. Available at https://pewsocialtrends.org/2010/03/18/the-return-of-the-multi-generational-family-household. Last accessed March 27, 2020.
94. U.S. Census Bureau. Census Bureau Releases Comprehensive Analysis of Fast-Growing 90-and-Older Population. Available at https://www.census.gov/newsroom/releases/archives/aging_population/cb11-194.html. Last accessed March 26, 2020.
95. Ljubuncic P, Reznick AZ. The evolutionary theories of aging revisited: a mini-review. *Gerontol*. 2009;55(2):205-216.
96. Fok M, Stewart R, Besset A, Ritchie K, Prince M. Incidence and persistence of sleep complaints in a community older population. *Int J Geriatr Psychiatry*. 2010;25(1):37-45.
97. Centers for Disease Control and Prevention. HIV/AIDS among Persons Aged 50 and Older. Available at https://www.cdc.gov/hiv/group/age/olderamericans/index.html. Last accessed April 1, 2020.
98. Grossman S, Lange J. Theories of aging as basis for assessment. *Medsurg Nurs*. 2006;15(2):77-83.
99. United Health Foundation. Senior Report: Suicide. Available at https://www.americashealthrankings.org/explore/senior/measure/Suicide_sr_a/state/ALL. Last accessed April 1, 2020.
100. Chen JH, Gill TM, Prigerson HG. Health behaviors associated with better quality of life for older bereaved persons. *J Palliat Med*. 2005;8(1):96-106.
101. Brown University. Substance abuse and the aging brain: screening, diagnoses, and treatment. *Brown University Geriatric Psychopharmacology Update*. 2008;12(4):1-6.
102. Boyle AR, Davis H. Early screening and assessment of alcohol and substance abuse in the elderly: clinical implications. *J Addict Nurs*. 2006;17(2):95-103.
103. Toossi M, Torpey E. Older Workers: Labor Force Trends and Career Options. Available at https://www.bls.gov/careeroutlook/2017/article/older-workers.htm. Last accessed March 30, 2020.
104. Langer N. Integrating compliance, communication, and culture: delivering health care to an aging population. *Educ Gerontol*. 2008;34(5):385-396.
105. National Council on Aging. The United States of Aging Survey: National Findings. Available at https://www.ncoa.org/wp-content/uploads/8-3-12-US-of-Aging-Survey-Fact-Sheet-National-FINAL.pdf. Last accessed April 1, 2020.
106. Onolemhemhen DN. Meeting the challenges of urban aging: narratives of poor elderly women of Detroit, Michigan. *J Gerontol Soc Work*. 2009;52(7):729-743.
107. Hughes M. Lesbian and gay people's concerns about ageing and accessing services. *Aust Soc Work*. 2009;62(2):186-201.
108. Burlew LD, Serface HC. The tricultural experience of older, African American, gay men: counseling implications. *Adultspan: Theory, Research and Practice*. 2006;5(2):81-90.
109. Shippy RA, Cantor MH, Brennan MJ. Social networks of aging gay men. *J Mens Stud*. 2004;13(1):107-120.
110. Chopik WJ, Bremner RH, Johnson DJ, Giasson HL. Age differences in age perceptions and developmental transitions. Front Psych. 2018;9(67):1-10.
111. Altshuler N, Schimmel J. Aging in Place: Do Older Americans Act Title III Services Reach Those Most Likely to Enter Nursing Homes? Available at https://agid.acl.gov/resources/datasources/DataFiles/AoA_1_NursingHomes_041311.pdf. Last accessed April 5, 2020.
112. U.S. Administration on Aging. Long-Term Care Ombudsman. Available at https://www.aging.ca.gov/Programs_and_Services/Long-Term_Care_Ombudsman. Last accessed April 5, 2020.
113. Fujisawa D, Tanaka E, Sakamoto S, et al. The development of a brief screening instrument for depression and suicidal ideation for elderly: the Depression and Suicide Screen. *Psychiatry Clin Neurosci*. 2005;59(6):634-638.
114. Yaffe MJ, Wolfson C, Lithwick M, Weiss D. Development and validation of a tool to improve physician identification of elder abuse: the Elder Abuse Suspicion Index (EASI). *J Elder Abuse Negl*. 2008;20(3):276-300.
115. Koenig T, Spano R. Professional hope in working with older adults. *J Sociol Soc Welf*. 2006;33(2):25-44.
116. King C. A reality check on virtual communications in aged care: pragmatics or power. *Ageing Int*. 2006;31(4):253-262.
117. Tuckett AG. On paternalism, autonomy, and best interests: telling the (competent) aged-care resident what they want to know. *Int J Nurs Pract*. 2006;12(3):166-173.
118. O'Connor D, Hall IM, Donnelly M. Assessing capacity within a context of abuse or neglect. *J Elder Abuse Negl*. 2009;21(2):156-169.
119. Moye J, Armesto J, Karel M. Evaluating capacity of older adults in rehabilitation settings: conceptual models and clinical challenges. *Rehabil Psychol*. 2005;50(3):207-214.
120. Grant BF, Chou SP, Saha TD, et al. Prevalence of 12-month alcohol use, high-risk drinking, and DSM-IV alcohol use disorder in the United States, 2001-2002 to 2012-2013: results from the National Epidemiologic Survey on Alcohol and Related Conditions. JAMA Psychiatry. 2017;74(9):911-923.
121. Elmore S. Apoptosis: a review of programmed cell death. *Toxicol Pathol*. 2007;35(4):495-516.
122. Epstein R. Brutal truths: about the aging brain. *Discover*. 2012;33(8):48-76.

123. Doherty-King B, Yoon JY, Pecanac K, et al. Frequency and duration of nursing care related to older patient mobility. *J Nurs Scholarsh*. 2014;46(1):20-27.
124. Cleveland RJ, Luong MN, Knight JB, et al. Independent associations of socioeconomic factors with disability and pain in adults with knee osteoarthritis. *BMC Musculoskelet Disord*. 2013;14(1):1-20.
125. Haimov I, Shatil E. Cognitive training improves sleep quality and cognitive function among older adults with insomnia. *PLoS ONE*. 2013;8(4):1-17.
126. Cahill S, Valadéz R. Growing older with HIV/AIDS: new public health changes. *Am J Pub Health*. 2013;103(3):e7-e15.
127. Lusti-Narasimhan M, Beard JR. Sexual health in older women. *Bull World Health Org*. 2013;91(9):707-709.
128. Darque A, Enel P, Petit N, et al. Drug interactions with elderly individuals with the human immunodeficiency virus. *J Am Geriatr Soc*. 2012;60(2):382-384.
129. Tornstam L. Maturing into gerotranscendence. *Journal of Transpersonal Psychology*. 2011;43(2):166-180.
130. Melin-Johansson C, Eriksson U, Segerbäck I, Boström S. Reflections of older people living in nursing homes. *Nurs Older People*. 2014;26(1):33-39.
131. Rasquinha DM. Depression among institutionalized and non-institutionalised elderly widows and married women. *Indian Journal of Gerontology*. 2013;27(3):468-475.
132. Huh JT, Weaver CM, Martin JL, et al. Effects of a late-life suicide risk-assessment training on multidisciplinary healthcare providers. *J Am Geriatr Soc*. 2012;60(4):775-780.
133. Gibson J. How cognitive behavior therapy can alleviate older people's grief. *Ment Health Pract*. 2012;15(6):12-17.
134. Ghesquiere A. "I was just trying to stick it out until I realized that I couldn't:" a phenomenological investigation of support seeking among older adults with complicated grief. *Omega*. 2013;68(1):1-22.
135. Bogunovic O. Substance abuse in aging and elderly adults. *Psychiatr Times*. 2012;29(8):39-40.
136. Substance Abuse and Mental Health Services Administration. Substance Abuse Among Older Adults: Treatment Improvement Protocol (TIP) Series 26. Available at https://www.ncbi.nlm.nih.gov/books/NBK64419/pdf/Bookshelf_NBK64419.pdf. Last accessed April 1, 2020.
137. Thomas C. First national study of elder abuse and neglect: contrast with results from other studies. *J Elder Abuse Negl*. 2002;12(1):1-14.
138. Laumann EO, Leitsch SA, Waite LJ. Elder mistreatment in the United States: prevalence estimates from a nationally representative study. *J Gerontol B Psychol Sci Soc Sci*. 2008;63(4):S248-S254.
139. Zhang Z, Schiamberg L, Oehmke J, et al. Neglect of older adults in Michigan nursing homes. *J Elder Abuse Negl*. 2011;23:58074.
140. Jin K. Modern biological theories of aging. *Aging Dis*. 2010;1(2):72-74.
141. Bunch SG, Eastman BJ, Moore RR. A profile of grandparents raising grandchildren as a result of parental military deployment. *J Hum Behav Soc Environ*. 2007;15(4):1-12.
142. Dolbin-MacNab ML. Just like raising your own? Grandmothers' perceptions of parenting a second time around. *Fam Relat*. 2006;55(5):64-575.
143. Lipsky MS, King M. Biological theories of aging. *Dis Mon*. 2015;61(11):460-464.
144. U.S. Census Bureau. The Opioid Prescribing Rate and Grandparents Raising Grandchildren: State and County Level Analysis. Available at https://www.census.gov/library/working-papers/2019/demo/SEHSD-WP2019-04.html. Last accessed April 2, 2020.
145. Lee Y, Jang K. Mental health of grandparents raising grandchildren: understanding predictors of grandparents' depression. *Innov Aging*. 2019;3(1): S282.
146. Dhargave P, Sendhilkumar R. Prevalence of risk factors for falls among elderly people living in long-term care homes. *J Clin Gerontology Geriatrics*. 2016;7(3):99-103.
147. Hiedemann B, Brodoff L. Increased risks of needing long-term care among older adults living with same-sex partners. *Am J Pub Health*. 2013;103(8):e27-e33.
148. Fredriksen-Goldsen KI, Kim H, Barkan SE, et al. Health disparities among lesbian, gay, and bisexual older adults: results from a population-based study. *Am J Pub Health*. 2013;103(10):1802-1809.
149. U.S. Department for Health and Human Services. Long-Term Care Providers and Service Users in the United States: 2015-2016. Available at https://www.cdc.gov/nchs/data/series/sr_03/sr03_43-508.pdf. Last accessed April 5, 2020.
150. Borson S, Scanlan J, Brush M, et al. The Mini-Cog: a cognitive "vital signs" measure for dementia screening in multi-lingual elderly. *Int J Geriatr Psychiatry*. 2000;15(11):1021-1027.
151. McCarten JR, Anderson P, Kuskowski MA, et al. Screening for cognitive impairments in an elderly veteran population: acceptability and results using different versions of the Mini-Cog. *J Am Geriatr Soc*. 2011;59(2):309-313.
152. Hardy S. Prevention and management of depression in primary care. *Nurs Stand*. 2013;27(26):51-56.
153. Imbody B, Vandsburger E. Elder abuse and neglect: assessment tools, interventions, and recommendations for effective service provision. *Educ Gerontol*. 2011;37(7):634-650.

154. Connolly M, Breckman R, Callahan J, et al. The sexual revolution's last frontier: how silence about sex undermines health, well-being and safety in old age. *Generations*. 2012;36(3):43-52.

155. Kozar-Westman M, Troutman-Jordan M, Nies MA. Successful aging among assisted living community older adults. *J Nurs Scholarsh*. 2013;45(3):238-246.

156. Stueber K, Hassiotis A. Reminiscence therapy for older service users. *Learning Disability Practice*. 2012;15(2):12-16.

157. Schoenmakers EC, van Tilburg TG, Fokkema T. Coping with loneliness: what do older adults suggest? *Aging Ment Health*. 2012;16(3):353-360.

158. Brownie S, Horstmanshof L. Creating the conditions for self-fulfillment for aged care residents. *Nurs Ethics*. 2012;19(6):777-786.

159. Holmberg M, Valmari G, Lundgren SM. Patients' experiences of homecare nursing: balancing the duality between obtaining care and to maintain dignity and self-determination. *Scand J Caring Sci*.2012;26(4):705-712.

160. Hewitt-Taylor J, Bond C, Hear S, Barker S. The experiences of older people who live with a long-term condition. *Nurs Older People*.2013;25(6):21-25.

161. Dörenberg V, Frederiks B. The legal position of vulnerable people in the future: improving or going backwards? *Eur J Health Law*. 2012;19(5):485-502.

162. Suhonen R, Stolt M, Leino-Kilpi H. Older people in long-term care settings as research informants: ethical challenges. *Nurs Ethics*. 2013;20(5):551-567.

163. Materson BJ, Garcia-Estrada M, Preston RA. Hypertension in the frail elderly. *J Am Soc Hypertens*. 2016;10(6):536-541.

164. Lee JE, Kahana B, Kahana E. Social support and cognitive functioning as resources for elderly persons with chronic arthritis pain. *Aging Ment Health*. 2016;20(4):370-379.

165. Bonardi JMT, Lima LG, Campos GO, et al. Effect of different types of exercise on sleep quality of elderly subjects. *Sleep Med*. 2016;25:122-129.

166. The Center for Innovative Public Health Research. The Center for Epidemiologic Studies Depression Scale Revised. Available at https://cesd-r.com/cesdr/. Last accessed April 5, 2020.

167. Moremen RD. The Forgotten Generation: Public Health, HIV/AIDS, and the Elderly. Paper presented at: Paper submitted for Annual Meeting of the American Sociological Association; Chicago, IL; August 2015.

168. Alencar RA, Ciosak SI. AIDS in the elderly: reasons that lead to late diagnosis. *Brazilian Journal of Nursing*. 2016;69(6):1076-1081.

169. Nilsson H, Bülow PH, Kazemi A. Mindful sustainable aging: advancing a comprehensive approach to the challenges and opportunities of old age. *Eur J Psychol*. 2015;11(3):494-508.

170. Buchanan JA, Lai D, Ebel D. Differences in perception of gerotranscendence behaviors between college students and community-dwelling older adults. *J Aging Stud*. 2015;34:1-9.

171. Wernher I, Lipsky MS. Psychological theories of aging. *Dis Mon*. 2015;61(11):480-488.

172. Salvator T. Suicide Risk in Older Adults: A Growing Challenge for Law Enforcement. Available at https://leb.fbi.gov/articles/featured-articles/suicide-risk-in-older-adults-a-growing-challenge-for-law-enforcement. Last accessed April 1, 2020.

173. Centers for Disease Control and Prevention. National Vital Statistics Report. Deaths: Final Data for 2017. Available at https://www.cdc.gov/nchs/data/nvsr/nvsr68/nvsr68_09-508.pdf . Last accessed April 1, 2020.

174. van den Berg GJ, Lindeboom M, Portrait F. Conjugal bereavement effects on health and mortality at advanced ages. *J Health Econ*. 2011;30:774-794.

175. Mercan MA, Barlin H, Cebeci AF. Late-life bereavement: association between familial death and weight loss among elderly in the United States. *Omega*. 2016;74(1):3-15.

176. Kettaneh AA. Substance abuse among the elderly population: overview and management. *Journal of Applied Rehabilitation Counseling*. 2015;46(4):11-17.

177. National Institute on Drug Abuse. Misuse of Prescription Drugs. Available at https://www.drugabuse.gov/publications/research-reports/misuse-prescription-drugs/what-scope-prescription-drug-misuse. Last accessed April 1, 2020.

178. White House. The 2015 White House Conference on Aging Final Report. Available at https://whitehouseconferenceonaging.gov/2015-WHCOA-Final-Report.pdf. Last accessed April 2, 2020.

179. Roberto KA. The complexities of elder abuse. *American Psychologist*. 2016;71(4):302-311.

180. Dunifon R. The influence of grandparents on the lives of children and adolescents. *Child Dev Perspect*.2013;7(1):55-60.

181. Berry B, Apesoa-Varano EC, Gomez Y. How family members manage risk around functional decline: the autonomy management process in households facing dementia. *Soc Sci Med*. 2015;130:107-114.

182. University of Miami. Geriatrics: Decision-Making, Autonomy, Valid Consent, and Guardianship. Available at https://bioethics.miami.edu/education/ethics-curricula/geriatrics-and-ethics/decision-making-autonomy-valid-consent-and-guardianship/index.html. Last accessed April 5, 2020.

183. Choi SK, Meyer IH. LGBT Aging: A Review of Research Findings, Needs, and Policy Implications. Available at https://www.lgbtagingcenter.org/resources/resource.cfm?r=825. Last accessed April 2, 2020.

184. American Psychological Association. Lesbian, Gay, Bisexual and Transgender Aging. Available at https://www.apa.org/pi/lgbt/resources/aging. Last accessed April 2, 2020.
185. Wu L, Koo M. Randomized controlled trial of a six-week spiritual reminiscence intervention on hope, life satisfaction, and spiritual wellbeing in elderly with mild and moderate dementia. *Int J Geriatr Psychiatry*. 2016;31(2):120-127.
186. Henkel LA, Kris A, Birney S, Krauss K. The functions and value of reminiscence for older adults in long-term residential care facilities. *Memory*. 2017;25(3):425-435.
187. Chen YR, Schulz PJ. The effect of information communication technology interventions on reducing social isolation in the elderly: a systematic review. *J Med Internet Res*. 2016;18(1):1-11.
188. Iversen TN, Larsen L, Solem PE. A conceptual analysis of ageism. *Nordic Psychology*. 2009;61:4-22.
189. Ko P, Yeung WJ. Contextualizing productive aging in Asia: definitions, determinants, and health implications. *Soc Sci Med*. 2019;229:1-5.
190. World Health Organization. What is Healthy Aging? Available at https://www.who.int/ageing/healthy-ageing/en/. Last accessed May 5, 2020.
191. Bruine de Bruin W, Parker AM, Strough J. Age differences in reported social networks and well-being. *Psychology Aging*. 2020;35(2):159-168.
192. Auais M, Ahmed T, Alvarado B, et al. Gender differences in four-year incidence of self-reported and performance-based functional disability: the International Mobility in Aging Study. *Arch Gerontol Geriatr*. 2019;82:266-272.
193. Centers for Medicare and Medicaid Services. Multiple Chronic Conditions. Available at https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Chronic-Conditions/MCC%5fMain.html. Last accessed May 5, 2020.
194. Rani S, Singh K, Kumari A. Study of sleep disorder in elderly: a review. *Indian Journal of Health and Wellbeing*. 2019;10(4-6):95-97.
195. Hosaka KRJ, Greene M, Premeaux TA, et al. Geriatric syndromes in older adults living with HIV and cognitive impairment. *J Am Geriatr Soc*. 2019;67(9):1913-1916.
196. Asiamah N. Social engagement and physical activity: commentary on why the activity and disengagement theories of ageing may both be valid. *Cogent Medicine*. 2017;4(1).
197. George W, Dixon A. Understanding the presence of gerotranscendence among older adults. *Adultspan Journal*. 2018;17(1):27-40.
198. Newton NJ, Stewart AJ, Vandewater EA. Age is opportunity: women's personality trajectories from mid- to later-life. *J Res Pers*. 2019;80:43-54.
199. Zhou B, Liu X, Yu P. Toward successful aging: the Chinese health criteria for the elderly. *Aging Med*. 2018;1(2):154-157.
200. Upenieks L, Settels J, Schafer MH. For everything a season? A month-by-month analysis of social network resources in later life. *Soc Sci Res*. 2018;69:111-125.
201. World Health Organization. Mental Health of Older Adults. Available at https://www.who.int/news-room/fact-sheets/detail/mental-health-of-older-adults. Last accessed May 5, 2020.
202. Cho JH, Olmstead R, Choi H, Carrillo C, Seeman TE, Irwin MR. Associations of objective versus subjective social isolation with sleep disturbance, depression, and fatigue in community-dwelling older adults. *Aging Ment Health*. 2019;23(9):1130-1138.
203. Balsamo M, Cataldi F, Carlucci L, Padulo C, Fairfield B. Assessment of late-life depression via self-report measures: a review. *Clin Interv Aging*. 2018;13:2021-2044.
204. Maciejewski PK, Maercker A, Boelen PA, Prigerson HG. Prolonged grief disorder and persistent complex bereavement disorder, but not complicated grief, are one and the same diagnostic entity: an analysis of data from the Yale Bereavement Study. *World Psychiatry*. 2016;15(3):266-275.
205. Mowbray O, Washington T, Purser G, O'Shields J. Problem drinking and depression in older adults with multiple chronic health conditions. *J Am Geriatr Soc*. 2017;65(1):146-152.
206. Jackson SL. *Understanding Elder Abuse: A Clinician's Guide*. Washington, DC: American Psychological Association; 2018.
207. Williams JL, Racette EH, Hernandez-Tejada MA, Acierno R. Prevalence of elder polyvictimization in the United States: data from the National Elder Mistreatment Study. *J Interpers Violence*. 2017; [Epub ahead of print].
208. Anderson L. States with High Opioid Prescribing Rates Have Higher Rates of Grandparents Responsible for Grandchildren. Available at https://www.census.gov/library/stories/2019/04/opioid-crisis-grandparents-raising-grandchildren.html. Last accessed May 5, 2020.
209. Polvere L, Barnes C, Lee E. Housing needs of grandparent caregivers: grandparent, youth, and professional perspectives. *J Gerontol Soc Work*. 2018;61(5):549-566.
210. Taylor MF, Coall DA, Karthigesu S. Who'll care for them in the event of me dying? Custodial grandparents' incapacity, mortality, and succession care-plan fears for their custodial grandchild/ren. *J Intergener Relatsh*. 2019;17(2):178-200.
211. Correro AN Jr, Nielson KA. A review of minority stress as a risk factor for cognitive decline in lesbian, gay, bisexual, and transgender (LGBT) elders. *J Gay Lesbian Ment Health*. 2020;24(1):2-19.
212. Dunkle JS, Bradley CA, Petruzzella FL. Lesbian and gay men's perceptions of their local area agency on aging. *J Gay Lesbian Soc Serv*. 2019;31(4):416-434.

213. Hado E, Komisar H. Long-Term Services and Supports. Available at https://www.aarp.org/content/dam/aarp/ppi/2019/08/long-term-services-and-supports.doi.10.26419-2Fppi.00079.001.pdf. Last accessed May 5, 2020.

214. Hinrichsen GA. Assessment and treatment of cognitive impairment, problem alcohol use, and prescription drug misuse. In: Hinrichsen GA. *Assessment and Treatment of Older Adults: A Guide for Mental Health Professionals*. Washington, DC: American Psychological Association; 2020: 133-164.

215. Heisel MJ, Flett GL. The development and initial validation of the geriatric suicide ideation scale. *Am J Geriatr Psychiatry*. 2006;14(9):742-751.

216. Satorres E, Viguer P, Fortuna FB, Melendez JC. Effectiveness of instrumental reminiscence intervention on improving coping in healthy older adults. *Stress Health*. 2018;34(2):227-234.

217. Nilsen KM, Medvene LJ, Ofei-Dodoo S, et al. Aging in community: home- and community-based services clients' use of computers as a protective factor for social isolation and loneliness. *Educ Gerontol*. 2018;44(10):648-661.

218. Sundgren S, Stolt M, Suhonen R. Ethical issues related to the use of gerontechnology in older people care: a scoping review. *Nursing Ethics*. 2020;27(1):88-103.

219. Petersen N, König HH, Hajek A. The link between falls, social isolation and loneliness: a systematic review. *Arch Gerontol Geriatr*. 2020;88:104020.

## *Evidence-Based Practice Recommendations Citations*

Trangle M, Gursky J, Haight R, et al. *Adult Depression in Primary Care*. Bloomington, MN: Institute for Clinical Systems Improvement; 2016. Available at https://www.icsi.org/wp-content/uploads/2019/01/Depr.pdf. Last accessed May 15, 2020.

U.S. Preventive Services Task Force. Screening for intimate partner violence, elder abuse, and abuse of vulnerable adults: U.S. Preventive Services Task Force final recommendation statement. *JAMA*. 2018;320(16):1678-1687. Available at https://jamanetwork.com/journals/jama/fullarticle/2708121. Last accessed May 15, 2020.

# *Osteoporosis: Diagnosis and Management*

## HOW TO RECEIVE CREDIT

- Read the enclosed course.
- Complete the questions at the end of the course.
- Return your completed Evaluation to NetCE by mail or fax, or complete online at www.NetCE.com. (If you are a physician, Florida nurse, or CST/CSFA, please return the included Answer Sheet/Evaluation.) Your postmark or facsimile date will be used as your completion date.
- Receive your Certificate(s) of Completion by mail, fax, or email.

### *Faculty*

**John J. Whyte, MD, MPH**, is currently the Director of Professional Affairs and Stakeholder Engagement at the FDA's Center for Drug Evaluation and Research. Previously, Dr. Whyte served as the Chief Medical Expert and Vice President, Health and Medical Education at Discovery Channel, part of the media conglomerate Discovery Communications. In this role, Dr. Whyte developed, designed, and delivered educational programming that appeals to both a medical and lay audience. (A complete biography appears at the end of this course.)

**Peter Peraud, MD**, is a graduate of Harvard College with a degree in economics and a graduate of the University of Iowa College of Medicine. As a medical student, Dr. Peraud participated in the American Medical Association Government Relations Internship Program, working at the Centers for Medicare & Medicaid Services. He completed an emergency medicine residency on the medical staff at Advocate Christ Medical Center in suburban Chicago. Currently, he is practicing emergency medicine at Mercy Medical Center in Cedar Rapids, Iowa.

### *Faculty Disclosure*

Contributing faculty, John J. Whyte, MD, MPH, has disclosed no relevant financial relationship with any product manufacturer or service provider mentioned.

Contributing faculty, Peter Peraud, MD, has disclosed no relevant financial relationship with any product manufacturer or service provider mentioned.

### *Division Planners*

John M. Leonard, MD
Jane C. Norman, RN, MSN, CNE, PhD
Shannon E. Smith, MHSC, CST, CSFA

### *Division Planners Disclosure*

The division planners have disclosed no relevant financial relationship with any product manufacturer or service provider mentioned.

### *Audience*

This course is designed for members of the healthcare interdisciplinary team, especially those working with patients who present with suspected osteoporosis.

### *Accreditations & Approvals*

JOINTLY ACCREDITED PROVIDER™
INTERPROFESSIONAL CONTINUING EDUCATION

In support of improving patient care, NetCE is jointly accredited by the Accreditation Council for Continuing Medical Education (ACCME), the Accreditation Council for Pharmacy Education (ACPE), and the American Nurses Credentialing Center (ANCC), to provide continuing education for the healthcare team.

### *Designations of Credit*

NetCE designates this enduring material for a maximum of 5 *AMA PRA Category 1 Credit(s)™*. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Successful completion of this CME activity, which includes participation in the evaluation component, enables the participant to earn up to 5 MOC points in the American Board of Internal Medicine's (ABIM) Maintenance of Certification (MOC) program. Participants will earn MOC points equivalent to the amount of CME credits claimed for the activity. It is the CME activity provider's responsibility to submit participant completion information to ACCME for the purpose of granting ABIM MOC credit. Completion of this course constitutes permission to share the completion data with ACCME.



*A complete Works Cited list begins on page 26.*

***Mention of commercial products does not indicate endorsement.***

Through an agreement between the Accreditation Council for Continuing Medical Education and the Royal College of Physicians and Surgeons of Canada, medical practitioners participating in the Royal College MOC Program may record completion of accredited activities registered under the ACCME's "CME in Support of MOC" program in Section 3 of the Royal College's MOC Program.

NetCE designates this continuing education activity for 5 ANCC contact hours.

IPCE CREDIT™

This activity was planned by and for the healthcare team, and learners will receive 5 Interprofessional Continuing Education (IPCE) credits for learning and change.

NetCE designates this continuing education activity for 6 hours for Alabama nurses.

NetCE designates this continuing education activity for 4 pharmacotherapeutic/pharmacology contact hours.

AACN Synergy CERP Category A.

This continuing education activity is approved for 6.6 CE credits by the Association of Surgical Technologists, Inc., for continuing education for the Certified Surgical Technologist, Certified Surgical First Assistant, and Associate members of AST. This recognition does not imply that AST approves or endorses any product or products that are included in enduring materials.

***Individual State Nursing Approvals***

In addition to states that accept ANCC, NetCE is approved as a provider of continuing education in nursing by: Alabama, Provider #ABNP0353 (valid through 11/21/2021); Arkansas, Provider #50-2405; California, BRN Provider #CEP9784; California, LVN Provider #V10662; California, PT Provider #V10842; District of Columbia, Provider #50-2405; Florida, Provider #50-2405; Georgia, Provider #50-2405; Kentucky, Provider #7-0054 (valid through 12/31/2021); South Carolina, Provider #50-2405; West Virginia, RN and APRN Provider #50-2405.

***Special Approvals***

This activity is designed to comply with the requirements of California Assembly Bill 1195, Cultural and Linguistic Competency.

***About the Sponsor***

The purpose of NetCE is to provide challenging curricula to assist healthcare professionals to raise their levels of expertise while fulfilling their continuing education requirements, thereby improving the quality of healthcare.

Our contributing faculty members have taken care to ensure that the information and recommendations are accurate and compatible with the standards generally accepted at the time of publication. The publisher disclaims any liability, loss or damage incurred as a consequence, directly or indirectly, of the use and application of any of the contents. Participants are cautioned about the potential risk of using limited knowledge when integrating new techniques into practice.

***Disclosure Statement***

It is the policy of NetCE not to accept commercial support. Furthermore, commercial interests are prohibited from distributing or providing access to this activity to learners.

***Course Objective***

To appropriately prevent, diagnose, and treat osteoporosis, physicians and other healthcare providers should understand the epidemiology, physiology, and management. The purpose of this course is to provide members of the interdisciplinary team, including physicians, nurses, and other healthcare professionals, with the information regarding causes and treatment of osteoporosis necessary to effectively provide patient-centered care.

***Learning Objectives***

*Upon completion of this course, you should be able to:*

1. Discuss the clinical background of osteoporosis, noting the various definitions used in the past few years.
2. Discuss the epidemiology of osteoporosis in the United States, based on age, sex, race, and other factors.
3. Identify the primary and secondary causes of osteoporosis.
4. Identify the various risk factors for osteoporosis.
5. Describe the signs and symptoms of osteoporosis.
6. List the various screening recommendations established for osteoporosis.
7. Explain the various treatment modalities for osteoporosis.
8. Describe the current dietary and physical activity recommendations related to osteoporosis.
9. Discuss the pharmacologic treatment of osteoporosis, including indications and adverse reactions and the importance of utilizing interpreters in providing care to non-English-proficient patients.

EVIDENCE-BASED PRACTICE RECOMMENDATION

Sections marked with this symbol include evidence-based practice recommendations. The level of evidence and/or strength of recommendation, as provided by the evidence-based source, are also included so you may determine the validity or relevance of the information. These sections may be used in conjunction with the course material for better application to your daily practice.

## INTRODUCTION

Osteoporosis has increasingly become a major health problem. The National Osteoporosis Foundation (NOF) has estimated that 10.2 million Americans have osteoporosis and 43.4 million have low bone mass, or osteopenia, which places them at risk for osteoporosis [1; 2]. Approximately 4 in 10 women and 1 in 10 men 50 years of age and older will have an osteoporosis-related fracture in their lifetime [3].

Osteoporosis is the most common type of metabolic bone disease. It results either from the body's inability to form new bone or from an increased resorption of formed bone. Essentially, when there is an imbalance between osteoblastic and osteoclastic activity, skeletal problems arise. Risk factors, such as advanced age, family history, race, estrogen deficiency, tobacco use, steroid use, low calcium intake, physical inactivity, and low body weight, contribute to this condition [4].

Several diagnostic techniques have improved the ability to diagnose osteoporosis, most notably dual-energy x-ray absorptiometry (DXA), which is considered the gold standard for diagnosing osteopenia or osteoporosis [5]. Ultrasound, radionuclide absorptiometry, quantitative computed tomography (CT), and magnetic resonance imaging (MRI) also have been used to assess risk of fracture [6]. In the United States, current diagnostic criteria are based solely on quantitative CT hip and DXA spine or hip T-score measurements [7; 8]. Along with these diagnostic techniques, biochemical markers, such as hydroxyproline and collagen cross links, may be used to identify patients at risk [5; 9]. Several screening guidelines have been published indicating the preferred techniques and indications.

Treatment of osteoporosis remains controversial. The focus of management has been on slowing or stopping bone loss or creating new bone. Because of the significant disability, morbidity, mortality, and costs associated with osteoporosis-related fractures, the American College of Physicians recommends that treatment be aimed at fracture prevention [10]. First-line therapy remains diet supplementation and regular weight-bearing and muscle-strengthening exercises, both of which should be started before 30 years of age [11; 12]. Numerous medications, either antiresorptives or bone formation agents (anabolics), exist with different patient indications, adverse events, and contraindications. Additionally, several high-profile studies have impacted the treatment and prevention of osteoporosis. Specifically, the Heart and Estrogen/Progestin Replacement Study (HERS) and the Women's Health Initiative (WHI) have indicated some potential dangers (e.g., increased risk of breast cancer, heart attack, stroke, blood clots in the legs and lungs) associated with estrogen replacement, which until recently had been one of the mainstays of treatment [13; 14].

To effectively prevent, diagnose, and treat this disease, physicians and other healthcare providers should understand the epidemiology, physiology, and management of osteoporosis. The following case study will be referenced throughout the text to illustrate the challenges of treating patients with osteoporosis.

*An Asian woman, Patient D, is 64 years of age with a history of type 2 diabetes, asthma, hypertension, and degenerative joint disease. She presents to a general medicine clinic with persistent lower back pain. The patient reports that for the last few months, she has been experiencing aching pain in the lower lumbar area. It is worse with exertion. The pain is fairly localized, without radiation. She does not experience any tingling, numbness, or weakness. There is no history of trauma. On exam, blood pressure is 135/75 mm Hg, heart rate 72 beats per minute, respirations 18 breaths per minute, temperature 99 degrees Fahrenheit, height*

*59 inches (150 cm), and weight 99 lbs (45 kg). The patient does exhibit some tenderness to palpation in the lower lumbar area. She notes that she tries to remain active, walking about 2 to 3 miles, three or four days a week; she is also a devoted gardener. She is concerned enough about this pain that she believes she needs an x-ray. She also reluctantly remarks that she is not sure if she is exaggerating, but she feels she might be "shrinking." She recently tried on a pair of pants she purchased several years ago, and now they appear to be too long. She wants to know if this is possible. One of her sisters recently told her that she was diagnosed with "brittle bones." She asks you what this means and if she should be concerned.*

## DEFINITIONS

The definition of osteoporosis has evolved over the past few decades. Osteoporosis has been described colloquially as "thin bones" or "brittle bones," and at one time, the diagnosis of osteoporosis relied on the occurrence of a low-trauma fracture. The most widely accepted medical definition was proposed in 1991 and reaffirmed in 1993 at consensus development conferences supported by the National Institute of Arthritis and Musculoskeletal Disease of the National Institutes of Health and the National Osteoporosis Foundation (NOF). At those conferences, osteoporosis was defined as [15; 16]:

A systemic skeletal disease characterized by low bone mass and microarchitectural deterioration of bone tissue, leading to enhanced bone fragility and a consequent increase in fracture risk.

In 1994, a World Health Organization (WHO) working group determined a level of bone mineral density (BMD) that would be clinically applicable and consistent with the new definition [17]. This was due to a desire to seek a more quantitative, rather than qualitative, definition. Additionally, this group published a set of standards to define the patient with osteopenia. Osteopenia had been loosely defined as low bone mass or decreased calcification of bone without the clinically increased risk of fracture. However, there is a wide spectrum of bone quality and strength. Frequently, osteopenia is a precursor of osteoporosis.

### T-SCORE

A T-score is the quantitative measurement of bone mineral density obtained by an examination, such as DXA, of the hip or other acceptable skeletal region. The score is the number of standard deviations from the mean (average) bone density for a young healthy adult. The exact age range used varies among authorities, but it is usually from 20 to 30 years of age.

### Z-SCORE

Similarly, a Z-score is the number of standard deviations from the mean bone density for age-matched, sex-matched, and ethnicity-matched patients. For example, a woman 75 years of age with a Z-score of -1.0 is one standard deviation below the BMD of average women 75 years of age, but her T-score may be -3.0 because she is 3 standard deviations below the BMD of an average woman 30 years of age. Alternatively, an elderly patient's T-score may be low, but average for her age by Z-score. For a young adult woman, the T-score and Z-score should be the same.

For each standard deviation decrease in BMD, there is a doubling of fracture risk [18]. A patient with a T-score of -1.0 is twice as likely to sustain a fracture as someone with a T-score of zero; a patient with a T-score of -2.0 indicates a fourfold increase in risk of fracture, and so on. The WHO working group determined that patients with T-scores of at least -2.5, or 2.5 standard deviations below the young healthy mean, would meet the diagnostic criteria for osteoporosis. Those with T-scores from -1.0 to -2.5 would fall into the range for osteopenia (***Table 1***). Statistically, a cutoff of one standard deviation below the mean would categorize roughly 24% of all women with osteopenia and around 1% with osteoporosis. (Note that these statistics assume a normal distribution of data.)

The WHO criteria are easy to use for study inclusion criteria as well as epidemiologic data; however, individual patient decisions should not be based solely on a T- or Z-score. Just as total cholesterol is not the only risk indicator for coronary events, single quantitative measurements, like a T- or Z-score, must be combined with individual patient

| WHO CRITERIA FOR DIAGNOSIS OF OSTEOPOROSIS BY T-SCORE | |
|---|---|
| **T-Score** | **Diagnosis** |
| Equal to or above -1 | Normal range |
| Between -1 and -2.5 | Osteopenia |
| Equal to or below -2.5 | Osteoporosis |
| Equal to or below -2.5 + fracture | Severe osteoporosis |

*Source: [19; 20]* *Table 1*

characteristics to make clinical decisions. Bone mineral density may account for 70% of bone strength; however, bone quality, the rate of bone turnover, and other architectural properties of bone (as well as genetics) play an important role in the development of osteoporosis and bone fragility [5; 21].

Although the WHO definition includes measurement of bone density at several possible sites, such as the spine, heel, or wrist, BMD measured at the hip, femoral neck, and lumbar spine is preferred by most authorities. There are slight variations in the degree of fracture risk with BMD measurements at the different sites (e.g., T-score at the hip correlates to greater fracture risk than the same T-score taken at the spine). If measurements are made at different sites, fracture risk is determined according to the lowest values obtained. It must be emphasized that the WHO BMD T-score diagnostic classification should be used with caution in men and children because established criteria are primarily based on an adult female population. The diagnosis of osteoporosis in these groups should not be made based on densitometric criteria alone; the International Society for Clinical Densitometry (ISCD) has recommended instead that ethnicity- or race-adjusted Z-scores be used [20].

## EPIDEMIOLOGY

As noted, an estimated 10.2 million individuals in the United States already have osteoporosis, and another 43.4 million have low bone density [1; 2]. According to data from the National Osteoporosis Foundation, 8.2 million American women 50 years of age and older have osteoporosis and 27.3 million are at risk of developing the disease [22]. The diagnosis of osteoporosis is important as a predictor of fracture. Osteoporosis results in more than 2 million osteoporotic fractures every year. This number is expected to double or triple by 2040 [23]. To fully understand the epidemiology of osteoporosis, one must examine the effects of race, gender, and age.

### ETHNICITY/GENDER

Women are the most commonly affected population in the United States due to a lower peak bone mass and an accelerated bone loss in the postmenopausal period [24]. Osteoporosis is underrecognized and undertreated in African American women and is increasing most rapidly among Hispanic women [5; 24]. White and Asian women are at highest risk for osteoporotic fracture; African American and Hispanic women have a lower but significant risk [5; 24]. The National Osteoporosis Risk Assessment (NORA) study found that the fracture rates in postmenopausal Hispanic, African American, and Asian women were 91%, 54%, and 41%, respectively, of the fracture rates in white women [25].

Men also are affected by osteoporosis, although they represent only about 20% of the cases [5]. Part of the reason for this may be that this population has not been studied as frequently as postmenopausal women. In fact, the number of men with osteoporosis has not been clearly quantified, and the WHO bone mineral density cut-offs are not necessarily applicable. In general, men have greater peak bone mass and greater BMD [24]. As a result, they usually present with fractures 10 years later than women [26]. Sex-specific T-scores are available, but the appropriate cut-offs have not been definitively determined; more research is needed.

Up to 30% of hip fractures and 20% of vertebral fractures occur in men. Of note, mortality associated with hip fractures in men is nearly 50% higher than in women [5; 26].

### AGE

All patients lose bone mass as they age. Consequently, the incidence of osteoporosis increases with age. Age does predict fracture risk independent of BMD; however, osteoporosis is not an inevitable consequence of aging [11]. For patients with the same T-score, there is still a significant difference in fracture risk across age groups. For example, a woman 80 years of age with a T-score of -2.0 has a greater risk of hip fracture over 10 years than does a woman 70 years of age with the same T-score. This difference is likely attributable to decreasing bone quality as well as other factors, including unsteadiness, decreasing muscle strength, and comorbidities that occur with aging [25].

### COSTS

Osteoporotic fractures account for an estimated $19 billion in healthcare expenditures annually [2]. These costs are expected to rise to $25.3 billion by 2025 [2]. Osteoporosis causes nearly 300,000 hip fractures, 547,000 vertebral (spine) fractures, 397,000 wrist fractures, and almost 675,000 other fractures each year. Annual medical costs related to hip fractures alone are expected to double or triple by 2040 [27]. Osteoporosis results in more than 432,000 hospital admissions, 2.5 million physician visits, and 180,000 nursing home admissions annually [20]. Notably, statistics relating to cost are most often based on treatment and hospital costs, thereby underestimating the true total costs associated with this disease [28].

The indirect costs of osteoporosis have not yet been accurately ascertained, but the decreased productivity, lost wages, and psychologic and social factors associated with osteoporosis and related fractures are substantial. For example, hip fracture patients have demonstrated a lower baseline health-related quality of life and a prolonged and significant deterioration in health-related quality of life following hip fracture [29; 30].

The costs of osteoporosis should also encompass the effects on people around the patient. The caregiver and close family members also suffer decreased productivity due to the emotional and physical strain associated with the high level of care required for these patients.

## PATHOPHYSIOLOGY

The development of osteoporosis results from defective bone remodeling. Normally, bone is under a continuous remodeling process of formation by osteoblasts and resorption by osteoclasts. When the resorption exceeds the formation (either due to decreased formation, increased resorption, or combination of the two), bone density decreases, bone quality deteriorates, and the patient develops osteopenia or osteoporosis.

Osteoblasts are formed from the same precursors as fibroblasts, the cells that produce collagen. They ultimately are responsible for the formation of osteoid, or bone matrix. Mineralization of this osteoid matrix produces bone, and the osteoblasts that remain following mineralization become the osteocytes, the functioning bone cells. Osteoblasts respond to a variety of humoral factors, such as estrogen, vitamin D, cytokines, and the various growth factors that stimulate bone formation.

Osteoclasts act in opposition to osteoblasts and, interestingly, result from a line of hematopoietic cells. Like osteoblasts, they respond to many signals that are necessary for cell development. Because osteoclasts are formed from the same line as many blood cells, they also respond to granulocyte colony-stimulating factor and a wide range of interleukins. They are inhibited in their differentiation by the protein osteoprotegerin. Osteoclasts attach to endosteal bone and secrete acid to dissolve calcium crystals. Enzymes like metalloproteinases then act to break down the protein matrix and the osteoclast undergoes apoptosis. The breakdown materials from this protein degradation may be measured as possible markers of bone resorption.

The imbalance of osteoclastic and osteoblastic activity may be caused by several age- and disease-related factors. There is some difference of opinion about how to classify the categories of osteoporosis; however, many authorities utilize three main categories: primary osteoporosis, postmenopausal osteoporosis (generally included in the category of primary osteoporosis), and secondary osteoporosis [23].

### PRIMARY OSTEOPOROSIS

Primary, age-related, or low-turnover osteoporosis results from decreasing bone mineral density and bone quality with age. Normal aging processes decrease gonadal function, and physical activity is usually less strenuous. Everyone reaches a peak bone mass around the third decade of life, usually between 25 to 30 years of age. The maximum BMD achieved by any individual depends upon genetic factors, nutrition, endocrine status, and physical activity. Bone density then gradually decreases as the individual ages. This primary type of osteoporosis is due to decreased bone formation without declining osteoclastic action. The molecular changes that lead to this type of osteoporosis are not clear at this time; however, micrographs of bone show loss of trabecular plates in cancellous bone [20].

### POSTMENOPAUSAL OSTEOPOROSIS

Postmenopausal osteoporosis causes most of the skeletal difficulties in the adult female population. Again, these molecular processes are not well understood. It is known that declining estrogen levels cause an increase in osteoclastic activity with a resulting imbalance between skeletal formation and resorption [23]. Estrogens act on nuclear receptors of both osteoblasts and osteoclasts. Deficiency of estrogen leads to, among other effects, the upregulation of osteoprotegerin ligand gene transcription and increased production of macrophage colony stimulating factor (M-CSF), both of which result in increased osteoclastic activity [31].

### SECONDARY OSTEOPOROSIS

The final category is osteoporosis due to secondary causes. This can be from many diseases, including liver disease, rheumatoid arthritis, celiac sprue or other malabsorption syndromes, inflammatory bowel disease, lymphoma, multiple myeloma, thalassemia, acromegaly, amyloidosis, leukemia, and thyrotoxicosis. Nutritional deficiencies or medications that have effects on calcium, sex steroids, or other factors related to bone formation or resorption also may cause secondary osteoporosis [23]. In men, 30% to 60% of osteoporosis cases have been associated with secondary causes [26]. In perimenopausal women, about half of the cases are due to secondary causes, such as hyperthyroidism and anticonvulsant treatment. The most common medications associated with osteoporosis are glucocorticoids. Even small doses (i.e., 2.5–7.5 mg prednisone per day) have been associated with an increase in fractures [23]. Patients with osteoporosis should have possible secondary causes explored, as many of the conditions are treatable.

## RISK FACTORS

There are numerous risk factors that predict low BMD, the development of osteoporosis, and resulting fractures. Risk factors include advanced age, white race, tobacco use, female gender, low body weight, physical inactivity, and others (***Table 2***). Each risk factor has a different impact on the development of osteoporosis.

When evaluating risk factors, it is important to discuss with patients those risk factors that they can modify. Some modifiable risk factors directly impact bone biology and result in a decrease in BMD. Others increase the risk of fracture independently of their effect on bone [32]. For example, smoking is well correlated with an increase in postmenopausal bone loss and fracture risk [21; 32]. Alcohol use is also a consistent risk factor for osteoporosis and fracture, though its effects seem to be dose-related. Drinking some but less than one

drink a day may be protective, perhaps because of an effect on estrogen, but larger amounts of alcohol (i.e., two or more drinks/day) increase the risk of osteoporosis and fracture by 40% [20; 32]. High caffeine intake also may increase the risk of fracture in older women [20].

Low physical activity is also an important risk factor that should be modified. Exercise is important for maintaining strong bones, physical ability, and independence throughout life and, depending on the individual's age, may increase or preserve bone mass and help reduce the risk of falls and fractures [23]. Patients with nutritional deficiencies of calcium and vitamin D also are at increased risk of osteoporosis. Protein may also be important due to its synergistic action with vitamin D and calcium [32]. Building a maximal peak bone mass as a child and adolescent is very important, and continuing to receive adequate amounts of these nutrients also is necessary.

Clinicians and patients should be aware of medications that may increase the risk of osteoporosis. As noted earlier, glucocorticoids are the most common cause. The list of medications that may increase the risk of osteoporosis includes [20; 23]:

- Anticonvulsants
- Anticoagulants (long-term use)
- Thyroxine
- Lithium
- Tamoxifen (premenopausal use)
- Immunosuppressants and cytotoxic drugs

Many of these drugs have different mechanisms of action. For instance, some of the anticonvulsants (e.g., phenytoin, phenobarbital) increase hepatic metabolism of vitamin D, resulting in decreased calcium absorption in the intestine. The key is to be aware of these medications and their impact on osteoporosis.

*Patient D has numerous risk factors for osteoporosis, including older age, female gender, and low body weight. She may also have a family history, and this should be explored further. Upon review of her medications, she has been treated with steroids for exacerbation of asthma, but there have been no such episodes in the past year. In addition, she is not on estrogen replacement therapy. The use of steroids and estrogen deficiency may be additional risk factors. Her level of physical activity is encouraging, but it does not offset her numerous risk factors.*

| RISK FACTORS FOR OSTEOPOROSIS |
|---|
| Advanced age |
| Low body weight (<70 kg) |
| Family history |
| Low physical activity |
| White race |
| Medications |
| Female gender |
| Menopause/hysterectomy |
| Tobacco use |
| Previous fracture |
| Low cognitive function |
| Estrogen deficiency |
| Low calcium intake |
| *Source: Compiled by Author* — *Table 2* |

## PREVENTION

Although the process of bone thinning is a natural part of aging and cannot be completely stopped, there are measures that can and should be taken early to prevent or delay osteoporosis. Ideally, it is best to start these measures during adolescence; however, adults who follow them also may benefit. An estimated 10% increase of peak bone mass in children reduces the risk of osteoporotic fracture during adult life by 50% [32]. Preventive measures include [20; 23; 32]:

- A balanced, nutritious diet rich in calcium and vitamin D
- Maintenance of a healthy body weight
- Beneficial weight-bearing exercise for 30 to 60 minutes, five days a week
- No use of tobacco products and only moderate (if any) alcohol consumption, and avoid secondhand smoke, if possible
- Fall prevention
- Careful medication usage, recognizing which agents increase risk for osteoporosis, and seeking alternatives, if possible

EVIDENCE-BASED PRACTICE RECOMMENDATION

The American Association of Clinical Endocrinologists recommends counseling patients to maintain adequate dietary intake of calcium, to a total intake (including diet plus supplement, if needed) of 1,200 mg/day for women ≥50 years of age.

(https://www.aace.com/files/postmenopausal-guidelines.pdf. Last accessed October 25, 2018.)

**Level of Evidence**: Grade B (Evidence from at least one well-designed clinical trial, cohort- or case-controlled analytic study, or meta-analysis)

Falls often precipitate fractures in individuals with low BMD. They occur for a variety of reasons and may involve multiple factors (e.g., problems with balance, mobility, vision, lower extremity weakness, and/or blood pressure circulation). Falls are a major contributor to hip fractures and have also been associated with an increased risk of spine, wrist, pelvis, and upper arm fractures. Preventive measures should include regular vision checks, elimination of medications that may cause dizziness, low blood pressure, or confusion, and elimination of environmental obstacles (e.g., removing throw rugs, installing night lights). Another important fall prevention measure is physical activity, which may help to improve muscle strength and balance. Physical activity, performed an average of three times each week for a duration of 30 to 45 minutes, should be encouraged in the elderly [23].

Both smoking and heavy alcohol consumption have been associated with reduced bone mass and increased fracture risk. Smoking has been found to have a direct toxic effect on bone cells and may also harm bone indirectly by lowering the amount of calcium the intestine is able to absorb [23]. Heavy alcohol consumption has known negative effects on bone and bone remodeling [23].

Healthcare providers should review these preventive measures frequently with patients and be certain that language or cultural differences do not interfere with the patient's ability to understand them.

# DIAGNOSIS

## CLINICAL SIGNS AND SYMPTOMS

Osteoporosis is often a silent disease without obvious indications that it is present. However, there are some signs and symptoms that may accompany the development of the condition, including [23; 33]:

- Decreasing height (patients may lose 10–15 cm in height due to collapsing vertebrae)
- Back pain (typically in the lower thoracic and lumbar areas, T5–L5)
- Development of a kyphosis or curvature of the upper back (Dowager's hump)
- Fracture occurring with minimal trauma
- Low body weight and weight loss of more than 1% per year in the elderly
- Suspicion of vitamin D deficiency (e.g., due to low intake or little exposure to sunshine)

Any of these findings in a patient should lead to an evaluation for osteoporosis. A fracture in at-risk populations, especially one that is disproportionate to the amount of trauma, should prompt a work-up. Subtle vertebral fractures may be identified incidentally on chest radiographs or bone scans. A vertebral fracture assessment (VFA) may be needed if a vertebral fracture is suspected in certain populations [34]. Acute onset of low back pain with little or no trauma could represent a vertebral compression fracture. Wrist fractures (either Smith or Colles) should raise suspicion in a younger population; they often are an earlier manifestation of osteoporosis, with increasing incidence in women 40 years of age and older [35].

*As noted, most often patients do not present with significant signs or symptoms of osteoporosis. In this example, Patient D does present with back pain in the lower lumbar area, which has been persistent for several months. The physical exam does not reveal any signs of radiculopathy, obvious fracture, nerve damage, or acute cause of the low back pain. In addition, the review of past records does demonstrate that Patient D is approximately 10 cm shorter in height than five years ago. She clearly needs a work-up for osteoporosis.*

The key to diagnosis is a thorough history and physical examination, followed by bone measurement tests. Because low BMD may indicate metabolic bone disease other than osteoporosis (e.g., hyperparathyroidism or osteomalacia), it should not be used as the sole indicator of osteoporosis [20]. Healthcare professionals should also ask about other risk factors for osteoporosis, as well as any family history, pain or tenderness in bones or joints, recent broken bones, current and recent past medication use, and level of physical activity. For men, physicians should inquire about changes in libido. On exam, it is important that height is measured and compared with results from past measurements. There also should be a focus on evidence of old fractures during a skeletal survey, as previous fractures often may signal the presence of osteoporosis or a metabolic abnormality. If suspicion for osteoporosis is high, bone measurement testing should follow.

*Patient D has a full chemistry panel including calcium and phosphorus, liver function tests, thyroid function tests, and a complete blood count (CBC). All are within normal limits. Normal values should not be unexpected in patients with osteoporosis, as this is often the case. Because suspicion remains high for osteoporosis, Patient D must undergo bone mineral density testing. Although the patient wishes to have an x-ray, simple x-rays would not be helpful here unless one is trying to rule out a fracture or other structural cause of the low back pain.*

## BONE DENSITY MEASUREMENT TESTS

There are several ways to determine bone mineral density, and each diagnostic tool may identify a different population with osteoporosis. Bone measurement tests include DXA of the hip, spine, or wrist; quantitative ultrasound of the heel; spinal CT; radiographic absorptiometry; and MRI. These tests are most useful when they will have an effect on clinical decision making. That is, physicians should have a plan before they order a test and anticipate how the test result will affect their management of the patient.

There is considerable debate among the several disciplines that perform bone density studies. Osteoporosis clinics using DXA have their preferences, while radiologists performing CT scans or MRI may have different ideas. The spectrum of available tests is outlined here, but most authorities now prefer DXA [20; 32; 35; 36; 37]. The types of studies performed and their appropriate follow-up times continue to be investigated at many centers. For additional information, one may review the Official Positions of the ISCD [34].

### Dual-Energy X-Ray Absorptiometry

The most commonly used BMD assessment is DXA, which may be done either at central or peripheral (pDXA) sites. DXA uses two distinct beams of x-ray photons. The amounts of each x-ray beam that pass through bone and soft tissue are compared to estimate the bone density. DXA measures the sum of cortical and trabecular bone and can detect as little as 2% bone loss. Central DXA measures BMD at the spine, upper femur, and hip, whereas pDXA measures BMD at the heel, finger, and forearm. Measurement of hip BMD represents a good approach because there is less soft tissue and other artifacts compared to other sites. Individuals with osteoporosis have a greater risk of fractures in the hip and spine, which can lead to longer recovery time, greater pain, and permanent disability [23; 38]. These sites also are appropriate for monitoring the effectiveness of therapy, as they are more likely to show an increase in BMD in response to treatment [23]. Be aware, however, that falsely elevated BMD may occur in patients with certain pathologic processes, such as degenerative joint disease, compression fractures, and vascular calcifications.

Central DXA is generally preferred over pDXA as it can measure whole body bone mass. It has minimal radiation exposure and may be completed in less than 10 to 15 minutes [38]. Peripheral DXA may be done with portable units in a physician's office and involves even less radiation than central DXA. It is also less expensive. However, it is less sensitive and less specific and thereby provides less precise T-scores. Moreover, pDXA cannot detect spinal fracture sites. It is most useful at identifying at-risk individuals who may benefit from further BMD testing [23; 38].

### Quantitative Ultrasound

Quantitative ultrasound is based on the premise that attenuation of sound waves into bone and the speed of sound correlate independently with BMD of the heel. The calcaneus is the primary site of measurement, although this technique also has been used to measure bone mass at the tibia, phalanges, or wrist. It is believed that ultrasound measures changes in bone architecture. Limitations include measure reproducibility (should not be used for monitoring bone changes over time or to evaluate response to therapy) as well as lack of adaptation for various sizes and shapes of heels. It involves no radiation exposure, but it is less sensitive than DXA and does not always correlate with DXA readings. However, some studies have indicated that quantitative ultrasound may predict fractures as well as other measures of bone density [20; 21; 39].

### Quantitative Computed Tomography

Quantitative CT can measure the lumbar spine, hip, and peripheral sites. In general, the results are less likely to be affected by degenerative spinal changes than spinal DXA scanning. Unlike DXA, quantitative CT allows for assessment of both cortical and trabecular bone. As a result, it can make volume BMD determinations [20]. Trabecular bone, because of its higher rate of turnover compared with cortical bone, is expected to show metabolic changes earlier [40]. The ability of quantitative CT to enable prediction of spinal fracture is equal to that of DXA scanning in postmenopausal women; there is lack of sufficient evidence for fracture prediction in men [20]. The cost and level of radiation exposure are higher (as much as 200 times greater than some other techniques) [20]. In some cases, this results in decreased patient acceptability.

### Radiographic Absorptiometry

Radiographic absorptiometry provides radiologic assessment of the metacarpals and phalanges. It was originally based on a plain film; however, computerized image processing has since been applied to radiography [41]. Radiographs are an insensitive measure of bone loss and may only demonstrate abnormalities after 30% of bone loss has occurred [42]. Generally, radiographic absorptiometry is not recommended as a screening or diagnostic test for osteoporosis or osteopenia. It can be used to assess vertebral and overall fracture risk in postmenopausal women; there is lack of sufficient evidence for fracture prediction in men [20].

### Magnetic Resonance Imaging

Most people today are familiar with MRI and aware that it uses a strong magnetic field, limiting its use in patients with ferromagnetic implants. Essentially, cells in the bony region studied emit a signal as they respond to the radio frequency waves of the device. The detector transmits the skeletal information to the computer, which then produces the familiar detailed images. The use of MRI in diagnosing osteoporosis is still evolving and is unlikely to become widely used due to the expense and time required to obtain a scan [42]. Also, more research must be done to improve the sensitivity and specificity of MRI as well as to calculate appropriate T- and Z-scores. Its use, therefore, is mainly limited to certain centers, which generally use MRI for osteoporosis detection as part of a research study.

### Selection of Tests

Given the multitude of tests, there are some general factors to keep in mind when ordering them. For women 65 years of age and younger, vertebral fractures are more common than hip fractures [43]. Therefore, it is prudent to also consider ordering DXA of the spine. For women older than 65 years of age, hip fractures are more common. At the same time, degenerative spinal changes and aortic calcifications make spine imaging more difficult to assess. Therefore, one should consider DXA of the hip or lateral spine, as well as quantitative CT of the hip. DXA of the hip is the best predictor of future hip fracture risk [20]. DXA is also preferred when patients exhibit multiple risk factors. Measurements at two sites are preferable, as this increases sensitivity and specificity. Again, these are general considerations; individual physician's preferences may differ.

| BIOCHEMICAL MARKERS OF BONE FORMATION AND RESORPTION | |
|---|---|
| **Formation Markers** | **Resorption Markers** |
| Bone specific alkaline phosphatase (BSAP)<br>Osteocalcin<br>C-Amino-terminal propeptide of type I procollagen (PINP)<br>Carboxy-terminal propeptide of type I collagen (PICP) | Calcium<br>Hydroxyproline<br>Free and total deoxypyridinolines (Dpd)<br>Free and total pyridinolines (Pyd)<br>Type I collagen cross-linked C-telopeptide (CTx)<br>Type I collagen cross-linked N-telopeptide (NTX) |
| *Source: [23]* | *Table 3* |

Serial measurements may be helpful to assess bone loss rates; however, they should not be performed too often. Follow-up measurements, one to two years apart, may be useful in determining whether patients with normal baseline bone mass demonstrate a rapid loss of BMD. They may also be helpful when assessing persons undergoing treatment to discern whether the treatment has been effective [20]. Presently, DXA is the only method that has been validated for use in serial measurements. Keep in mind that a minimum of two years is typically required to measure any changes in BMD [6; 20].

*Patient D should undergo DXA of the hip. She has a history of degenerative joint disease, which makes spine-imaging results more difficult to interpret. In addition, she has numerous risk factors, which make DXA a preferred test.*

## LABORATORY TESTS AND BIOCHEMICAL MARKERS

There are currently no specific laboratory tests of blood or urine that are diagnostic of osteoporosis. Most laboratory tests will be normal. A physician or other clinical provider, however, should still order lab tests that include a complete serum chemistry, including calcium and phosphorus, CBC, thyroid function tests, parathyroid hormone (PTH), 25-hydroxyvitamin D, free testosterone, liver function tests, and urine calcium, in order to diagnose secondary causes, such as hyperthyroidism or hyperparathyroidism [6].

The strength of bone is determined by bone density and bone quality, but the overall rate of remodeling also plays an important role. The remodeling process, including the breakdown of bone and protein matrix, generates breakdown products, many of which may be measured in the blood or urine. Additionally, the formation of bone increases other markers (***Table 3***).

Studies of these biochemical markers have not been encouraging for their use in clinical practice, and their routine use in clinical practice is not generally recommended [36]. The levels of the markers change daily, even hourly, so many measurements would have to be made to determine an accurate level. Although biochemical markers have not yet proven to be predictive of bone mineral density or fracture risk, studies have shown that they may be able to estimate fracture risk and rate of bone loss, particularly when combined with BMD [23; 32]. They have also demonstrated an early estimation of treatment effect [32].

## RISK ASSESSMENT TOOLS

Assessment tools that may be used to determine a patient's osteoporosis risk include the Osteoporosis Risk Assessment Instrument (ORAI), the Simple Calculated Osteoporosis Risk Estimation (SCORE), and the WHO Fracture Risk Assessment Tool (FRAX).

The ORAI is a simple, three-item tool based on age, weight, and current hormone use. The SCORE tool combines six risk factors, including age, weight, race, estrogen use, presence of rheumatoid arthritis, and fracture history. A Canadian study using DXA of the hip as the standard for diagnosing osteoporosis (T-score below -2.5) found that the ORAI had a sensitivity of 97.5% and a specificity of 28%. In the same study, the SCORE tool had a higher sensitivity, at 99.6%, but a lower specificity, at 18% [44]. A systematic review of SCORE, ORAI, and the Osteoporosis Self-assessment Tool (OST) found SCORE and OST to have a higher sensitivity for predicting major osteoporotic fracture in women 65 years of age and older [45]. The OST uses age and weight as parameters to predict the risk of osteoporosis and has been found to be superior in identifying men at risk of osteoporosis or osteoporotic fractures [46; 47].

FRAX is a web-based tool that assesses the 10-year risk of osteoporosis fracture in women and men. Individual risk factors (i.e., age, sex, weight, height, and femoral neck BMD, if available) and clinical risk factors (i.e., prior fragility fracture, parental history of hip fracture, current tobacco use, long-term glucocorticoid use, rheumatoid arthritis, daily alcohol consumption, and secondary causes of osteoporosis) are entered into the web tool, which calculates and provides a 10-year fracture probability (as a percentage) of absolute, rather than relative, risk (as occurs on the output of DXA equipment) [48]. The NOF has outlined U.S.-specific considerations for the application and use of FRAX [20]. No changes to osteoporosis practices guidelines have been anticipated as a result of the FRAX algorithm [25].

### SCREENING GUIDELINES

Routine BMD screening has been recommended for women 65 years of age and older, regardless of risk, and for women 50 to 69 years of age with clinical risk factors for fracture [20; 34; 36; 49; 50]. The ISCD and NOF also have recommended routine screening for men 70 years of age and older, regardless of risk factors, and for men 50 to 69 years of age when concerns exist about the patient's risk factor profile [20; 34]. The U.S. Preventive Services Task Force (USPSTF) has determined that the evidence is insufficient to recommend routine screening for osteoporosis in men [49]. Additional recommendations for BMD screening include [20; 34; 36; 49; 50]:

- Adults being considered for pharmacologic therapy for osteoporosis
- Women in menopausal transition with risk factors for fracture
- Adults 50 years of age and older with fragility fracture
- Adults with disease/conditions associated with low bone mass/bone loss
- Anyone not receiving therapy in whom evidence of bone loss would lead to treatment

EVIDENCE-BASED PRACTICE RECOMMENDATION

The USPSTF recommends screening for osteoporosis with bone measurement testing to prevent osteoporotic fractures in women 65 years and older and postmenopausal women younger than 65 years who are at increased risk of osteoporosis, as determined by a formal clinical risk assessment tool.

(https://jamanetwork.com/journals/jama/fullarticle/2685995. Last accessed October 25, 2018.)

**Strength of Recommendation**: B (There is high certainty that the net benefit is moderate or there is moderate certainty that the net benefit is moderate to substantial.)

## TREATMENT

The challenge for physicians and other clinicians is to diagnose, prevent, and treat osteoporosis before fractures occur. However, several studies have indicated that there has been a failure in the United States to apply preventive and treatment measures to many individuals at risk for bone disease [23]. For example, the use of BMD testing in this at-risk population has been estimated to be as low as 3%; calcium and vitamin D supplementation has been recommended to only 11% to 14% of this population; and antiresorptive therapy has

been recommended for only 12% to 16% of this population [51; 52]. Additionally, Medicare cuts in reimbursement for DXA services (initiated in 2007) led to a decline in office-based provision of DXA services, a decline in retail prescriptions for osteoporosis therapies, and a decline in restarting drug therapy after an extended gap in treatment, despite a 2.6% increase in the U.S. population aged 65 years and older [53; 54; 55]. One retrospective analysis found a significant association between Medicare reimbursement reductions and decreased use of BMD testing in female Medicare beneficiaries who had no supplemental private health insurance [56].

According to NOF guidelines, postmenopausal women and men 50 years of age and older who present with any of the following should be considered for treatment [20]:

- Hip or vertebral (clinical or morphometric) fracture
- T-score at the femoral neck or spine of <-2.5 (after evaluation has excluded secondary causes)
- Low bone mass (T-score between -1.0 and -2.5 at femoral neck or spine) and 10-year probability of hip fracture >3% or 10-year probability of major osteoporosis-related fracture >20%

These recommendations also are supported by the American Association of Clinical Endocrinologists (AACE) [57]. Although the guidelines are helpful, it is important to remember that treatment should be considered on an individual basis because T- and Z-scores are only part of a patient's workup [20; 58].

Numerous treatment options exist, including [20]:

- Diet/supplementation
- Exercise
- Medications

Some patients may have a limited understanding of English, requiring the need of translators or foreign language brochures, to properly convey the necessary information.

## DIET/SUPPLEMENTATION

### Calcium

The skeletal structures contain 99% of the body's calcium stores. When the extraskeletal calcium level is inadequate, bone tissues are resorbed in an attempt to maintain equilibrium. To prevent excessive skeletal calcium loss, an adequate amount of calcium, as well as vitamin D, must be ingested. Clinical trials have shown that following a regimen of adequate consumption of calcium and vitamin D may significantly reduce fracture risk [20].

According to NOF recommendations, men 50 to 70 years of age should obtain at least 1,000 mg/day of elemental calcium; women 51 years of age and older and men 71 years of age and older require 1,200 mg/day of elemental calcium [20]. National nutrition surveys have revealed that many individuals in the United States consume less than half of the recommended daily amount of calcium in their diet [20]. Dietary supplements may be necessary. Intakes in excess of 1,200–1,500 mg per day provide limited benefit and may increase the risk of developing kidney stones or cardiovascular disease [20]. The upper safe limit for total calcium intake is 2,500 mg/day [23; 59].

Calcium supplements are especially necessary in more fragile, older osteoporosis patients; however, the problem of reduced calcium absorption is more acute in older persons. This may be overcome by increasing overall calcium intake and maintaining adequate levels of vitamin D [23]. The best way to increase calcium intake is through diet (e.g., consumption of dairy products), because supplements are not always absorbed well. To increase absorption, supplements should be taken with meals [23]. For patients on acid-reducing medications, calcium citrate should be used because calcium carbonate requires an acidic environment.

### Vitamin D

Normally, vitamin D is mainly stimulated by ultraviolet radiation, or sunlight, on the skin and then by hydroxylation in the liver and kidney. Vitamin D then acts to increase intestinal absorption of calcium and promote bone formation. Deficiency of vitamin D in children causes rickets, and adult deficiency results in osteomalacia. Because it is not practical for many individuals to get adequate levels of vitamin D from exposure to sunlight, increasing vitamin D levels through diet and supplementation should be encouraged [23]. Vitamin D supplementation in conjunction with calcium has been shown to reduce fractures [21].

According to NOF recommendations, adults 50 years of age and older should obtain 800–1,000 IU of vitamin D per day [20]. High-risk patients (e.g., the elderly) may need more. The safe upper limit of daily vitamin D intake for the general adult population was increased to 4,000 IU/day in 2010 [20; 23]. Evidence has shown that higher daily intakes are safe and that some elderly patients may need this amount to maintain optimal serum 25 hydroxyvitamin D levels [20]. Keep in mind that both vitamin D and calcium supplements should be combined with other treatments.

### Phytoestrogens

Plant-derived phytoestrogens may be found in such foods as beans, cabbage, rice, berries, sesame seeds, and grains. They are structurally similar to estrogen, but with weaker effects. They also are not stored in the body and may be easily broken down and eliminated. The three main dietary types of phytoestrogens are isoflavones, coumestans, and lignans. Most foods that contain these compounds include more than one type [60].

Most evidence about the potential role of phytoestrogens has been based on animal studies, and many of these studies have shown that treatment with phytoestrogens has serious adverse effects [61; 62; 63]. Phytoestrogens also have been associated with some serious drawbacks, including inability to accurately measure their levels in food; limited scientific evidence regarding active ingredients, dosage, and potential presence of unexpected agents; and a short-lived benefit cycle [64; 65]. Additionally, the evidence in humans remains conflicting [60; 66]. For example, studies in Hong Kong, China, and Japan (where higher dietary intake of phytoestrogens occurs) have revealed lower rates of hip fracture when compared to white individuals, but relatively similar rates of spine fractures [67]. Few studies on the effect of phytoestrogens on BMD have shown a positive effect; supplementation is not recommended [67; 68; 69; 70].

## EXERCISE

Exercise is beneficial for many reasons, including reduction in the risk of heart disease, improved glycemic control in diabetes, improved blood pressure, and reduction in cholesterol levels (total cholesterol and low density lipoprotein [LDL]), as well as improved psychologic well-being. For patients with osteoporosis, exercise may specifically increase bone mass and total body calcium. Numerous studies have documented that consistently active individuals have higher bone density than inactive individuals [23]. The beneficial physiologic effects most likely result from imposing repetitive stress upon the muscular and skeletal systems. The mechanical strain and loading on bone may decrease the rate of bone loss as well as produce an actual increase in bone mass [23].

Exercises can basically be classified as either aerobic or anaerobic. Aerobic exercise is any activity that uses large muscle groups, is maintained continuously, and is rhythmic in nature. It strengthens the myocardium and improves overall fitness by increasing the body's ability to use oxygen. It does so by increasing the inotropic and chronotropic activity of the heart along with increasing respiratory demand. Examples of aerobic exercise include running, biking, skating, brisk walking, and dancing. Anaerobic exercises typically involve major muscle groups and resistance training, which relate to muscular strength and muscular endurance. Muscular strength involves exerting a force for a brief period of time with repeat contractions until the muscle becomes fatigued. Weightlifting is a good example of an anaerobic muscular strength activity. Muscular endurance involves sustaining

repeated contractions or the application of a continual force against a fixed object. Push-ups are an example of muscular endurance. The NOF has recommended a combination of weight-bearing and resistance type (i.e., muscle strengthening) exercises [20]. The program prescribed will depend on the ability and interests of the individual patient. Patients should be encouraged to exercise at least 30 minutes per day, at least five days per week, eventually working up to 60 minutes per day, if tolerated. Ideally, patients should stretch for 10 minutes prior to exercise. Patients with a history of vertebral compression fracture, as well as those patients with significant musculoskeletal disease or serious degenerative joint disease, should initially participate in a monitored exercise program [11].

## MEDICATION

Medications may be divided into antiresorptives, which reduce bone loss, and anabolic, or bone-formation, agents. Antiresorptive therapies include estrogen, selective estrogen receptor modulators (SERMs), bisphosphonates, and calcitonin. The first U.S. Food and Drug Administration (FDA)-approved anabolic agent was teriparatide, which is a synthetic form of PTH. A second agent, abaloparatide, was approved by the FDA in 2017 for the treatment of osteoporosis in postmenopausal women at high risk for fracture [71; 72]. The effectiveness of these therapies, and combinations of them, is being studied [23].

### Antiresorptives

#### *Hormone Replacement*

Hormone replacement, either in the form of unopposed estrogen or estrogen-progestin combination agents, had commonly been used in postmenopausal patients for alleviation of postmenopausal symptoms and prevention of chronic diseases. Estrogen increases osteoblastic activity, which leads to greater pro-collagen and alkaline phosphatase production. As a result, it inhibits bone resorption. Deficiency in estrogen causes increased osteoclast formation. Studies conducted in the early 2000s have led to a change in the recommendations for hormone therapy in postmenopausal women [20; 37; 73].

The Women's Health Initiative (WHI), a large randomized control trial (and an observational study), showed the osteoporosis prevention benefit of combination therapy in healthy, postmenopausal women. Nearly 27,000 women were randomized to conjugated estrogen plus medroxyprogesterone (if they had an intact uterus), conjugated estrogen (if they had a hysterectomy), or placebo. The primary outcome measure was coronary heart disease, but hip fracture was one of the secondary outcomes measured. The results demonstrated a one-third decrease in hip fractures and a 24% to 30% decrease in total fractures among the treatment group [13; 23]. The reduction in total fracture risk was significant; however, reductions in vertebral and hip fractures were not statistically significant. The study was stopped before completion due to increases in invasive breast cancer in the treatment group. There was also an increased absolute risk of nonfatal stroke, cognitive impairment, venous thromboembolism, and nonfatal myocardial infarction. A reduced incidence in colon cancer was observed. The authors concluded that hormone replacement is not recommended unless the fracture risk benefit is greater than the risk of cardiovascular disease and breast cancer [13; 23].

Another trial, the Heart and Estrogen/Progestin Replacement Study (HERS) and its subsequent follow-up HERS II, studied more than 2,700 postmenopausal women with pre-existing coronary heart disease and an intact uterus. Patients were randomized to conjugated estrogen plus medroxyprogesterone daily versus placebo. The studies involved a mean follow-up of 4.1 years. No significant decrease in hip or total fracture rates was shown for the patients receiving daily combination therapy [74]. The HERS trial showed no protective cardiovascular effects of the treatment and actually showed a 50% increase in cardiovascular events in the treatment group in the first year of the trial. The HERS II trial supported the conclusion from the initial HERS study, which was that hormone replacement therapy does not reduce the risk of cardiovascular events in postmenopausal women with coronary heart disease.

Prior to the studies, hormone replacement therapy was generally considered beneficial; however, recommendations have changed. The USPSTF has recommended against routine use of combination hormone therapy for prevention of chronic disease in postmenopausal women. The USPSTF also has recommended against routine use of unopposed estrogen in patients who have undergone a hysterectomy [75]. Hormone replacement therapy has been implicated in increased risk of breast cancer, stroke, venous thromboembolism, cholecystitis, and possibly coronary heart disease. Unopposed estrogen also has been shown to increase the risk of endometrial cancer. The WHI, HERS, and HERS II studies helped form an argument against hormone therapy in postmenopausal women, and given the other effective treatments for osteoporosis, treatment with hormones is not recommended [75].

While the WHI study findings have been useful, it should be noted that concerns have arisen in response to their conclusions. Specifically, the high average age of the study population (63.3 years of age) and use of only one type of medication and dosage have been the source of much criticism. It is necessary to remember that the use of hormone therapy should be individualized to the patient's needs and medical history. Hormone replacement therapy may be beneficial short-term for a small subset of women with severe fracture risk [23].

The AACE has suggested that hormone replacement could be acceptable for treatment of osteoporosis under the following circumstances, after obtaining informed consent, discussing the risks and benefits of replacement, and with strict follow-up [37]:

- Women with significant menopausal symptoms who are at risk for osteoporosis
- Women with significant osteoporosis who are unable to tolerate alternative therapies

Because research is ongoing in this area, recommendations may evolve or change.

### *Selective Estrogen Receptor Modulators*

SERMs are designed to mimic the beneficial effects of estrogen on bone, the heart, and the central nervous system, while at the same time minimizing the adverse effects on the breast and the uterus [23]. For example, raloxifene is an estrogen receptor modulator that acts as an estrogen agonist for bone and the lipoproteins, but an antagonist at the breast and uterus. It was the first SERM approved for the prevention and treatment of osteoporosis in postmenopausal women and has been shown to increase BMD, structurally recover bone, and decrease the risk of vertebral fractures [76; 77]. It is contraindicated in patients with a history of clotting disorders, such as venous thromboembolism. Side effects include leg cramps, arthralgias, rhinitis, headaches, and hot flashes [72; 77].

The Multiple Outcomes of Raloxifene Evaluation (MORE) trial was a multicenter, randomized, double-blind, placebo-controlled study that followed 7,705 postmenopausal women for three years. The MORE trial demonstrated a decreased risk of invasive breast cancer by 76% as well as increased bone density in the spine and femoral neck and significantly reduced risk of vertebral (but not hip) fractures [78; 79].

Interestingly, some data have suggested that raloxifene may reduce coronary events and strokes in women at high risk for cardiovascular events and lower cholesterol levels, similar to statins [77]. Additional research is being conducted with respect to these outcomes [80].

Tibolone is an estrogen-like agent that has been used for decades in Europe to reduce menopausal symptoms and possibly prevent bone loss. Although there is some evidence of an increased risk of stroke, it does not appear to stimulate breast or uterine tissue and has been suggested for use in the treatment of vasomotor symptoms and prevention of osteoporosis [81]. However, it is not currently approved by the FDA for use in the United States [72].

Another SERM, bazedoxifene, was approved for the treatment of osteoporosis by the European Medicines Agency in 2009 [82]. One randomized, controlled trial of postmenopausal women with osteoporosis compared 20 mg or 40 mg of bazedoxifene with 60 mg raloxifene or placebo [83]. After 36 months, the incidence of new vertebral fractures was significantly lower in all treatment groups compared to placebo. Bazedoxifene also improved BMD and reduced bone marker levels. FDA approval of bazedoxifene was granted in 2013 [72; 84].

### *Bisphosphonates*

Bisphosphonates act to decrease resorption by causing apoptosis and decreased function of osteoclasts. Several medications or drug combinations have been approved by the FDA for the prevention and treatment of osteoporosis, including alendronate, alendronate plus D (alendronate and cholecalciferol), ibandronate, risedronate, risedronate with a calcium supplement, and zoledronic acid [20]. These agents may also be effective in reversing the effects of steroid-induced osteoporosis [72; 85]. The FDA also has approved the use of other bisphosphonates, including etidronate disodium, pamidronate, and tiludronate; however, they have not been approved for use in osteoporosis [72; 86].

EVIDENCE-BASED PRACTICE RECOMMENDATION

According to the Institute for Clinical Systems Improvement, bisphosphonates should be considered (unless contraindicated) for reduction of fracture risk (both vertebral and non-vertebral) in men and postmenopausal women with osteoporosis.

(https://www.icsi.org/_asset/vnw0c3/Osteo.pdf. Last accessed October 25, 2018.)

**Strength of Recommendation/Level of Evidence**: Strong Recommendation, High-Quality Evidence

For severe osteoporosis, bisphosphonates are the best treatment option, with beneficial effects typically seen within a year. Note that bisphosphonates should be used with caution in patients with severe renal impairment [20; 72].

Oral bisphosphonates are generally well tolerated; however, complaints of upper gastrointestinal side effects (e.g., dyspepsia, reflux) are common in adults [20; 72]. When side effects occur and threaten to interfere with therapy, evaluate the patient's ability to comply with dosing instructions (e.g., take on empty stomach with 8 ounces water, remain upright 30 to 60 minutes) [20; 72]. If esophagitis/gastritis associated with alendronate is suspected, discontinue therapy for four to six weeks. Some patients may benefit from a change to risedronate; however, studies have found similar gastrointestinal tolerability between risedronate and alendronate [87; 88]. Intravenous bisphosphonates may be used in patients who are unable to tolerate oral preparations. IV zoledronic acid (preferred) is administered once every two years; ibandronate is administered once every three months [72; 89].

Results after three years of therapy with oral bisphosphonates vary across studies. Generally, femoral neck and spine BMD have increased by 1.5% to 6% and 5.5% to 6.5%, respectively, and vertebral/femoral neck fracture risk has been reduced by 40% to 60%, a significant difference from trial placebo groups [90]. A 2017 meta-analysis of 24 studies was conducted to evaluate the efficacy of bisphosphonates in preventing fracture in patients with osteoporosis. The analysis included 21,335 patients assigned to a bisphosphonate group and 17,862 patients assigned to a placebo group [91]. The overall rate of osteoporotic fracture was 5.9% in the bisphosphonate group and 9.9% in the placebo group. The rate of vertebral fracture was 5.9% in the bisphosphonate and 10.3% in the placebo group. The rate of nonvertebral fracture was 6.9% in the bisphosphonate group and 9.6% in the placebo group [91]. The best long-term (5 to 10 years) data come from the use of alendronate [92; 93; 94].

There is no consensus on the optimal duration of bisphosphonate treatment [95; 96]. Generally, it is considered reasonable to discontinue treatment ("drug holiday"), after five years of oral therapy or three years of IV therapy, in low-risk women with stable BMD and no previous history of vertebral/femoral fracture [97]. Most experts favor continu-

ing therapy for high-risk patients (i.e., previous fracture, elderly/frail). The duration of drug holiday is a matter for clinical judgment and individual patient considerations, determined in part by annual BMD monitoring and the patient's level of activity and fracture risk [98].

Alendronate, a second-generation bisphosphonate, has been shown to be most effective for patients with T-scores less than -2.5 or for patients with previous vertebral fracture. Alendronate has demonstrated the ability to reduce the incidence of wrist, hip, and spinal fractures by 50% over a three-year period in women with a prior fracture of the spine [20]. In the Fracture Intervention Trial (FIT), a large alendronate study, women with osteoporosis and vertebral fracture showed a significant decrease in vertebral and hip fractures [99]. A follow-up trial to FIT, the Fracture Intervention Trial Long-Term Extension (FLEX), showed that when compared with women who stopped alendronate after an average of five years, women who continued alendronate maintained a higher BMD and greater reduction of bone turnover. The risk for vertebral fracture between the two groups was relatively the same. While results indicated that women with very high risk of clinical vertebral fractures may benefit by continuing alendronate beyond five years, study results indicated that more data are needed on the effect of continuation versus discontinuation of alendronate before an optimal length of treatment can be recommended [92; 95]. One study sought to predict fracture risk among participants in the FLEX trial by looking only at those assigned to the placebo group [94]. Hip and spine DXA and two biochemical markers of bone turnover were measured when placebo was begun (FLEX baseline) and again after one and three years of follow-up. During five years of placebo, 22% of women in the placebo group experienced one or more symptomatic fractures and 19% had fractures after one year. Age and hip BMD at discontinuation predicted clinical fractures during the subsequent five years [94]. In both the FIT and follow-up FLEX trials, women were encouraged to take 500 mg/day of calcium and 250 IU/day of vitamin D in addition to the alendronate. One study suggests that the success of alendronate therapy may depend on the vitamin D status of patients [100].

Alendronate dosing is 5 mg/day for osteoporosis prevention and 10 mg/day for treatment [72; 101]. It is also available in a 35-mg and a 70-mg once-weekly oral dose that may be better for patient compliance due to its easier dosing. As stated, bisphosphonate medications should be taken on an empty stomach with a full glass of water. The most common side effects of alendronate are gastrointestinal, including esophagitis and gastric ulcer. Muscular and skeletal pains have also been reported. As stated, to prevent the gastrointestinal effects, the patient is urged to sit upright for at least 30 minutes after taking the medication [72]. Proton pump inhibitors and other acid reducing agents do not appear to prevent the gastrointestinal side effects of the bisphosphonates [101].

Of note, the effects of alendronate on bone density after discontinuation of hormone replacement therapy have yielded promising, if mixed, results. For example, in a published randomized controlled trial, women who had been diagnosed as having low BMD and had recently stopped hormone replacement therapy were randomized to either 10 mg of alendronate or placebo. At the end of the one-year trial, treatment with alendronate had demonstrated a 2.3% mean increase in spine BMD versus a mean loss of 3.2% in the placebo group. There was also greater total body and hip BMD preservation as well as decreased bone turnover with the use of alendronate as compared to placebo [102]. A separate trial, designed to evaluate the combined use of alendronate and estrogen, indicated that combination therapy produced somewhat larger increases in BMD than either agent alone and was well tolerated [103]. A trial designed to determine the rate of bone loss when therapy with alendronate, estrogen, or both agents was discontinued revealed accelerated bone loss after withdrawal of estrogen therapy, but not after withdrawal of alendronate or combination therapy [104]. One randomized, placebo-controlled trial compared BMD and bone turnover changes after

therapy withdrawal in postmenopausal women treated with alendronate or estrogen/progestin [105]. Of the 1,609 women at the start of the trial, one-third were switched from alendronate to placebo after the second year and one-third after the fourth year (while all remained blinded to treatment assignment). Women taking estrogen/progestin in years 1 to 4 were followed off therapy in years 5 and 6. BMD decreased steadily in the placebo group during all six years, whereas spine and hip BMD increased during the first four years in groups receiving both alendronate and estrogen/progestin. BMD decreased during years 5 and 6 in the group previously treated with alendronate for four years. In comparison, large BMD decreases were observed at the spine and hip among women who received estrogen/progestin for four years [105].

Risedronate is another agent that is effective for osteoporosis. A three-year trial of risedronate on patients with pre-existing vertebral fracture demonstrated a significant reduction in both vertebral and nonvertebral fractures [106]. It reduced the incidence of fractures of the spine by 41% to 49% and other fractures by 36% in patients with prior spinal fractures [20].

The recommended dose of risedronate is 5 mg/day, or a 35 mg weekly dose [20; 72]. The 35 mg dose of risedronate should be taken weekly with 1250 mg of calcium carbonate taken daily on the intervening six days. Reported side effects include headache, nausea, arthralgias, asthenia, abdominal pain, and other gastrointestinal problems [72]. A two-year study of risedronate given at a dose of 150 mg once a month to women with postmenopausal osteoporosis found similar efficacy and safety compared with risedronate 5 mg daily [107]. The mean percent changes in BMD at the hip and in biochemical markers of bone turnover were similar, as were adverse events.

Ibandronate also has been added to the FDA-approved list for the prevention and treatment of postmenopausal osteoporosis. The medication has been shown to reduce the incidence of spinal fractures by approximately 50% over a three-year period. It may be taken in tablet form, 150-mg tablet once a monthly, or intravenously, 3 mg every three months [72]. The side effects are similar to those of the other bisphosphonate medications [20; 72].

### *Denosumab*

Denosumab is a human monoclonal antibody being studied for its effects on bone metastases, rheumatoid arthritis, and multiple myeloma [108; 109]. In 2011, the FDA approved denosumab for treatment of osteoporosis in postmenopausal women who are at high risk of fracture [72; 110; 111]. Denosumab acts by binding to and inhibiting receptor activator of nuclear factor kappaB ligand (RANKL). RANKL controls the differentiation, proliferation, and survival of osteoclasts. Inhibition of RANKL provides a lengthened period of absorption and inhibition of bone resorption [72; 112].

Several studies evaluating the efficacy of denosumab in the prevention and treatment of postmenopausal osteoporosis have been completed. In the Fracture Reduction Evaluation of Denosumab in Osteoporosis every 6 Months (FREEDOM) trial, use of denosumab resulted in a reduced risk for vertebral, nonvertebral, and hip fractures in women with osteoporosis [113]. The trial involved 7,868 postmenopausal women with T-scores between -2.5 and -4 who were randomly assigned to receive placebo or a subcutaneous injection of 60 mg denosumab every 6 months for 36 months. Results demonstrated a 68% decrease in new vertebral fracture in the treatment group as compared to the placebo group (2.3% versus 7.2%) [113]. Significant reductions in hip and nonvertebral fractures were also noted. The authors reported no increases in adverse effects (e.g., cancer, delayed healing, osteonecrosis of the jaw, injection site reactions) associated with use of denosumab.

While results of one meta-analysis also found a decreased risk of nonvertebral fracture with use of denosumab in postmenopausal women with osteoporosis or low BMD, the study did find a significantly increased risk of serious adverse event related to infection [114]. A 12-month study compared the effects on BMD and bone turnover on patients with osteoporosis who were suboptimally adherent to bisphosphonates (and at higher risk for fracture) who were transitioned to denosumab or monthly oral bisphosphonate (ibandronate or risedronate) [115]. A total of 1,703 women were randomized to either denosumab 60 mg subcutaneously every six months or oral bisphosphonate 150 mg monthly. In both the overall and higher-risk populations, denosumab was associated with greater gains in BMD at 12 months than oral bisphosphonate at the total hip, femoral neck, and lumbar spine. Adverse events were generally similar between the two treatment groups [115].

### *Calcitonin*

Calcitonin is a hormone normally produced by the parafollicular cells of the thyroid gland. Salmon calcitonin is approved by the FDA for the treatment and prevention of osteoporosis in women who have been postmenopausal for at least five years; it has not been recommended as a first-line treatment [36]. In the proper dosages, it is an inhibitor of bone resorption [20; 23]. Calcitonin may be administered by intranasal spray or by a subcutaneous injection of 100 IU/day. Intranasal use has been shown to decrease vertebral fractures in patients with pre-existing fractures, but only at 200 IU/day, not at 100 IU or 400 IU/day [20; 21; 23]. Oral and inhaled forms of calcitonin are under development [23].

There is no good data regarding the use of calcitonin in reducing hip fractures or preventing any fractures in patients without pre-existing fracture [36]. Calcitonin may have a role in patients with acute vertebral fractures due to a possible analgesic effect and its decreased risk of gastrointestinal upset and venous thromboembolism associated with other agents [116]. It has been shown to preserve bone mass by about 3% in the first year of glucocorticoid therapy [117].

Adverse effects from the injectable form include nausea, back pain, frequent urination, arthralgias, and rash. The intranasal form has fewer side effects, which are primarily localized and include rhinitis and, rarely, epistaxis [20; 72; 118].

### Bone-Formation Agents

The original FDA-approved medications for osteoporosis were antiresorptives. Newer medications act instead to enhance bone formation by increasing the number and action of osteoblasts. The human PTH agents teriparatide and abaloparatide have been approved for use in the treatment of osteoporosis [71; 72].

### *Parathyroid Hormone*

PTH acts normally to increase bone resorption in response to low serum calcium levels; however, in intermittent doses, it has been shown to have a favorable impact on bone mineral density [23]. Teriparatide is a portion of human PTH, classified as PTH (1-34) and, as noted, has been approved by the FDA for the treatment of osteoporosis in postmenopausal women at high risk for a fracture. It also has been approved to increase bone mass in men with primary or hypogonadal osteoporosis who are at high risk for a fracture [20; 23; 37; 72; 119].

Teriparatide stimulates new bone formation by increasing the number and action of osteoblasts. Specifically, it increases the number of osteoblasts through the induction of osteoprogenitor cell differentiation in the bone marrow. In addition, it prevents osteoblast apoptosis. It is offered as a daily injection and recommended for use in patients with severe osteoporosis, especially those who have failed other treatments [72]. In a pivotal trial of more than 1,500 postmenopausal women, there was a 65% reduction in new vertebral fractures compared with placebo over 19 months of treatment. New nonvertebral fractures were reduced by 53% [20]. Ninety-six percent of women had an increase in BMD. Side effects included nausea, leg cramps, and dizziness [120].

Treatment with teriparatide is not recommended for more than 18 months to 2 years, nor should it be prescribed to patients with pre-existing hypercalcemia [72; 119]. Before it may be prescribed, it is necessary to obtain baseline measurements of calcium, uric acid, current PTH level, creatinine, and 25 hydroxyvitamin D to be certain that hypercalcemia is not present. These values should be re-examined periodically [72; 119]. Of note, there was an increase in the incidence of osteosarcoma in rats that was dependent on dose and duration of treatment, although no cases of osteosarcoma were reported in patients during the clinical trials. Teriparatide should not be prescribed for patients at increased risk for osteosarcoma, patients with Paget disease or unexplained elevations of alkaline phosphatase, or those who have undergone prior skeletal radiation therapy [20; 72; 119].

Because prior use of the bisphosphonates may interfere with the action of PTH (1–34), it has been recommended that teriparatide only be administered to bisphosphonate-naïve patients [72; 119]. Side effects include leg cramps, dizziness, nausea, cramps, pharyngitis, asthenia, and headache [20; 72].

Like teriparatide, abaloparatide is a portion of human PTH, classified as PTH (1–34) and, as noted, has been approved by the FDA for the treatment of osteoporosis in postmenopausal women at high risk for a fracture [71; 72]. Abaloparatide stimulates new bone formation by increasing the number and action of osteoblasts by acting as an agonist at the PTH1 receptor [72; 121; 122]. It is offered as a subcutaneous 80-mg daily injection [72]. As with teriparatide, abaloparatide therapy is not recommended for more than two years and is not recommended for patients with pre-existing hypercalcemia or an underlying hypercalcemic disorder (e.g., primary hyperparathyroidism) [72]. Before it is prescribed, it is necessary to obtain baseline measurements of calcium, uric acid, current PTH level, creatinine, and 25 hydroxyvitamin D to be certain that hypercalcemia is not present. These values should be re-examined periodically [72].

Abaloparatide has been shown to reduce the risk of new vertebral and nonvertebral fractures, major osteoporotic fractures, and clinical fractures, with a significant improvement in BMD at femoral neck, total hip, and lumbar spine [123; 124].

### *Romosozumab-aqqg*

Romosozumab-aqqg is a monoclonal antibody that blocks the effects of the protein sclerostin and works mainly by increasing new bone formation [135]. It is approved for the treatment of osteoporosis in postmenopausal women with a history of osteoporotic fracture, with multiple risk factors for fracture, or those who have failed or are intolerant to other osteoporosis therapies.

The result of two clinical trials involving more than 11,000 women with postmenopausal osteoporosis, one year of treatment with romosozumab-aqqg lowered the risk of vertebral fracture by 73% compared with placebo [135]. One dose consists of two injections, one immediately following the other, given once a month. The bone forming effect wanes after 12 doses, so more than 12 doses should not be used.

Romosozumab-aqqg has a boxed warning regarding an increase the risk of heart attack, stroke, and cardiovascular death, and it should not be used in patients who have had a heart attack or stroke within the previous year. Other possible adverse effects include joint pain, headache, and injection site reactions [135].

### *Sodium Fluoride*

Sodium fluoride is not currently a recommended treatment for osteoporosis based on the data available as well as significant side effects, including hyperostosis, gastrointestinal irritation, rash, and various neurologic complications. However, sodium fluoride does increase osteoblastic activity and has been shown to cause an increase in spine and hip bone mass [20; 119]. Initially, the new bone formed is poorly mineralized, but eventually it is replaced by the lamellar bone structure. Its effect on trabecular bone is more prominent than cortical bone. Significant effects on the rate of vertebral fracture have not been shown in any studies [21].

**Vitamin D Analogues**

Vitamin D causes increased gastrointestinal absorption of calcium, a function that is generally impaired in the elderly. Results from trials have shown decreased fracture rates in older patients taking vitamin D; it is often given in combination with calcium supplements in these patients [20]. The main concern with vitamin D supplementation is hypercalcemia, so calcium levels must be monitored. Vitamin D analogues also may cause gastrointestinal symptoms, erythema multiforme, and hyperphosphatemia. As noted, the common recommended daily dose of vitamin D is 800–1,000 IU, although there is not a clear consensus as to the optimal dose. Evidence indicates that higher intakes are safe and that some elderly patients will need at least 2,000 IU daily to maintain optimal serum levels [20]. As previously stated, the safe upper limit for vitamin D intake was increased in 2010 to 4,000 IU daily for adults [20].

Calcitriol is a synthetic vitamin D analogue that has been approved by the FDA for managing hypocalcemia and metabolic bone disease in patients on renal dialysis, as well as for those with hypoparathyroidism [20]. There has not been a demonstrated reduction in osteoporotic fractures from the use of calcitriol [20; 119].

Strontium ranelate is an investigational drug that inhibits bone resorption and stimulates bone formation [125; 126]. Large trials of strontium ranelate use in postmenopausal women with osteoporosis have shown a 40% to 50% reduction in the risk of vertebral fractures as well as a reduction in the risk of nonvertebral fractures; a separate review of the drug's efficacy concluded that it reduced vertebral fractures in postmenopausal women both with and without osteoporosis [127; 128; 129; 130; 131]. An open-label study examined the efficacy of strontium ranelate over 10 years in postmenopausal women with osteoporosis. Results indicate a continuous increase in BMD over the 10-year period and a lower incidence of both vertebral and nonvertebral fracture with use of strontium ranelate compared to placebo [132]. However, debate continues about whether the drug's effects on the vascular and neurologic systems are sufficient to limit or abandon its use [133]. Other agents, such as insulin-like growth factors and bone morphogenic proteins, are also undergoing further research.

Some data have suggested that medications to treat osteoporosis have been underused and that too little of what has been learned about bone health has been applied in practice [23]. Reasons for such low treatment rates include lack of knowledge of the recommended therapies and inappropriate work-up following a fracture diagnosis.

*Patient D's T-score from DXA of the hip is -2.5; she meets the WHO criteria for osteoporosis. Given that she is already experiencing symptoms, intervention is necessary. A review of diet is the first step. Patient D currently does not use any supplements because she believes she eats a healthy diet. However, further review with a dietitian reveals that she is below the recommended intake of calcium and vitamin D. Therefore, supplementation with both calcium and vitamin D should begin immediately. As noted earlier, Patient D tries to remain active, mostly involved in walking and gardening. These can be good aerobic exercises, depending on their intensity, and she should be encouraged to continue them. However, a weight-bearing exercise regimen should slowly be worked into her routine. Because she does have degenerative joint disease, a monitored exercise program should be initially pursued so that she focuses properly on form and does not cause any excess stress on her joints.*

*Medications should also be strongly considered, given her T-score as well as symptoms. SERMs and bisphosphonates should be the preferred medications. Estrogen replacement is not recommended.*

### TREATMENT MONITORING AND FOLLOW-UP

Because medications have side effects and proper diet/exercise may not be routinely followed, it is important to monitor treatment with BMD testing and to consider evaluating the level of the biochemical markers. There is no universally accepted agreement on treatment monitoring, including the utility of biochemical markers; however, some authorities have provided suggested guidelines for following patients being treated for osteoporosis [20; 37].

It has been noted that most treatment measures will produce minor increases in bone mass over the period of one year and that improvement may not be evident until after 24 months of treatment. In addition, most measurement errors are around 5%, so there will need to be improvement greater than 5% in bone mass to have any significance. Taking all of this into consideration, monitoring should occur every two years in most cases; however, the interval should be determined according to individual patient status [20; 34; 38].

## DIAGNOSING AND TREATING OSTEOPOROSIS PATIENTS WITH THE ASSISTANCE OF AN INTERPRETER

As a result of the evolving racial and immigration demographics in the United States, interaction with patients for whom English is not a native language is inevitable. Because patient education is such a vital aspect of the treatment and management of osteoporosis, it is each practitioner's responsibility to ensure that information and instructions are explained in such a way that allows for patient understanding. When there is an obvious disconnect in the communication process between the practitioner and patient due to the patient's lack of proficiency in the English language, an interpreter is required. (In many cases, the terms "interpreting" and "translating" are used interchangeably, but interpreting is specifically associated with oral communication while translating refers to written text.) While this may be easier said than done, due to institutional and/or patient barriers, the U.S. Department of Health and Human Services Office for Civil Rights has stated that denying adequate interpreter services to patients with limited English proficiency is a form of discrimination and that insufficient use of professional interpreters and inappropriate reliance on ad hoc interpreters may compromise patient care [134].

In this multicultural landscape, interpreters are a valuable resource to help bridge the communication and cultural gap between clients/patients and practitioners. Interpreters are more than passive agents who translate and transmit information back and forth from party to party. When they are enlisted and treated as part of the interdisciplinary clinical team, they serve as cultural brokers, who ultimately enhance the clinical encounter. In any case in which information regarding diagnostic procedures, treatment options, and medication/treatment measures are being provided, the use of an interpreter should be considered.

## CONCLUSION

Osteoporosis is a significant health problem. Along with osteopenia, it affects a very large portion of the population. Unfortunately, it is often a silent disease, because patients typically do not present with signs and symptoms until they actually experience an untoward event, such as a fracture. Clinicians and patients should understand the factors that heighten the risk for developing osteoporosis, including advanced age, certain ethnicities, family history, and female gender. Particular attention should be directed to modifiable risk factors, such as tobacco use, physical inactivity, nutritional deficiencies, and medication usage.

The good news is that osteoporosis can be detected before significant symptoms occur. A complete history and physical examination, followed by BMD testing, such as DXA or other modality, can identify the majority of patients with osteoporosis.

For patients who are diagnosed with osteoporosis or who are determined to be at risk, a plan of diet supplementation and frequent weight-bearing exercises may significantly improve bone structure. Numerous medications useful in the treatment of the condition exist, including the bisphosphonates, SERMs, and recombinant PTH. In addition, several new therapies are on the horizon. Estrogen replacement, which had in the past been recommended fairly universally to postmenopausal women, is now reserved for use in only very limited circumstances, based on studies that have demonstrated increases in certain cancers, stroke, and coronary artery disease [13; 74]. Prevention is critical, and patients should learn about diet, exercise, and medication use.

Finally, physicians and other providers should develop a greater understanding of osteoporosis and be more aggressive in addressing this topic. It is a disease that is increasing in prevalence and has significant morbidity, but also may often be treated with some success. Preventive measures should be discussed with patients earlier in life and not delayed until a patient is elderly.

## RESOURCES

**American Bone Health**
https://americanbonehealth.org

**International Osteoporosis Foundation**
http://www.iofbonehealth.org

**National Osteoporosis Foundation**
https://www.nof.org

**National Osteoporosis Society of the United Kingdom**
https://nos.org.uk

**Osteoporosis Canada**
https://osteoporosis.ca

**The NIH Osteoporosis and Related Bone Diseases National Resource Center**
https://www.bones.nih.gov

## FACULTY BIOGRAPHY

**John J. Whyte, MD, MPH**, is currently the Director of Professional Affairs and Stakeholder Engagement at the FDA's Center for Drug Evaluation and Research. Previously, Dr. Whyte served as the Chief Medical Expert and Vice President, Health and Medical Education at Discovery Channel, part of the media conglomerate Discovery Communications. In this role, Dr. Whyte developed, designed, and delivered educational programming that appeals to both a medical and lay audience.

Prior to this, Dr. Whyte was in the Immediate Office of the Director at the Agency for Healthcare Research Quality. He served as Medical Advisor/Director of the Council on Private Sector Initiatives to Improve the Safety, Security, and Quality of Healthcare. Prior to this assignment, Dr. Whyte was the Acting Director, Division of Medical Items and Devices in the Coverage and Analysis Group in the Centers for Medicare & Medicaid Services (CMS). CMS is the federal agency responsible for administering the Medicare and Medicaid programs. In his role at CMS, Dr.Whyte made recommendations as to whether or not the Medicare program should pay for certain procedures, equipment, or services. His division was responsible for durable medical equipment, orthotics/prosthetics, drugs/biologics/therapeutics, medical items, laboratory tests, and non-implantable devices. As Division Director as well as Medical Officer/Senior Advisor, Dr. Whyte was responsible for more national coverage decisions than any other CMS staff.

Dr. Whyte is a board-certified internist. He completed an internal medicine residency at Duke University Medical Center as well as earned a Master's of Public Health (MPH) in Health Policy and Management at Harvard University School of Public Health. Prior to arriving in Washington, Dr. Whyte was a health services research fellow at Stanford and attending physician in the Department of Medicine. He has written extensively in the medical and lay press on health policy issues.

## Works Cited


1. Wright NC, Looker AC, Saag KG, et al. The recent prevalence of osteoporosis and low bone mass in the United States based on bone mineral density at the femoral neck or lumbar spine. *J Bone Miner Res*. 2014;29(11):2520-2526.
2. National Osteoporosis Foundation. Osteoporosis Fast Facts. Available at https://cdn.nof.org/wp-content/uploads/2015/12/Osteoporosis-Fast-Facts.pdf. Last accessed October 1, 2018.
3. NIH Osteoporosis and Related Bone Diseases National Resource Center. The Surgeon General's Report on Bone Health and Osteoporosis: What It Means to You. Available at https://www.bones.nih.gov/health-info/bone/SGR/surgeon-generals-report. Last accessed October 1, 2018.
4. NIH Osteoporosis Foundation. Are You at Risk? Available at https://www.nof.org/preventing-fractures/general-facts/bone-basics/are-you-at-risk/. Last accessed October 1, 2018.
5. Bethel M, Lohr KM, Carbone LD, et al. Osteoporosis. Available at https://emedicine.medscape.com/article/330598-overview. Last accessed October 1, 2018.
6. Mauck KF, Clarke BL. Diagnosis, screening, prevention, and treatment of osteoporosis. *Mayo Clin Proc*. 2006;81(5):662-672.
7. Khoo BC, Brown K, Cann C, et al. Comparison of QCT-derived and DXA-derived areal bone mineral density and T scores. *Osteoporos Int*. 2009;20(9):1539-1545.
8. Link TM. Axial and peripheral QCT. In: Guglielmi G (ed). *Osteoporosis and Bone Densitometry Measurements*. New York, NY: Springer Heidelberg; 2013: 123-132.
9. Kraenzlin ME, Kraenzlin CA, Meier C, Giunta C, Steinmann B. Automated HPLC assay for urinary collagen cross-links: effect of age, menopause, and metabolic bone diseases. *Clin Chem*. 2008;54(9):1546-1553.
10. Qaseem A, Snow V, Shekelle P, Hopkins R Jr, Forciea MA, Owens DK. Pharmacologic treatment of low bone density or osteoporosis to prevent fractures: a clinical practice guideline from the American College of Physicians. *Ann Intern Med*. 2008;149(6):404-415.
11. National Osteoporosis Foundation. Prevention and Healthy Living. Available at https://www.nof.org/preventing-fractures/prevention/prevention-and-healthy-living. Last accessed October 1, 2018.
12. Sandhu SK, Hampson G. The pathogenesis, diagnosis, investigation and management of osteoporosis. *J Clin Pathol*. 2011;64(12):1042-1050.
13. Rossouw JE, Anderson GL, Prentice RL, et al. Risks and benefits of estrogen plus progestin in healthy postmenopausal women: principal results from the Women's Health Initiative randomized controlled trial. *JAMA*. 2002;288(3):321-333.
14. National Heart, Lung, and Blood Institute. Women's Health Initiative. Available at https://www.nhlbi.nih.gov/science/womens-health-initiative-whi. Last accessed October 1, 2018.
15. Consensus development conference: prophylaxis and treatment of osteoporosis. *Am J Med*. 1991;90(1):107-110.
16. Consensus development conference: diagnosis, prophylaxis, and treatment of osteoporosis. *Am J Med*. 1993;94(6):646-650.
17. World Health Organization. Assessment of Fracture Risk and Its Application to Screening for Postmenopausal Osteoporosis. Available at http://apps.who.int/bookorders/anglais/detart1.jsp?codlan=1&codcol=10&codcch=843. Last accessed October 1, 2018.
18. McClung MR. Assessing Fracture Risk in Individual Patients. Available at https://www.jwatch.org/wh200708300000001/2007/08/30/assessing-fracture-risk-individual-patients. Last accessed October 1, 2018.
19. World Health Organization. WHO Scientific Group on the Assessment of Osteoporosis at Primary Health Care Level. Available at http://www.who.int/chp/topics/Osteoporosis.pdf. Last accessed October 1, 2018.
20. National Osteoporosis Foundation. *Clinician's Guide to Prevention and Treatment of Osteoporosis*. Washington, DC: National Osteoporosis Foundation; 2014.
21. NIH Consensus Development Panel on Osteoporosis Prevention, Diagnosis, and Therapy. Osteoporosis prevention, diagnosis, and therapy. *JAMA*. 2001;285(6):785-795.
22. National Osteoporosis Foundation. 54 Million Americans Affected by Osteoporosis and Low Bone Mass. Available at https://www.nof.org/news/54-million-americans-affected-by-osteoporosis-and-low-bone-mass. Last accessed October 1, 2018.
23. Office of the Surgeon General. Bone Health and Osteoporosis: A Report of the Surgeon General. Available at https://www.ncbi.nlm.nih.gov/books/NBK45513. Last accessed October 1, 2018.
24. NIH Osteoporosis and Related Bone Diseases National Resource Center. Osteoporosis. Available at https://www.bones.nih.gov/health-info/bone/osteoporosis. Last accessed October 1, 2018.
25. Dawson-Hughes B, Tosteson ANA, Melton LJ III, et al. Implications of absolute fracture risk assessment for osteoporosis practice guidelines in the USA. *Osteoporos Int*. 2008;19(4):449-458.
26. Campion JM, Maricic MJ. Osteoporosis in men. *Am Fam Physician*. 2003;67(7):1521-1526.
27. Jenkins MR, Denison AV. Smoking status as a predictor of hip fracture risk in postmenopausal women of Northwest Texas. *Prev Chronic Dis*. 2008;5(1):A09.
28. Theodorou SJ, Theodorou DJ, Sartoris DJ. Osteoporosis and fractures: the size of the problem. *Hosp Med*. 2003;64(2):87-91.
29. Hallberg I, Rosenqvist AM, Kartous L, Lofman O, Wahlstrom O, Toss G. Health-related quality of life after osteoporotic fractures. *Osteoporos Int*. 2004;15(10):834-841.

30. Randell AG, Nguyen TV, Bhalerao N, Silverman SL, Sambrook PN, Eisman JA. Deterioration in quality of life following hip fracture: a prospective study. *Osteoporos Int*. 2000;11(5):460-466.
31. Shevde NK, Bendixen AC, Dienger KM, Pike JW. Estrogens suppress RANK ligand-indiced osteoclast differentiation via a stromal cell independent mechanism involving c-Jun repression. *Proc Natl Acad Sci U S A*. 2000;97(14):7829-7834.
32. International Osteoporosis Foundation. Who's At Risk? Available at http://www.iofbonehealth.org/whos-risk. Last accessed October 1, 2018.
33. Moayyeri A, Luben RN, Bingham SA, Welch AA, Wareham NJ, Khaw KT. Measured height loss predicts fractures in middle-aged and older men and women: the EPIC-Norfolk prospective population study. *J Bone Miner Res*. 2008;23(3):425-432.
34. International Society for Clinical Densitometry. ISCD Official Positions. Available at http://www.iscd.org/official-positions/official-positions. Last accessed October 1, 2018.
35. Stein JH (ed). *Internal Medicine*. 5th ed. St Louis, MO: Mosby; 1998.
36. The North American Menopause Society. Management of osteoporosis in postmenopausal women: 2010 position statement of The North American Menopause Society. *Menopause*. 2010;17(1):25-54.
37. Goodman NF, Cobin RH, Ginzburg SB, et al. American Association of Clinical Endocrinologists medical guidelines for clinical practice for the diagnosis and treatment of menopause: executive summary of recommendations. *Endocr Pract*. 2011;17(6):949-954.
38. National Osteoporosis Foundation. Bone Density Exam/Testing. Available at https://www.nof.org/patients/diagnosis-information/bone-density-examtesting. Last accessed October 1, 2018.
39. Khaw KT, Reeve J, Luben R, et al. Prediction of total and hip fracture risk in men and women by quantitative ultrasound of the calcaneus: EPIC-Norfolk prospective population study. *Lancet*. 2004;363(9404):197-202.
40. *ACR Appropriateness Criteria: Osteoporosis and Bone Mineral Density*. Reston, VA: American College of Radiology; 2016.
41. Yates AJ, Ross PD, Lydick E, Epstein RS. Radiographic absorptiometry in the diagnosis of osteoporosis. *Am J Med*. 1995;98(2A):41S-47S.
42. Nawaz Khan A, MacDonald S. Involutional Osteoporosis Imaging. Available at https://emedicine.medscape.com/article/393602-overview. Last accessed October 1, 2018.
43. Old JL, Calvert M. Vertebral compression fractures in the elderly. *Am Fam Physician*. 2004;69(1):111-116.
44. Cadarette SM, Jaglal SB, Murray TM, et al. Evaluation of decision rules for referring women for bone densitometry by dual-energy x-ray absorptiometry. *JAMA*. 2001;286(1):57-63.
45. Crandall CJ. Risk assessment tools for osteoporosis screening in postmenopausal women: a systematic review. *Curr Osteoporos Rep*. 2015;13(5):287-301.
46. Richards JS, Lazzari AA, Teves Qualler DA, Desale S, Howard R, Kerr GS. Validation of the Osteoporosis Self-Assessment Tool in U.S. male veterans. *J Clin Densitom*. 2014;17(1):32-37.
47. Skedros JG, Sybrowsky CL, Stoddard GJ. The Osteoporosis Self-Assessment Screening Tool: a useful tool for the orthopaedic surgeon. *J Bone Joint Surg Am*. 2007;89(4):765-772.
48. International Osteoporosis Foundation. FRAX Resources. Available at http://www.iofbonehealth.org/osteoporosis-musculoskeletal-disorders/osteoporosis/diagnosis/frax-information-and-resources. Last accessed October 1, 2018.
49. U.S. Preventive Services Task Force. Osteoporosis: Screening. Available at https://www.uspreventiveservicestaskforce.org/Page/Document/UpdateSummaryFinal/osteoporosis-screening1. Last accessed October 1, 2018.
50. Cheung AM, Feig DS, Kapral M, et al. Prevention of osteoporosis and osteoporotic fractures in postmenopausal women: recommendation statement from the Canadian Task Force on Preventive Health Care. *CMAJ*. 2004;170(11):1665-1667.
51. Morris CA, Cheng H, Cabral D, Solomon DH. Predictors of screening and treatment of osteoporosis: a structured review of the literature. *Endocrinologist*. 2004;14(2):70-75.
52. Smith MD, Ross W, Ahern MJ. Missing a therapeutic window of opportunity: an audit of patients attending a tertiary teaching hospital with potentially osteoporotic hip and wrist fractures. *J Rheumatol*. 2001;28(11):2504-2508.
53. Hayes BL, Curtis JR, Laster A, et al. Osteoporosis care in the United States after declines in reimbursements for DXA. *J Clin Densitom*. 2010;13(4):352-360.
54. McAdam-Marx C, Unni S, Ye X, Nelson S, Nickman NA. Effect of Medicare reimbursement reduction for imaging services on osteoporosis screening rates. *J Am Geriatr Soc*. 2012;60(3):511-516.
55. Kim SJ, Lee JH, Kim S, et al. Associations between the 2007 Medicare reimbursement reduction for bone mineral density testing and osteoporosis drug therapy patterns of female Medicare beneficiaries. *Patient Prefer Adherence*. 2014;8:909-915.
56. Yoo JW, Nakagawa S, Kim S. Effect of reimbursement reductions on bone mineral density testing for female Medicare beneficiaries. *J Womens Health (Larchmt)*. 2012;21(11):1144-1148.
57. Camacho PM, Petak SM, Binkley N, et al. American Association of Clinical Endocrinologists and American College of Endocrinology for clinical practice guidelines for the diagnosis and treatment of postmenopausal osteoporosis. *Endocr Pract*. 2016;22(Suppl 4):1-42.
58. Licata AA. Diagnosing primary osteoporosis: it's more than a T-score. *Cleve Clin J Med*. 2006;73(5):473-476.

59. National Institutes of Health, Office of Dietary Supplements. Calcium. Available at https://ods.od.nih.gov/factsheets/Calcium-Consumer. Last accessed October 1, 2018.
60. Al-Anazi AF, Qureshi VF, Javaid K, Qureshi S. Preventive effects of phytoestrogens against postmenopausal osteoporosis as compared to the available therapeutic choices: an overview. *J Nat Sci Biol Med*. 2011;2(2):154-163.
61. Reinwald S, Weaver CM. Soy isoflavones and bone health: a double-edge sword? *J Nat Prod*. 2006;69(3):450-459.
62. Johnson EB, Muto MG, Yanushpolsky EH, Mutter GL. Phytoestrogen supplementation and endometrial cancer. *Obstet Gynecol*. 2001;98(5 Pt 2):947-950.
63. Obermeyer WR, Musser SM, Betz JM, Casey RE, Pohland AE, Page SW. Chemical studies of phytoestrogens and related compounds in dietary supplements: flax and chaparral. *Proc Soc Exp Biol Med*. 1995;208(1):6-12.
64. Albertazzi P, Purdie D. The nature and utility of the phytoestrogens: a review of the evidence. *Maturitas*. 2002;42(3):173-185.
65. Geller SE, Studee L. Botanical and dietary supplements for menopausal symptoms: what works, what does not. *J Womens Health (Larchmt)*. 2005;14(7):634-649.
66. Lagari VS, Levis S. Phytoestrogens in the prevention of postmenopausal bone loss. *J Clin Densitom*. 2013;6(4):445-449.
67. eMedTV. Phytoestrogens. Available at http://osteoporosis.emedtv.com/phytoestrogens/phytoestrogens.html. Last accessed October 1, 2018.
68. Atkinson C, Compston JE, Day NE, Dowsett M, Bingham SA. The effects of phytoestrogen isoflavones on bone density in women: a double-blind, randomized, placebo-controlled study. *Am J Clin Nutri*. 2004;79(2):326-333.
69. Cook A, Pennington G. Phytoestrogen and multiple vitamin/mineral effects on bone mineral density in early postmenopausal women: a pilot study. *J Womens Health Gend Based Med*. 2002;11(1):53-60.
70. Zheng X, Lee SK, Chun OK. Soy isoflavones and osteoporotic bone loss: a review with an emphasis on modulation of bone remodeling. *J Med Food*. 2016;19(1):1-14.
71. Dede AD, Makras P, Anastasilakis AD. Investigational anabolic agents for the treatment of osteoporosis: an update on recent developments. *Expert Opin Investig Drugs*. 2017;26(10):1137-1144.
72. LexiComp Online. Available at http://online.lexi.com. Last accessed October 1, 2018.
73. Qaseem A, Forciea MA, McLean RM, et al for the Clinical Guidelines Committee of the American College of Physicians. Treatment of low bone density or osteoporosis to prevent fractures in men and women: a clinical practice guideline from the American College of Physicians. *Ann Intern Med*. 2017;166(11):818-839.
74. Hulley S, Furberg C, Barrett-Connor E, et al. Noncardiovascular disease outcomes during 6.8 years of hormone therapy: Heart and Estrogen/progestin Replacement Study follow-up (HERS II). *JAMA*. 2002;288(1):58-66.
75. U.S. Preventive Services Task Force. Hormone Therapy in Postmenopausal Women: Primary Prevention of Chronic Conditions. Available at https://www.uspreventiveservicestaskforce.org/Page/Document/UpdateSummaryFinal/menopausal-hormone-therapy-preventive-medication1. Last accessed October 1, 2018.
76. Rey JR, Cervino EV, Rentero ML, Crespo EC, Alvaro AO, Casillas M. Raloxifene: mechanism of action, effects on bone tissue, and applicability in clinical traumatology practice. *Open Orthop J*. 2009;3:14-21.
77. Cranney A, Adachi JD. Benefit-risk assessment of raloxifene in postmenopausal osteoporosis. *Drug Saf*. 2005;28(8):721-730.
78. Stefanick ML. Risk-benefit profiles of raloxifene for women. *N Eng J Med*. 2006;355(2):190-192.
79. Cummings SR, Eckert S, Krueger KA, et al. The effect of raloxifene on risk of breast cancer in postmenopausal women: results from the MORE randomized trial. *JAMA*. 1999;281(23):2189-2197.
80. Barrett-Connor E, Mosca L, Collins P, et al. Effects of raloxifene on cardiovascular events and breast cancer in postmenopausal women. *N Eng J Med*. 2006;355(2):125-137.
81. Cummings SR, Ettinger B, Delmas PD, et al. The effects of tibolone in older postmenopausal women. *N Engl J Med*. 2008;359(7):697-708.
82. European Medicines Agency. Conbriza. Available at https://www.ema.europa.eu/medicines/human/EPAR/conbriza. Last accessed October 1, 2018.
83. Silverman SL, Christiansen C, Genant HK, et al. Efficacy of bazedoxifene in reducing new vertebral fracture risk in postmenopausal women with osteoporosis: results from a 3-year, randomized, placebo-, and active-controlled clinical trial. *J Bone Miner Res*. 2008;23(12):1923-1934.
84. Drugs@FDA. Label and Approval History: Duavee. Available at https://www.accessdata.fda.gov/scripts/cder/daf/index.cfm?event=overview.process&ApplNo=022247. Last accessed October 1, 2018.
85. Allen CS, Yeung JH, Vandermeer B, Homik J. Bisphosphonates for steroid-induced osteoporosis. *Cochrane Database Syst Rev*. 2016;10:CD001347.
86. U.S. Food and Drug Administration. Update of Safety Review Follow-Up to the October 1, 2007 Early Communication About the Ongoing Safety Review of Bisphosphonates. Available at https://wayback.archive-it.org/7993/20170112032108/http://www.fda.gov/Drugs/DrugSafety/PostmarketDrugSafetyInformationforPatientsandProviders/DrugSafetyInformationforHeathcareProfessionals/ucm136201.htm. Last accessed October 1, 2018.

87. Rosen CJ, Hochberg MC, Bonnick SL, et al. Treatment with once-weekly alendronate 70 mg compared with once-weekly risedronate 35 mg in women with postmenopausal osteoporosis: a randomized double-blind study. *J Bone Miner Res*. 2005;20:141-151.

88. Bonnick S, Saag KG, Kiel DP, et al. Comparison of weekly treatment of postmenopausal osteoporosis with alendronate versus risedronate over two years. *J Clin Endocrinol Metab*. 2006;91:2631-2637.

89. Rosen HN. The Use of Bisphosphonates in Postmenopausal Women with Osteoporosis. Available at https://www.uptodate.com/contents/the-use-of-bisphosphonates-in-postmenopausal-women-with-osteoporosis. Last accessed October 1, 2018.

90. Harris ST, Watts NB, Genant HK, et al. Effects of risedronate treatment on vertebral and nonvertebral fractures in women with postmenopausal osteoporosis: a randomized controlled trial. Vertebral Efficacy With Risedronate Therapy (VERT) Study Group. *JAMA*. 1999;282(14):1344-1352.

91. Byun JH, Jang S, Lee S, et al. The efficacy of bisphosphonates for prevention of osteoporotic fracture: an update meta-analysis. *J Bone Metab*. 2017;24(1):37-49.

92. Black DM, Schwartz AV, Ensrud KE, et al. Effects of continuing or stopping alendronate after 5 years of treatment: the Fracture Intervention Trial Long-Term Extension (FLEX): a randomized trial. *JAMA*. 2006;296(24):2927-2938.

93. Schwartz AV, Bauer DC, Cummings SR, et al. Efficacy of continued alendronate for fractures in women with and without prevalent vertebral fracture: the FLEX trial. *J Bone Miner Res*. 2010;25(5):976-982.

94. Bauer DC, Schwartz A, Palermo L, et al. Fracture prediction after discontinuation of 4 to 5 years of alendronate therapy: the FLEX study. *JAMA Intern Med*. 2014;174(7):1126-1134.

95. Ensrud KE, Barrett-Connor EL, Schwartz A, et al. Randomized trial of effect of alendronate continuation versus discontinuation in women with low BMD: results from the Fracture Intervention Trial long-term extension. *J Bone Miner Res*. 2004;19(8):1259-1269.

96. Tandon VR, Sharma S, Mahajan A. Bisphosphonate drug holidays: can we recommend currently? *J Midlife Health*. 2014;5(3):111-114.

97. McClung M. Controversies in osteoporosis management: concerns about bisphosphonates and when are "drug holidays" required? *Clin Obstet Gynecol*. 2013;56(4):743-748.

98. Diab DL, Watts NB. Use of drug holidays in women taking bisphosphonates. *Menopause*. 2014;21(2):195-197.

99. Black DM, Cummings SR, Karpf DB, et al. Randomized trial of effect of alendronate on risk of fracture in women with existing vertebral fractures. *Lancet*. 1996;348(9041):1535-1541.

100. Roux C, Binkley N, Boonen S, et al. Vitamin D status and bone mineral density changes during alendronate treatment in postmenopausal osteoporosis. *Calcif Tissue Int*. 2014;94(2):153-157.

101. Physician's Desk Reference. Available at http://www.pdr.net. Last accessed October 1, 2018.

102. Ascott-Evans BH, Guanabens N, Kivinen S, et al. Alendronate prevents loss of bone density associated with discontinuation of hormone replacement therapy. *Arch Intern Med*. 2003;163(7):789-794.

103. Bone HG, Greenspan SL, McKeever C, et al. Alendronate and estrogen effects in postmenopausal women with low bone mineral density. *J Clin Endocrinol Metab*. 2000;85(2):720-726.

104. Greenspan SL, Emkey RD, Bone HG, et al. Significant differential effects of alendronate, estrogen, or combination therapy on the rate of bone loss after discontinuation of treatment of postmenopausal osteoporosis: a randomized, double-blind, placebo-controlled trial. *Ann Intern Med*. 2002;137(11):875-883.

105. Wasnich RD, Bagger YZ, Hosking DJ, et al. Changes in bone density and turnover after alendronate or estrogen withdrawal. *Menopause*. 2004;11(6 Pt 1):622-630.

106. Harris ST, Watts NB, Genank HK, et al. Effects of risedronate treatment on vertebral and nonvertebral fractures in women with postmenopausal osteoporosis: a randomized control trial. *JAMA*. 1999;282(14):1344-1352.

107. McClung MR, Zanchetta JR, Racewicz A, et al. Efficacy and safety of risedronate 150 mg once a month in the treatment of postmenopausal osteoporosis: 2-year data. *Osteoporos Int*. 2013;24(1):293-299.

108. McClung MR, Lewiecki M, Cohen SB, et al. Denosumab in postmenopausal women with low bone mineral density. *N Engl J Med*. 2006;354(8):821-831.

109. Lipton A, Steger GG, Figueroa J, et al. Randomized active-controlled phase II study of denosumab efficacy and safety in patients with breast cancer-related bone metastases. *J Clin Oncol*. 2007;25(28):4431-4437.

110. Daily Med. Denosumab. Available at https://dailymed.nlm.nih.gov/dailymed/search.cfm?labeltype=all&query=denosumab. Last accessed October 1, 2018.

111. National Cancer Institute. Denosumab. Available at https://www.cancer.gov/about-cancer/treatment/drugs/denosumab?redirect=true. Last accessed October 1, 2018.

112. McClung M. Role of RANKL inhibition in osteoporosis. *Arthritis Res Ther*. 2007;9(Suppl 1):S3.

113. Cummings SR, San Martin J, McClung MR, et al. Denosumab for prevention of fractures in postmenopausal women with osteoporosis. *N Engl J Med*. 2009;361(8):756-765.

114. Zhou Z, Chen C, Zhang J, et al. Safety of denosumab in postmenopausal women with osteoporosis or low bone mineral density: a meta-analysis. *Int J Clin Exp Pathol*. 2014;7(5):2113-2122.

115. Brown JP, Roux C, Ho PR, et al. Denosumab significantly increases bone mineral density and reduces bone turnover compared with monthly oral ibandronate and risedronate in postmenopausal women who remained at higher risk for fracture despite previous suboptimal treatment with an oral bisphosphonate. *Osteoporos Int*. 2014;25(7):1953-1961.

116. Altkorn D, Vokes T. Treatment of postmenopausal osteoporosis. *JAMA*. 2001;285(11):1415-1418.

117. Cranney A, Welch V, Adachi JD, et al. Calcitonin for the treatment and prevention of corticosteroid-induced osteoporosis. *Cochrane Database Syst Rev*. 2000;(1):CD001983.

118. North American Menopause Society. Management of osteoporosis in postmenopausal women: 2006 position statement of The North American Menopause Society. *Menopause*. 2006;13(3):340-367.

119. Hodsman A, Papaioannou A, Cranney A. Clinical practice guidelines for the use of parathyroid hormone in the treatment of osteoporosis. *CMAJ*. 2006;175(1):48-51.

120. Neer RM, Arnaud CD, Zanchetta JR, et al. Effect of parathyroid hormone (1-34) on fractures and bone mineral density in postmenopausal women with osteoporosis. *N Engl J Med*. 2001;344(19):1434-1441.

121. Harsløf T, Langdahl BL. New horizons in osteoporosis therapies. *Curr Opin Pharmacol*. 2016;28:38-42.

122. Leder BZ. Parathyroid hormone and parathyroid hormone-related protein analogs in osteoporosis therapy. *Curr Osteoporos Rep*. 2017:

123. Pietrogrande L, Raimondo E. Abaloparatide for the treatment of postmenopausal osteoporosis. *Drugs Today (Barc)*. 2018;54(5):293-303.

124. Miller PD, Hattersley G, Riis BJ, et al. Effect of abaloparatide vs placebo on new vertebral fractures in postmenopausal women with osteoporosis: a randomized clinical trial. *JAMA*. 2016;316(7):722-733.

125. Neuprez A, Hiligsmann M, Scholtissen S, Bruyere O, Reginster JY. Strontium ranelate: the first agent of a new therapeutic class in osteoporosis. *Adv Ther*. 2008;25(12):1235-1256.

126. Reginster JY, Deroisy R, Neuprez A, Hiligsmann M, Zegels B, Bruyere O. Strontium ranelate: new data on fracture prevention and mechanisms of action. *Curr Osteoporos Rep*. 2009;7(3):96-102.

127. O'Donnell S, Cranney A, Wells GA, Adachi JD, Reginster JY. Strontium ranelate for preventing and treating postmenopausal osteoporosis. *Cochrane Database Syst Rev*. 2006;(4):CD005326.

128. Meunier PJ, Roux C, Seeman E, et al. The effects of strontium ranelate on the risk of vertebral fracture in women with postmenopausal osteoporosis. *N Engl J Med*. 2004;350(5):459-468.

129. Reginster JY, Seeman E, De Vernejoul MC, et al. Strontium ranelate reduces the risk of nonvertebral fractures in postmenopausal women with osteoporosis: treatment of peripheral osteoporosis (TROPOS) study. *J Clin Endocrinol Metab*. 2005;90(5):2816-2822.

130. Menunier PJ, Roux C, Ortolani S, et al. Effects of long-term strontium ranelate treatment on vertebral fracture risk in postmenopausal women with osteoporosis. *Osteoporos Int*. 2009;20(10):1663-1673.

131. Reginster JY, Felsenberg D, Boonen S, et al. Effects of long-term strontium ranelate treatment on the risk of nonvertebral and vertebral fractures in postmenopausal osteoporosis: results of a five-year, randomized, placebo-controlled trial. *Arthritis Rheum*. 2008;58(6):1687-1695.

132. Reginster JY, Kaufman JM, Goemaere S, et al. Maintenance of antifracture efficacy over 10 years with strontium ranelate in postmenopausal osteoporosis. *Osteoporos Int*. 2012;23(3):1115-1122.

133. Trivedi R, Mithal A, Chattopadhyay N. Anabolics in osteoporosis: the emerging therapeutic tool. *Curr Mol Med*. 2010;10(1):14-28.

134. Lee KC, Winickoff JP, Kim MK, et al. Resident physicians' use of professional and nonprofessional interpreters: a national survey. *JAMA*. 2006;296(9):1050-1053.

135. U.S. Food and Drug Administration. FDA Approves New Treatment for Osteoporosis in Postmenopausal Women at High Risk of Fracture. Available at https://www.fda.gov/NewsEvents/Newsroom/PressAnnouncements/ucm635653.htm. Last accessed April 22, 2019.

## *Evidence-Based Practice Recommendations Citations*

Camacho PM, Petak SM, Binkley N, et al. American Association of Clinical Endocrinologists and American College of Endocrinology clinical practice guidelines for the diagnosis and treatment of postmenopausal osteoporosis—2016. *Endocr Pract*. 2016;22(9):1111-1118. Available at https://www.aace.com/files/postmenopausal-guidelines.pdf. Last accessed October 25, 2018.

U.S. Preventive Services Task Force, Curry SJ, Krist AH, et al. Screening for osteoporosis to prevent fractures: US Preventive Services Task Force recommendation statement. *JAMA*. 2018;319(24):2521-2531. Available at https://jamanetwork.com/journals/jama/fullarticle/2685995. Last accessed October 25, 2018.

Allen S, Forney-Gorman A, Homan M, Kearns A, Kramlinger A, Sauer M. *Diagnosis and Treatment of Osteoporosis*. Bloomington, MN: Institute for Clinical Systems Improvement; 2017. Available at https://www.icsi.org/_asset/vnw0c3/Osteo.pdf. Last accessed October 25, 2018.

# *Alzheimer Disease*

## HOW TO RECEIVE CREDIT

- Read the enclosed course.
- Complete the questions at the end of the course.
- Return your completed Evaluation to NetCE by mail or fax, or complete online at www.NetCE.com. (If you are a physician, behavioral health professional, or Florida nurse, please return the included Answer Sheet/Evaluation.) Your postmark or facsimile date will be used as your completion date.
- Receive your Certificate(s) of Completion by mail, fax, or email.

### *Faculty*

**Joan Needham, MSEd, RNC**, was a graduate of Copley Memorial Hospital School of Nursing. She earned a baccalaureate degree in nursing from the College of Saint Francis in 1977 and a Master's degree in adult education from Northern Illinois University in 1981. She was certified in gerontological nursing by the American Nurses Association and worked in nursing education at various colleges in Illinois for many years. Regrettably, Ms. Needham passed away in 2010.

**John M. Leonard, MD**, Professor of Medicine Emeritus, Vanderbilt University School of Medicine, completed his post-graduate clinical training at the Yale and Vanderbilt University Medical Centers before joining the Vanderbilt faculty in 1974. He is a clinician-educator and for many years served as director of residency training and student educational programs for the Vanderbilt University Department of Medicine. Over a career span of 40 years, Dr. Leonard conducted an active practice of general internal medicine and an inpatient consulting practice of infectious diseases.

### *Faculty Disclosure*

Contributing faculty, Joan Needham, MSEd, RNC, has disclosed no relevant financial relationship with any product manufacturer or service provider mentioned.

Contributing faculty, John M. Leonard, MD, has disclosed no relevant financial relationship with any product manufacturer or service provider mentioned.

### *Division Planners*

John V. Jurica, MD, MPH
Jane C. Norman, RN, MSN, CNE, PhD
Alice Yick Flanagan, PhD, MSW
James Trent, PhD

### *Division Planners Disclosure*

The division planners have disclosed no relevant financial relationship with any product manufacturer or service provider mentioned.

### *Audience*

This course is designed for clinicians who come in contact with patients with Alzheimer disease in hospitals, long-term care facilities, home health care, and the office.

### *Accreditations & Approvals*

JOINTLY ACCREDITED PROVIDER™ INTERPROFESSIONAL CONTINUING EDUCATION

In support of improving patient care, NetCE is jointly accredited by the Accreditation Council for Continuing Medical Education (ACCME), the Accreditation Council for Pharmacy Education (ACPE), and the American Nurses Credentialing Center (ANCC), to provide continuing education for the healthcare team.

As a Jointly Accredited Organization, NetCE is approved to offer social work continuing education by the Association of Social Work Boards (ASWB) Approved Continuing Education (ACE) program. Organizations, not individual courses, are approved under this program. State and provincial regulatory boards have the final authority to determine whether an individual course may be accepted for continuing education credit. NetCE maintains responsibility for this course.

American Psychological Association

Continuing Education (CE) credits for psychologists are provided through the co-sponsorship of the American Psychological Association (APA) Office of Continuing Education in Psychology (CEP). The APA CEP Office maintains responsibility for the content of the programs.

NetCE has been approved by NBCC as an Approved Continuing Education Provider, ACEP No. 6361. Programs that do not qualify for NBCC credit are clearly identified. NetCE is solely responsible for all aspects of the programs.



*A complete Works Cited list begins on page 80.*

***Mention of commercial products does not indicate endorsement.***

***Designations of Credit***

NetCE designates this enduring material for a maximum of 15 *AMA PRA Category 1 Credit(s)™*. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Successful completion of this CME activity, which includes participation in the evaluation component, enables the participant to earn up to 15 MOC points in the American Board of Internal Medicine's (ABIM) Maintenance of Certification (MOC) program. Participants will earn MOC points equivalent to the amount of CME credits claimed for the activity. It is the CME activity provider's responsibility to submit participant completion information to ACCME for the purpose of granting ABIM MOC credit. Completion of this course constitutes permission to share the completion data with ACCME.

This activity has been designated for 15 Lifelong Learning (Part II) credits for the American Board of Pathology Continuing Certification Program.

Successful completion of this CME activity, which includes participation in the evaluation component, enables the learner to satisfy the Lifelong Learning requirement for the American Board of Ophthalmology's Maintenance of Certification program. It is the CME activity provider's responsibility to submit learning completion information to ACCME for the purpose of granting MOC credit.

Through an agreement between the Accreditation Council for Continuing Medical Education and the Royal College of Physicians and Surgeons of Canada, medical practitioners participating in the Royal College MOC Program may record completion of accredited activities registered under the ACCME's "CME in Support of MOC" program in Section 3 of the Royal College's MOC Program.

NetCE designates this continuing education activity for 15 ANCC contact hours.

IPCE CREDIT™

This activity was planned by and for the healthcare team, and learners will receive 15 Interprofessional Continuing Education (IPCE) credits for learning and change.

NetCE designates this continuing education activity for 18 hours for Alabama nurses.

AACN Synergy CERP Category A.

Social Workers participating in this intermediate to advanced course will receive 15 Clinical continuing education clock hours.

NetCE designates this continuing education activity for 15 CE credits.

NetCE designates this continuing education activity for 7.5 NBCC clock hours.

***Individual State Nursing Approvals***

In addition to states that accept ANCC, NetCE is approved as a provider of continuing education in nursing by: Alabama, Provider #ABNP0353 (valid through 11/21/2021); Arkansas, Provider #50-2405; California, BRN Provider #CEP9784; California, LVN Provider #V10662; California, PT Provider #V10842; District of Columbia, Provider #50-2405; Florida, Provider #50-2405; Georgia, Provider #50-2405; Kentucky, Provider #7-0054 (valid through 12/31/2021); South Carolina, Provider #50-2405; West Virginia, RN and APRN Provider #50-2405.

***Individual State Behavioral Health Approvals***

In addition to states that accept ASWB, NetCE is approved as a provider of continuing education by the following state boards: Alabama State Board of Social Work Examiners, Provider #0515; Florida Board of Clinical Social Work, Marriage and Family Therapy and Mental Health, Provider #50-2405; Illinois Division of Professional Regulation for Social Workers, License #159.001094; Illinois Division of Professional Regulation for Licensed Professional and Clinical Counselors, License #197.000185; Illinois Division of Professional Regulation for Marriage and Family Therapists, License #168.000190; Texas State Board of Social Work Examiners, Approval #3011.

***Special Approvals***

This activity is designed to comply with the requirements of California Assembly Bill 1195, Cultural and Linguistic Competency.

***About the Sponsor***

The purpose of NetCE is to provide challenging curricula to assist healthcare professionals to raise their levels of expertise while fulfilling their continuing education requirements, thereby improving the quality of healthcare.

Our contributing faculty members have taken care to ensure that the information and recommendations are accurate and compatible with the standards generally accepted at the time of publication. The publisher disclaims any liability, loss or damage incurred as a consequence, directly or indirectly, of the use and application of any of the contents. Participants are cautioned about the potential risk of using limited knowledge when integrating new techniques into practice.

***Disclosure Statement***

It is the policy of NetCE not to accept commercial support. Furthermore, commercial interests are prohibited from distributing or providing access to this activity to learners.

***Course Objective***

In order to increase and maintain a reasonable quality of life for patients with Alzheimer disease throughout the course of the disease, caregivers must have a thorough knowledge and understanding of the disease. The purpose of this course is to provide clinicians with the skills to care for patients with Alzheimer disease in any setting as part of the interdisciplinary team.

***Learning Objectives***

*Upon completion of this course, you should be able to:*

1. Outline the characteristics and impact of Alzheimer disease.
2. Summarize the pathophysiologic changes in the brain related to dementia and Alzheimer disease.
3. Describe the different types of memory.
4. List the clinical manifestations of Alzheimer disease in relation to stage of disease.
5. Identify the goals and components of the diagnostic workup, including assistance in diagnosing non-English-proficient patients.
6. Discuss the planning issues facing the family after the diagnosis is made.
7. Identify components of a therapeutic environment and devise a strategy for managing patients with Alzheimer disease.
8. Describe the appropriate pharmacologic and nonpharmacologic treatment modalities available for Alzheimer disease.
9. Discuss components of care in working with patients with Alzheimer disease, including rehabilitation and management of coexisting illnesses.
10. Describe interventions for impaired communication.
11. Identify and develop safeguards for issues of sexuality and intimacy that may occur in patients with Alzheimer disease.
12. Apply interventions for maintaining and enhancing nutrition for individuals with Alzheimer disease.
13. Describe successful approaches and skillfully apply interventions for managing specific behaviors common to patients with Alzheimer disease.
14. Compare the techniques used for reminiscing, reality orientation, and validation therapy.
15. Describe and facilitate the care required by those with end-stage Alzheimer disease.
16. Describe and utilize effective interventions for providing support to family caregivers of patients with Alzheimer disease.


Sections marked with this symbol include evidence-based practice recommendations. The level of evidence and/or strength of recommendation, as provided by the evidence-based source, are also included so you may determine the validity or relevance of the information. These sections may be used in conjunction with the course material for better application to your daily practice.

## INTRODUCTION

The number of adults 65 years of age and older in the United States has increased by 35% in the last decade and is anticipated to nearly double (to 94.7 million) by 2060 [2]. According to the U.S. Census Bureau data for 2018, 35% of adults older than 65 years of age report at least one disability [10].

Among common causes of disability in the elderly is dementia, the prevalence of which approximately doubles every 10 years after 60 years of age. The Pittsburg Cardiovascular Health Study–Cognition Study followed 532 individuals from 1998 (mean age: 79 years) to 2013 (mean age: 93 years) for death and dementia. Of the 160 subjects who were alive in 2013, all but 19 (88%) were found to have developed some degree of cognitive impairment or dementia [6].

Dementia is also encountered among younger adults. In an epidemiologic survey conducted in the United Kingdom focusing on the prevalence and causes of dementia in adults younger than 65 years of age, the prevalence of dementia in those 30 to 64 years of age was 54 per 100,000 [169]. The commonly reported causes were Alzheimer disease (AD) (34%), vascular disease (18%), and alcohol-associated encephalopathy (10%).

It is estimated that about 5.8 million people in the United States have AD, the most common form of dementia [4]. Approximately 1 in 10 persons 65 years of age or older have AD, and the prevalence increases with age, occurring in 3% of people 65 to 74 years of age, 17% of people 75 to 84 years of age, and 32% of people 85 years of age and older. Annual payments related to caring for and treating patients with AD and other forms of dementia total approximately $305 billion, and an estimated 18.6 billion hours of informal (unpaid) care, valued at $244 billion, were provided in 2019 [4]. Unpaid caregivers include children, partners/spouses, extended family, friends, and others in the community. The number of people with AD is expected to triple by 2050, primarily due to increases in longevity and the aged population.

(The first wave of baby boomers will reach 85 years of age in 2031.)

Although the disease was identified and named in the early part of the 20th century, little was known about AD until more recently. Now, there is much that can be done to increase and maintain a reasonable quality of life throughout the course of the disease. To accomplish this, caregivers must have a thorough knowledge and understanding of the disease. Successful management involves the "use of self" and application of behavioral interventions.

This course contains a significant amount of information that pertains to necessary care by the entire healthcare team. In order to support the purpose and unity of the interdisciplinary team, the course includes an appendix with specific nursing and caregiver interventions (***Appendix 1***) as well as information about special care facilities (***Appendix 2***).

The term "caregiver" is used throughout the text and refers to any person interacting with the patient with AD, including professional healthcare providers, nursing assistants, other members of the interdisciplinary team, or family members. Professional caregivers should accept the family as contributing members of the healthcare team.

## OVERVIEW

AD was first identified and named in 1906 by Dr. Alois Alzheimer, a German neuropathologist [1]. He had been treating a middle-aged woman who exhibited symptoms of memory loss and disorientation. Five years later, the patient died after suffering hallucinations and symptoms of dementia. The manifestations and course of the disease were so unusual that Dr. Alzheimer was unable to classify the disease into any existing category. Postmortem examination of the brain revealed microscopic and macroscopic lesions and distortions, including neuritic plaques and neurofibrillary tangles.

Although it has been more than a century since the disease was identified, it has been only within the last four decades that it has received recognition. In the past, symptoms were attributed to the "senility" of old age and victims were cared for at home. The problems of dementia were gradually recognized as an issue associated with the older population, but the nature of the disease and how to treat it were still a mystery. In the 1970s, researchers determined that people with AD had a neurochemical deficiency. This enabled them to study the disease in more detail and separate patients with AD from those with dementia of normal aging.

Clinicians and researchers began meeting with family members of patients with AD, leading to the founding of the Alzheimer's Disease and Related Disorders Association, now the Alzheimer's Association [15]. This group has been responsible for advancing research, public awareness, education, family support, and public policy changes [15]. Healthcare professionals now know that while there is a strong and as yet incompletely understood relationship between aging and AD, they are not the same condition [5]. The disease is recognized as a family, social, and economic problem.

AD is characterized by insidious, severe, and progressive cognitive impairment that is irreversible and eventually fatal. AD accounts for roughly 60% to 80% of all dementias in the United States [4]. It proceeds relentlessly, gradually destroying all cognitive functions. While the number of adults with AD doubles for every five years after 65 years of age, the disease is also seen (less frequently) in younger people [1].

There are two types of AD: familial and sporadic. Familial AD follows an autosomal dominant inheritance pattern, while sporadic AD has no known inheritance factor. Familial AD can be further classified as early-onset, when it occurs in individuals younger than 60 years of age, or late-onset, when it affects individuals older than 60 years of age [18]. Early-onset type occurs in only 4% to 5% of cases, generally affects people 30 to 60 years of age, and is considered hereditary [4; 18; 65]. There are roughly 200,000 people in the United States with early-onset AD [4; 65].

## IMPACT OF ALZHEIMER DISEASE

The impact of AD has been compared to tossing a pebble into a quiet pool—the ripple of the initial toss is just the beginning of the process. In that manner, a diagnosis of AD affects the patient first, moving on to touch family members and other caregivers. The disease has wide-reaching consequences personally, sociologically, and economically.

### Demographic Impact

According to the Centers for Disease Control and Prevention (CDC), approximately 122,019 patients with AD died in 2018, making it the fifth leading cause of death in adults 65 years of age or older [4]. Using mortality data provided by the National Vital Statistics System, a CDC analysis showed that the age-adjusted AD death rate per 100,000 population increased from 16.5 in 1999 to 25.4 in 2014 [172]. Rates were higher among women compared with men and among non-Hispanic whites compared with other racial/ethnic populations [172]. However, the findings in this report, which are derived from death certificates that list AD as the underlying cause of death, may underestimate the actual number of Alzheimer deaths in the United States.. Other organizations approximate the number of deaths directly caused or attributable to AD at 500,000 to 700,000; it is thought that the true number lies somewhere between the death certificate data and these higher numbers. Between 2000 and 2018, the annual number of deaths from AD more than doubled, increasing 146%, while the number of deaths from heart disease decreased 7.8% [4].

There are about 480,000 new cases of AD diagnosed each year [4]. As the aging population increases, so will these numbers. By 2030, it is estimated that about 615,000 new cases will be diagnosed each year, and by 2050, the number will increase to 959,000 [4]. Barring the development of effective new treatments, there will be an estimated 13.8 to 16 million patients with AD in 2050 [4].

### Economic Impact

As noted, the economic impact of AD is staggering. In 2020, the national cost of caring for persons with AD and other dementias is expected to reach $305 billion [4]. Projected costs for 2050 are $1.1 trillion annually (in 2020 dollars). Of the $305 billion annual direct and indirect costs of care, [4]:

- Medicare and Medicaid are expected to cover $206 billion, or 67%.
  - Medicare coverage for hospital and physicians' services accounts for $155 billion.
  - Medicaid costs associated with long-term nursing home care accounts for $51 billion.
- Out-of-pocket costs account for $66 billion.
- Other related costs (e.g., private insurance, managed care organizations, and uncompensated care) account for $33 billion.

With the help of family and friends, individuals with dementia often live at home. However, as the disease progresses, more care is needed. Depending on the severity of the disease progression, home care workers may be hired or the individual may be placed in a nursing home or assisted living residence. The only federal program that covers long-term nursing home care is Medicaid; however, in order to receive these benefits, the individual must be considered low income and have low assets [4]. Typically, income and assets dwindle and most individuals eventually qualify for Medicaid. Long-term care or private insurance may cover long-term nursing home care, but only if the policies are purchased before the onset of disease. These types of policies are only offered by a few insurers, have very high premiums, and are unaffordable for most. (Private insurance funding accounts for only 4% of total residential facility care costs.) The vast majority of nursing home residents with AD and other dementias depend on Medicaid to pay for their care [4]. However, even with Medicare coverage, families incur high out-of-pocket expenses as a result of premiums, deductibles, co-payments, and other healthcare costs not covered by Medicare [4].

AD sufferers often have comorbidities, including hypertension, congestive heart disease or failure, osteoarthritis, diabetes, peripheral vascular disease, chronic obstructive pulmonary disease, thyroid disease, and stroke. The cost of care for Medicare beneficiaries who suffer from AD and a comorbid condition is significantly higher, sometimes more than double the cost of care for Medicare beneficiaries without AD [4]. Hospitalization is also more likely for these patients than for those with the same condition but without AD.

**Impact on Family and Significant Others**

Patients are not the only ones affected by AD. Nearly 16 million family members, friends, and neighbors provide unpaid care for patients with AD [4]. Interventions that assist caregivers to cope and prevent caregiver burnout are as essential as interventions for the patient.

The patient with AD endures a continuing loss of mental acuity while the family witnesses the slow deterioration of their loved one. There are devastating mental, emotional, and physical changes that result in total dependence, and the need for care never stops. In the earlier stages, the patient may wander and get lost or get up frequently during the night. The sense of self is slipping away, but the patient is helpless to do anything about it. Familiar routine tasks become monumental chores, causing frustration and humiliation when they cannot be completed. In the later stages, maximum assistance with all activities of daily living is required.

Family members experience the same roller coaster ride of emotions as they too become frustrated, resentful, and often fatigued as they try to provide for the needs of their loved one. Marriages suffer as adult children with children of their own try to care for aging parents, or as one aging spouse feels responsible to meet every need of his or her increasingly dependent partner. Role reversals are common within a marriage or between parent and child. Caregivers have to take on the responsibilities previously assumed by the patients in addition to providing routine care. Caregivers must be strong, considerate, and able to anticipate problems. The support and care of friends may gradually subside as the situation continues for years.

## THE PHYSIOLOGY OF ALZHEIMER DISEASE

### ANATOMY AND PHYSIOLOGY ASSOCIATED WITH DEMENTIA

With the help of motor and sensory nerves, the brain integrates, regulates, initiates, and controls the functions of the whole body. These processes rely on successful chemical and electrical interactions. Thinking, remembering, and learning do not occur in one single place within the brain. These processes are shared by many structures, especially the cerebral cortex, which directs the most intricate and complicated functions of the brain.

To review, the longitudinal fissure divides the cerebrum into two hemispheres. The central and lateral fissures divide each hemisphere into four lobes: the frontal lobe, parietal lobe, temporal lobe, and occipital lobe. The frontal lobe is responsible for voluntary motor activity and higher intellectual functions involving conscious thought, such as planning, judgment, decision making, and problem solving. This lobe is the organizer and classifier of information. Damage to the frontal lobe results in inhibition of information processing. One section controls discrete body movements, while the centers for speech and smell are found in others. Lesions in the frontal region are linked to impulsiveness and hyperactivity. The Broca area governs verbal language skills and is located in the left frontal lobe.

The parietal lobe processes sensory input related to taste, position sense, touch, shape, and consistency of objects. The synthesis of auditory, visual, and somatic input into thought and memory is accomplished by the temporal lobe. Wernicke's area, which is responsible for the comprehension of written and verbal language, is located in the left temporal lobe.

The temporal lobe contains auditory receptive areas. Impaired memory for verbal material is linked to damage of the left temporal lobe and the inability to remember nonverbal material (e.g., faces) is associated with damage to the right temporal lobe. The reception and processing of visual information passing through the optic nerves is controlled by the occipital lobe.

All dementias can be categorized as one of two patterns of brain deterioration: cortical or subcortical. Cortical types of dementia are characterized by marked memory disturbances. AD is a result of cortical disruption but eventually affects all lobes to some degree [64]. Magnetic resonance imaging (MRI) has shown that the disease apparently occurs in different areas of the brain as it progresses [73]. Subcortical disorders often have associated motor disabilities.

The entire brain is involved in the process of memory. It is believed that the hippocampus (located deep in the brain above the brain stem) and the amygdala (situated under the temporal lobe) are critical to the formation, storage, and retrieval of memory. These structures are an integral part of the limbic system.

The hippocampus, connected by afferent pathways to sensory areas of the cortex, is responsible for the acquisition and temporary storage of declarative memory. Declarative memory enables individuals to organize their world. For example, one learns the route to work and after traveling the route a few times is able to get there even though there may be a detour. The hippocampus maintains the directory for all of these memories so when they are needed they can be retrieved. Individuals with bilateral loss of the hippocampus can only register incoming stimuli until the next stimulus arrives. Memories cannot be called up when needed, such as during learning experiences. Some believe the hippocampus helps associate affective characteristics of various sensory signals, thus helping to control the kinds of information a person will or will not remember.

The amygdala receives input directly and indirectly from the sensory system. All endocrine, visceral motor, and somatic motor effectors are influenced by the output of the amygdala. The sexual and emotional aspects of human behavior are also controlled by the limbic system.

Parkinson disease and Huntington disease are examples of dementias related to diseases that begin primarily with subcortical dysfunction. Subcortical structures include the basal ganglia, thalamus, and brain stem. Motor coordination, vital functions, and central nervous system arousal, timing, and sequential activity are controlled by the subcortical structures. Movement disorders (e.g., tremors, rigidity, chorea) are a prominent and early manifestation of subcortical dementias. In cortical diseases such as AD, impaired motor function occurs late in the course of the illness [14].

The neurons form the foundation of a complex communication system. They are attached to, and surrounded by, a myriad of dendrites, which serve to accept incoming information from the adjacent nerve cells. The nerve axon terminates in the synaptic knob, which contains a multitude of small vesicles. These vesicles, or sacs, are the storage containers for the chemical neurotransmitters that will allow the individual neuron to communicate with other nerve cells across the synaptic cleft. The neurotransmitters combine with the adjacent dendrite, causing a reaction, such as depolarization. They can also be reabsorbed by the emitting neuron or be degraded while in the synaptic cleft.

Until recently, it was believed that the human body formed its full complement of neurons before and for a short time after birth; it could not create new ones after this period. However, researchers, including those at the Institute of Neurology in Sweden and at the Salk Institute, have found that the human brain retains the ability to generate new neurons throughout life [8]. These findings may have an enormous impact on future approaches to the prevention and treatment of neurologic disorders, including AD.

There are several chemical neurotransmitters active in the brain, including dopamine, serotonin, norepinephrine, gamma-amino butyric acid (GABA), and acetylcholine; each has a fairly specific group of actions. Associated neurologic syndromes may be related to a deficit or overabundance of a particular neurotransmitter. An example is dopamine's effects on movement, learning, and emotion and abnormalities in its concentration or action leading to pathologic conditions such as Parkinson disease.

The neurotransmitter that features most prominently in AD is acetylcholine. Dysfunction and reduction of nicotinic acetylcholine receptors is linked to adverse cognitive and neurodegenerative effects [143]. As will be discussed later, the drugs that increase the cerebral levels of acetylcholine, such as the cholinesterase inhibitors, have been shown to provide some improvement in the cognition and function of people with AD [74].

## PATHOPHYSIOLOGY OF ALZHEIMER DISEASE

Symptoms seen in individuals with AD are partially the result of damage to the hippocampus and the cerebral cortex, reflected in memory loss, impaired cognition, and atypical behaviors. The damage seen in AD is caused by changes in three major processes. The first process is based on the communication between neurons. Successful communication depends on reliable neuronal functions and the production of neurotransmitters. Any disruption of this process interferes with the normal function of cell-to-cell communication. The second process is cellular metabolism. Sufficient blood circulation is required to supply the cells with oxygen and nutrients such as glucose. The third process is the repair of injured neurons. Neurons have the capacity to live more than 100 years, and as such, they must continuously maintain and adapt themselves in order to survive. If this process slows or stops for any reason, the cell cannot function properly.

The presence of neurofibrillary tangles and amyloid plaques are the structural hallmarks of AD. Beta-amyloid and tau are two proteins involved in the formation of these abnormal structures. A form of tau, A68, is the major component of these tangles. In healthy neurons, the internal structures (called microtubules) are formed like long parallel tracks with crosspieces that carry nutrients from the body of the cells to the ends of the axons. In AD, the structure has disintegrated; crosspieces formed from tau are twisted like two threads wound around each other. Amyloid plaques, made up of beta-amyloid mixed with dendritic debris from surrounding cells, are found in areas of the brain associated with memory. Knowledge of how beta-amyloid causes neuron death and forms plaques is incomplete, but it is known that the normally soluble amyloid becomes insoluble when the apolipoprotein E4 susceptibility gene (*APOE4*) protein latches onto the beta-amyloid.

It is well known that nicotinamide adenine dinucleotide phosphate oxidases (NADPH oxidases) are chief signaling enzymes for the production of excessive reactive oxygen species (ROS) throughout several body systems. One example is atherosclerosis, a condition whereby NADPH oxidases elicit excessive ROS production, which in turn activates an enzyme that causes macrophages to adhere to arterial walls [46]. Several studies have shown that glial NADPH oxidases, activated by beta-amyloid, causes an excessive amount of ROS to accumulate in the brain [50]. Direct neuronal death from extracellular oxidative damage occurs when there is an overabundance of ROS [3; 47]. Additionally, excesses of intracellular ROS activate several pro-inflammatory and neurotoxic cytokines (e.g., interleukin-1β, prostaglandin E2, and tumor necrosis factor-α) [47]. It is possible that ROS activates polymerizing enzymes (as with atherosclerosis), ultimately aiding the formation of amyloid plaques.

Individuals with more advanced AD also show decreased activity of the enzyme choline acetyltransferase in their brains. This enzyme is involved in the production of acetylcholine, and a significant drop in acetylcholine is linked to memory impairment [128]. Dysfunction and reduction in nicotinic acetylcholine receptors are linked to adverse cognitive and neurodegenerative effects [143].

**Genetic Factors**

Genes are comprised of four nucleotides in a wide variety of combinations, each of which directs the manufacture of a different protein. Even slight changes in a gene's DNA sequence can produce a faulty protein, which can lead to cell breakdown and eventually disease.

In addition to age and a positive family history of dementia, there are genetic risk factors for AD. Early-onset AD is an autosomal dominantly inherited disorder associated with gene mutations that alter production, assembly, and/or clearance of amyloid beta protein in the brain. Three well-characterized genotypes are mutations that encode for amyloid precursor protein (APP), presenilin-1, and presenilin-2 [12]. APP is a protein from which beta-amyloid, the chief component of plaques seen in the brains of patients with AD, is formed [4; 8]. Mutations of the presenilin 1, presenilin 2, and APP genes leading to AD occur principally on chromosomes 1, 14, and 21 [127; 155].

Genetic predisposition to late-onset AD has been linked to the *APOE* gene. Every person inherits one of three alleles of the *APOE* gene from each parent: e2, e3, or e4 in some combination (pairs). *APOE3* is the most common allele found in the general population, with 50% to 60% of individuals having one or two copies. The *APOE4* allele, either single (heterozygous) or as a pair (homozygous), is found in 5% to 35% of the population and is associated with an increased risk for AD compared with those individuals carrying *APOE3* or *APOE2* alleles [4; 127]. Carrying one copy of the *APOE4* allele confers a 3- to 4-fold increased risk; inheriting two copies of *APOE4* allele confers an 8- to 12-fold increased risk of developing AD [4; 13]. There is evidence that the *APOE2* allele may be protective against AD or at least help the maintenance of cognition with age [12; 78; 127].

Although it is possible to determine the *APOE* gene profile in connection with a strong family history of AD, carrying the e4 allele does not mean that an individual is certain to develop AD. The pathogenesis of AD is complex and other factors come into play, such as age, gender, race, lifestyle (e.g., engagement in regular physical exercise), and vascular disease.

Using data from multiple genome-wide association studies, researchers have identified other genes that may increase an individual's risk of late-onset AD, including bridging integrator 1 (*BIN1*), clustering gene (*CLU*), phosphatidylinositol binding clathrin assembly protein (*PICALM*), and complement receptor 1 (*CR1*) [127]. These studies have been made possible by the completion of the Human Genome Project in 2003 and the International HapMap Project in 2005. Research into the relationship between these genes and AD is in its infancy.

**Nongenetic Factors**

Although it is generally known what changes occur in the brain of people with AD, it is still not clear why these events occur in certain individuals. There are nongenetic factors related to AD, and research is being conducted to investigate these factors and to develop new theories about the processes involved in triggering the onset of the disease.

An area of investigation concerns a theory of aging that pertains to certain types of molecules, specifically free radicals that are a product of normal metabolism. These substances assist healthy cells in some functions (including signaling and homeostasis), but as discussed, an overabundance of free radicals can injure cells. The oxidative damage due to free radicals may contribute to the development of AD. Because brain cells have a high rate of metabolism and a long life span, they are vulnerable to oxidative stress.

Another area of investigation concerns the possible role of inflammation in the pathogenesis of plaque formation within the brain. Activation of the immune system leads to production of gene products that promote inflammation (i.e., inflammatory mediators). Various compounds involved in the inflammatory process have been found in the plaques of patients with AD [8]. One study has shown indirect evidence that use of nonsteroidal anti-inflammatory drugs (NSAIDs), particularly ibuprofen, may have a protective effect against AD [69].

Chronic conditions that lead to cerebrovascular disease, such as hypertension, diabetes, and obesity, appear to influence susceptibility for developing AD. Of interest is the impact of oxygen and glucose deprivation on neuronal function, amyloid accumulation, and other pathophysiologic features of AD. It has been suggested that limited degrees of brain ischemia may not be sufficient to cause dementia but may play a role in augmenting the pathologic changes and lowering the threshold for clinical expression of AD [8].

Most major vascular risk factors, including hypertension, diabetes, smoking, obesity, and hypercholesterolemia, particularly when present in midlife, have been associated with increased risk of dementia and AD later in life [4]. Less clear is whether these risk factors directly promote the neurodegenerative features (i.e., amyloid deposition) specific for AD or merely augment cognitive decline indirectly as a byproduct of enhanced atherosclerotic cerebrovascular disease. A prospective cohort study of 326 middle-aged community-based participants without dementia, followed for 20 years, found that the presence of two or more vascular risk factors was significantly associated with elevated brain amyloid deposition later in life [173]. In this study, the mean age of participants was 52 years at the time of vascular risk assessment in 1987–1989, and 76 years at the time of brain imaging (PET scan) in 2011–2013. Vascular risk factors at baseline included body mass index ≥30, current smoking, hypertension, diabetes, and hypercholesterolemia. The risk of amyloid deposition in late life correlated with the number of vascular risk factors present in midlife. Thirty-one percent of individuals with no risk factors in midlife had elevated brain amyloid deposition, compared with 61% of individuals with at least two vascular risk factors. The authors postulated that some aspect of subclinical cerebrovascular disease might increase the propensity for amyloid deposition in the brain or that vascular disease at the arteriolar level might result in reduced clearance of amyloid from the brain [173].

In a prospective analysis of 223 older adults in the Harvard Aging Brain Study, vascular risk was associated with cognitive decline and beta-amyloid deposition in the brain during a 3.7-year period of observation [174]. The rapidity of cognitive decline correlated with the magnitude of the vascular risk score and the burden of beta-amyloid. The interaction of the vascular risk score and amyloid burden with time was significant, suggesting a synergistic effect. These results highlight the importance of addressing vascular risk factors in midlife as part of a strategy to delay cognitive decline in older adults.

Researchers have also studied the role of circulating sex hormone levels in the development of AD. Some data show a correlation between decreased levels of circulating testosterone and AD in men [91]. Depletion of testosterone levels in the brain is a normal consequence of male aging. Because levels of the hormone decrease prior to the development of AD, it is not believed to be a consequence of the disease but rather a possible contributor to its development [92]. The mechanism by which the depletion may affect or cause AD has not been established. However, it has been hypothesized that low testosterone levels may increase brain levels of beta-amyloid [92]. There are also some preliminary studies examining the ability of estrogen to prevent the hyperphosphorylation of tau and, by extension, AD [96]. More research regarding the role of sex hormones in the development of AD is necessary before definitive recommendations may be made.

The prevalence AD is higher among women than men. Two-thirds of AD diagnosed in the United States are in women, a difference that cannot be accounted for by longer lifespan. At the cellular level, this difference appears to be driven by how well the aging brain is able to adapt to gradual loss of estrogen-controlled glucose utilization for energy needs. Studies have shown that estrogenic control of brain glucose metabolism is dismantled during perimenopause, resulting in a hypometabolic state and shift to free fatty acids as the source of energy for cellular mitochondrial function. The risk of developing neurodegenerative disease later in life may be influenced by how well the aging brain adapts to this transition in cellular metabolism [175]. In some women, the hypometabolic state that follows decline in estrogen-controlled glucose utilization by the brain may lead to loss of white matter, beta-amyloid deposition, and disruption of synaptic plasticity [176]. Metabolic studies in the mouse AD model and human cells indicate that brain adaptation to an alternate free fatty acid energy source occurs more readily in men than women [177].

The biologic sex difference in the risk of late-onset AD has been investigated clinically by means of a carefully designed protocol that included laboratory, neuropsychologic, and multimodality imaging to assess brain biomarkers [178]. In total, 121 adults (85 women and 36 men) 40 to 65 years of age with normal cognition were enrolled. After adjusting for modality-specific confounders, the female group showed higher beta-amyloid deposition, lower brain glucose metabolism, and lower MRI gray and white matter volumes compared with the male group. Among participants in the female group, menopausal status was the predictor most consistently and strongly associated with the observed brain biomarker differences, followed by hormone therapy, hysterectomy status, and thyroid disease. These results indicate that sex differences in the development of the AD endophenotype are closely linked to hormonal factors associated with menopause. The authors concluded that the preclinical phase of AD may be early in the female aging process and coincides with the endocrine transition of perimenopause, emphasizing that the window of opportunity for preventive measures in women is early in the endocrine aging process [176;178].

**Comorbid Factors**

A possible connection between herpes simplex virus-1 (HSV1) and AD has been explored. Researchers have found that the virus is able to enter the brain in later life as the immune system weakens, causing inflammation, oxidative damage, and increases in beta-amyloid and tau, especially in individuals with the *APOE4* allele [147]. HSV1 is found in a high proportion of the brains of elderly individuals with and without AD, but certain individuals, such as those with the *APOE4* allele, will suffer greater viral damage [147]. Interestingly, the *APOE4* allele is also a risk factor for symptomatic, HSV1 reactivation (i.e., "cold sores"). It should be noted that while the presence and activation of HSV1 in the brain is apparently common in the elderly, herpes simplex encephalitis, a serious brain disease, is an exceedingly rare, separate condition.

Researchers at Brown University and Rhode Island Hospital have proposed that AD is a neuroendocrine disorder "associated with brain-specific perturbations in insulin and insulin growth factor (IGF) signaling mechanisms;" essentially, they hypothesize that AD is a distinct type of diabetes, termed "type 3 diabetes" [148]. Animal experiments have demonstrated that many of the hallmark signs of AD can be reproduced by artificially reducing insulin and IGF levels, but additional research with human subjects is necessary before a link can be definitively proven [61; 149].

## MODIFIABLE RISK FACTORS ASSOCIATED WITH ALZHEIMER DISEASE

As noted, the risk of AD increases with age, doubling every five years after age 65. Other well-established risk factors include family history of dementia and Down syndrome [129; 130]. There is also growing evidence that people suffering head trauma involving loss of consciousness have a higher risk of developing AD [19]. Additionally, some studies have linked hypertension to a heightened risk for AD [93; 94]. As a result of these findings, it was hypothesized that antihypertensive medications may reduce the risk of dementia or AD. A study of more than 5,000 men and women older than 65 years of age found that those taking blood pressure lowering medications had a significantly lower risk of AD [95]. Cellular changes associated with vascular disease are also implicated in AD pathophysiology [150]. Lifetime epigenetic changes (i.e., environmental factors that cause interactions with an individual's genetic makeup), even those that occur in the womb, can make an individual more susceptible to AD later in life [127].

### Possible Environmental Risk Factors

Aluminum, a metal associated with chronic toxicity, was linked with AD in early studies. High concentrations of aluminum have been found in the brains of some individuals with AD, but the exact nature of the correlation, if any, is unknown [96]. The accumulation of aluminum may be responsible for the changes within the brain, or it might be secondary to the cause(s) of AD. Some research suggests that exposure to aluminum in municipal drinking water (used as a clearing agent during treatment) possesses greater potential for chronic toxicity than exposure from other sources, such as aluminum cookware, and that high intake of aluminum from tap water may be a risk factor for AD [144; 145]. Other researchers speculate that fluoride ingestion (at exposure levels experienced by regular drinking water consumption in fluoridated municipalities and toothpaste use) greatly enhances aluminum's neurodegenerative effects [146]. Higher levels of silicon intake are thought to protect against aluminum toxicity. Research into the possible role of aluminum in the development of AD is ongoing.

In addition to aluminum, other transition metals (e.g., copper, zinc, iron) are implicated as causative factors for AD [144; 151]. Oxidative stress, induced from either excesses or deficiencies of these metals, is theorized as being pathogenic. Iron overload, copper depletion, and zinc overload/depletion have been found in AD brains by various research groups. However, these findings were called into question by a 2011 meta-analysis that discovered citation bias towards irreproducible research, especially regarding iron overload [151]. Concrete evidence for transition metal pathogenesis is currently lacking.

While scholars agree that there may be several environmental factors for AD, no exposures, including pesticides, general air pollutants, lead, and other toxins, have been definitively linked to AD. Taking proactive steps to prevent oxidative damage, improve vascular health, and create a healthier lifestyle overall, seems to be the best defense against many environmental risks.

### Possible Lifestyle Risk Factors

The lack of conclusive evidence for environmental causes of AD extends to various nutritional factors [79; 127]. However, a relationship between AD and certain deficiencies has been suggested. Low vitamin E intake, or low intake of all tocopherols from food sources, has been associated with an increased risk of AD in some studies [37; 38; 41]. Oxidative damage, a major component of AD progression, is greatly reduced in individuals with adequate dietary vitamin E/tocopherol intake, and although other antioxidants and antioxidant cofactors are thought to have a protective effect, consistent data regarding the efficacy of vitamin C, flavonoids, and carotenoids, for example, is

lacking. Research so far has shown that vitamin E supplementation does not offer protection equivalent to dietary intake of vitamin E, although it has been suggested that supplementation levels used in studies were too low or that the supplements (usually containing only α-tocopherol) did not replicate the full range of tocopherols available in foods [41]. The Academy of Nutrition and Dietetics' food and nutrition guideline for patients with AD recommends against supplementation with any antioxidants, mainly because of the risk of side effects and lack of efficacy in randomized controlled trials and reviews, even at levels above the recommended daily allowance [35].

Low vitamin B12, B6, and folate levels are also suspected of increasing AD risk, but the association is unproven. These vitamins are cofactors for the methylation of homocysteine, and high levels of homocysteine are thought to contribute to cognitive decline [41]. Supplementation with B12, B6, and folate has been associated with a protective effect in some studies [41].

Fat composition is also suspect. High saturated or trans fat intake and low polyunsaturated and monounsaturated fat intake can cause hypercholesterolemia, a risk factor for AD [153]. Omega-3 fatty acids (especially docosahexaenoic acid, or DHA) are protective against inflammation, oxidative damage, and synaptic loss. Individuals consuming one fish meal per week are better protected against dementia than those eating fish less often [153]. There is consistently strong evidence regarding the protective effect of omega-3 fatty acids for the prevention of AD [41].

A meta-analysis of 16 prospective studies examining the association between physical activity and dementia, AD, and Parkinson disease showed that brisk physical activity is inversely associated with risk of dementia [170]. Further evidence of the neuroprotective effects of exercise is provided by a meta-analysis indicating that aerobic exercise in midlife is associated with a significant reduction in risk for later mild cognitive impairment [171].

**Possible Cognitive Risk Factors**

There is increasing evidence that individuals who do not engage in regular mental, social, and physical activities (and possibly a combination of all three) are at heightened risk for AD [153]. Social activities and interactions provide opportunities for exercise, which maintains vascular health, and intellectual stimulation and problem solving, which maintain cognition. Individuals with large social networks perform better on tests of cognition despite having similar amounts of brain lesions as individuals with few social contacts. It is not known which specific component of leisure, work, and/or mental activities in late life prevent or delay AD; however, researchers have noted a protective effect when greater mental complexity is required throughout life at work and if cognitive/social/physical activities are maintained during mid-life [153].

An analysis of data from two longitudinal studies of health and aging demonstrated the potential impact of a healthy lifestyle on lowering the risk of AD [179]. In this study, a cohort of 2,765 participants older than 65 years of age were selected on the basis of available lifestyle data at baseline and periodic assessment for AD. A healthy lifestyle score was defined in relation to five factors: nonsmoking, light-to-moderate alcohol consumption, high-quality diet intervention, ≥150 minutes/week moderate- or vigorous-intensity physical activity, and engagement in late-life cognitive activities, giving an overall score ranging 0 to 5. During a median follow-up of 5.8 to 6.0 years, 608 (22%) of the participants developed incident AD. Compared with participants with 0 to 1 healthy lifestyle score, the risk of AD was 37% lower in those with 2 to 3 healthy lifestyle factors and 60% lower in those with 4 or 5 healthy factors.

## THE ROLE OF MEMORY

AD is characterized by progressive deterioration of the domains of cognition, including memory, higher integrative function, and rational behavior. Cognition involves the host of mental skills and processes that are acquired over a lifetime that provide humans with the ability to learn, think, remember, make judgments, use logic and reason, and have insight. Memory is a major antecedent for developing mastery in these intellectual functions. Memory deficits are an early and progressive sign of AD. In order to understand the behaviors of individuals with AD, it is necessary to understand the significance of memory, the process of remembering and recall, and the various types of memory.

Memory is dynamic, developing in stages and constantly changing. Memory and learning are not separate functions. Both depend on the storage of data that can be retrieved at a later date. The ability to remember simplifies life, allowing minimum energy to be expended on routine activities. For example, arising in the morning and completing the activities of daily living requires little conscious thought. The tasks are performed by rote. However, the person with memory deficits may be unable to recognize the bedroom, unable to find the bathroom, and unaware that teeth must be brushed or where the items are that are used to complete these tasks.

### Remembering and Recall

The acquisition of a memory depends on several mechanisms. Information is received from the environment, and the senses perceive it, interpret it, and respond to it. There are three stages involved in this process.

Information is acquired during the first stage; the information is taken in through the senses, perceived, and understood. If the information is visual, it enters the brain through electrical impulses coming from the retina, traveling through the optic nerve and into the cerebral cortex. A limited amount of this information is retained in short-term memory. Like a clipboard on a computer, the contents of short-term memory are constantly being lost and replaced with other information unless the contents are restored through repetition. For example, when a telephone number is looked up, it is usually remembered long enough to complete the call. This information will soon be forgotten if it is not used again for several days or weeks. However, if the number is dialed every day or several times per week for several weeks, it becomes firmly entrenched in the brain as long-term memory for the duration of use. There is a limited storage capacity for short-term memory.

The second stage of memory is retention. Important information is placed in long-term memory, where the storage involves associations with words, images, or other experiences. This information can be recalled days, weeks, or years later. For a memory to be retained, it must be transferred from short-term to long-term memory. Physical changes take place in the brain to facilitate this transfer.

Retrieval of information occurs in the third stage. Information is stored at an unconscious level and is later recalled, bringing it into the conscious mind. The accuracy and availability of the memory depends on how well the information was processed in stage two (retention). Some memories are easily recalled, others seem temporarily unavailable, and some seem to disappear from the mind completely.

### Types of Memory

There are many types of memory. How the information is used depends on how the memory was formulated. Episodic memory pertains to remembering specific events associated with a particular time and place. Episodic memory requires no effort at learning. Remembering the details of a child's birth, one's wedding, or perhaps a catastrophic event are other examples of episodic memory.

Semantic memory requires the conscious involvement of the learner. The knowledge is not associated with a particular time or place but is learned at some point in time. Skills such as using a telephone book, balancing a bank statement, cooking from a recipe, and reading a road map are examples of semantic type memories.

| TEN WARNING SIGNS OF ALZHEIMER DISEASE | |
|---|---|
| **Normal Aging Events** | **Possibly Alzheimer Disease** |
| Temporarily forgetting someone's name | Not being able to remember the person later |
| Forgetting the carrots on the stove until the meal is over | Forgetting a meal was ever prepared |
| Unable to find the right word, but using a fit substitute | Uttering incomprehensible sentences |
| Forgetting for a moment where you are going | Getting lost on your own street |
| Talking on phone, temporarily forgetting to watch a child | Forgetting there is a child |
| Having trouble balancing the checkbook | Not knowing what the numbers mean |
| Misplacing a wristwatch until steps are retraced | Putting a wristwatch in a sugar bowl |
| Having a bad day | Having rapid mood shifts |
| Gradual changes in personality with age | Drastic changes in personality |
| Tiring of housework, but eventually getting back to it | Not knowing or caring that housework needs to be done |
| *Source: [121]* | *Table 1* |

Implicit memory is information learned without the conscious involvement of the individual. It is established through early and frequent repetition. Reciting the Pledge of Allegiance and singing "Happy Birthday" are the result of implicit memory. Social customs and manners, such as saying please and thank you, develop through implicit memory.

Motor memory is required for tasks utilizing motor skills, such as riding a bicycle, jumping rope, and dancing. Once learned, these skills are rarely lost even if not used for some time.

Affective memory refers to feelings and emotions. Listening to a song may evoke memories of a person, place, or event. The aroma of a certain perfume may bring to mind a specific person. Cooking odors may elicit the memory of family holiday meals. Meeting a person for the first time may bring forth feelings of dislike until one realizes that the person resembles someone from the past.

Semantic memory is the first type affected in the person with AD [131]. The individual may notice that tasks that were once simple to perform are causing increasing frustration. Motor memory is eventually lost as activities requiring fine and gross motor skills become more and more difficult to access. Implicit memory often remains intact as long as the individual can communicate. Anyone who has worked with those with advanced AD has experienced the surprise of hearing a person in the later stages singing a favorite hymn during church service or an old song during a sing-a-long. There is some evidence that affective memory remains intact far into the disease.

## NORMAL AGING, MILD COGNITIVE IMPAIRMENT, AND ALZHEIMER DISEASE

As individuals age, they may notice changes in memory and may express concern that they are developing AD. Age-associated memory impairment, a common and normal process relating to structural and functional brain changes, should not be confused with the memory loss associated with a dementia. Age-associated memory impairment, also called benign senescent forgetfulness, may accompany aging, but unlike AD, it does not include other cognitive impairments. Other factors, such as cardiovascular disease, metabolic disorders, head trauma, alcohol or substance abuse, and side effects of certain medications, can also cause an apparent decline of short-term memory. The Alzheimer's Association lists signs that distinguish normal aging events from those due to AD (***Table 1***).

## MILD COGNITIVE IMPAIRMENT

Mild cognitive impairment (MCI) is a spectrum of mild but persistent memory loss that lies between normal age-related memory loss and diagnosed AD. The memory deficits are beyond those expected for the person's age, and the individual persistently forgets meaningful information that he or she wants to remember. However, other cognitive functions may be normal, there is little loss of ability to work or function in typical daily activities, and there are no other clinical signs of dementia. Multi-step tasks such as shopping, making dinner, and paying bills may take longer than usual and more errors may be made, but overall, little or no assistance is required [154].

Many individuals with MCI have a high probability of developing AD. Those who are likely to progress to AD will have difficulty learning and retaining new information [154]. Testing for biomarkers while making a diagnosis can identify people at risk for or who are progressing to AD but is only recommended for use in research settings. Biomarker testing standards and cut-points are not yet defined; however, low cerebrospinal fluid (CSF) beta-amyloid levels combined with high CSF tau is considered a positive for MCI due to AD [154]. Positron emission tomography (PET) amyloid imaging has also proven valuable for predicting progression to AD in research.


The Society of Nuclear Medicine and Molecular Imaging and the Alzheimer's Association state that amyloid imaging is appropriate in certain patients satisfying core clinical criteria for possible Alzheimer disease because of unclear clinical presentation, either an atypical clinical course or an etiologically mixed presentation.

(https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3733252. Last accessed August 24, 2020.)

**Strength of Recommendation**: B (established as probably useful based on good evidence)

## PROGRESSION OF ALZHEIMER DISEASE

The onset of AD is slow and insidious; impaired memory is usually the initial symptom, followed later by deficits in other cognitive domains. Symptoms may be present for several months before the family realizes the severity of the problem. In some situations, a spouse may shelter and cover for the patient so even children and friends are unaware. In other cases, it is the death of the healthy spouse that causes other family members to recognize the changes that have occurred in the living partner. After the diagnosis of AD, most patients will survive for 4 to 6 years; however, this number can vary from 3 to 20 years [156].

The early stages are especially challenging for patients with AD, as they realize that they are slipping away and are unable to do anything about it; each stage brings with it additional mental, emotional, or physical losses. Inevitably, nearly all patients develop amnesia (memory impairment), aphasia (language impairment), agnosia (inability to identify common objects), apraxia (inability to use objects, despite knowing their function), and visuospatial deficit and may exhibit apathy, depression, or psychosis. Afflicted individuals will become dependent on caregivers for meeting even the most basic physical needs. The model of the progressive cognitive and functional decline in AD as "childhood development in reverse" (i.e., from the functional capacity of a child to that of an infant) is one that is easy for nonmedical family members and caregivers to understand [6].

The disease progresses continuously, and it is useful to remember that staging of AD is an artificial construct meant to assist in diagnosis and management. Presentation of the disease is widely varied in patients, with symptoms and deficits affecting every individual differently or not at all. The Alzheimer's Association presents a useful framework for staging, with various benchmarks in cognitive decline, based on the Global Deterioration Scale (GDS) [156]:

**Stage 1: Preclinical Stage (Normal Function)**

During an interview, no memory problems are evident, and no memory problems are identified by the patient. There may be measurable biomarkers indicating changes; however, no diagnostic criteria have been developed for use by clinicians. This stage exists as a placeholder for future biomarker diagnostics.

**Stage 2: Early Stage (Very Mild Cognitive Decline)**

Patient complains of memory lapses (e.g., forgetting familiar words and names, the location of keys, eyeglasses, or other everyday objects). These problems are not evident during a medical examination or readily apparent to friends, family, or co-workers. Patients in this stage may be experiencing normal age-related decline or early signs of AD.

**Stage 3: Early Stage (Mild Cognitive Impairment Due to AD)**

During a detailed medical interview or in clinical testing, problems with memory or concentration may be measurable or discernible. Patients, friends, family, or co-workers begin to notice deficiencies. Common difficulties include:

- Word- or name-finding problems (noticeable to family or close associates)
- Impaired ability to remember names when introduced to new people
- Performance issues in social and work settings (noticeable to others)
- Reading a passage and retaining little material
- Losing or misplacing important objects
- Decline in ability to plan or organize

Early-stage AD or MCI can be diagnosed in some, but not all, individuals with these symptoms.

**Stage 4: Early Stage (Moderate Cognitive Decline Due to Mild or Early-Stage AD)**

At this stage, the patient interview detects clear-cut deficiencies in the following areas:

- Reduced memory of personal history
- Decreased ability to remember recent events
- Impaired ability to perform challenging mental arithmetic (e.g., counting backward from 100 by serial 7s)
- Decreased capacity to perform complex tasks (e.g., shopping, planning dinner for guests, paying bills and/or managing finances)
- The patient may seem subdued and withdrawn, especially in socially or mentally challenging situations (identified by an acquaintance)

**Stage 5: Middle Stage (Moderately Severe Cognitive Decline; Moderate or Mid-Stage AD)**

Major gaps in memory and deficits in cognitive function are observed by an acquaintance and are apparent during an assessment. Some assistance with day-to-day activities becomes essential. At this stage, individuals may:

- Be unable, during a medical interview, to recall important details (e.g., their current address, their telephone number, or the name of the college or high school from which they graduated)
- Become confused about where they are or about the date, day of the week, or season
- Have trouble with less challenging mental arithmetic (e.g., counting backward from 40 by 4s or from 20 by 2s)
- Need help choosing proper clothing for the season or the occasion
- Usually retain substantial knowledge about themselves and know their own name and the names of their spouse or children
- Usually require no assistance with eating or using the toilet

**Stage 6: Middle Stage (Severe Cognitive Decline; Moderately Severe or Mid-Stage AD)**

Memory difficulties have significantly worsened, and noticeable personality changes may have emerged. Family members or caregivers relate that the affected individual needs extensive help with daily activities. At this stage, individuals may:

- Lose most awareness of recent experiences and events as well as of their surroundings
- Recollect their personal history imperfectly, although they generally recall their own name
- Occasionally forget the name of their spouse or primary caregiver but generally can distinguish familiar from unfamiliar faces
- Need help getting dressed properly, as without supervision, the individual may make such errors as putting pajamas over daytime clothes, socks over shoes, or shoes on wrong feet
- Experience disruption of their normal sleep/waking cycle
- Need help with handling details of toileting (e.g., flushing toilet, wiping, and disposing of tissue properly).
- Have increasing episodes of urinary or fecal incontinence
- Experience significant personality changes and behavioral symptoms, including suspiciousness and delusions (e.g., believing that their caregiver is an impostor); hallucinations (seeing or hearing things that are not really there); or compulsive, repetitive behaviors, such as hand wringing or tissue shredding
- Tend to wander and become lost

**Stage 7: Late Stage (Very Severe Cognitive Decline; Severe or Late-Stage AD)**

During an intensive interview, the patient may only be able to speak a few words. This is the final stage of the disease. Individuals lose the ability to respond to their environment, the ability to speak, and, ultimately, the ability to control movement. At this last stage, individuals will:

- Frequently lose their capacity for recognizable speech, although words or phrases may occasionally be uttered
- Need help with eating and toileting, as there is general incontinence
- Lose the ability to walk without assistance, then the ability to sit without support, the ability to smile, and the ability to hold their head up. Reflexes become abnormal and muscles grow rigid. Swallowing is impaired.

## DIAGNOSIS

Dementia is a general term encompassing many conditions, characterized by a decline in an individual's usual level of intellectual functioning severe enough to interfere with daily tasks, activities, work, and social and family relationships [17; 22; 155]. A dementia may be the result of chronic or infectious disease, malignancy, or head trauma, or it may be substance induced. Dementia may be progressive, static, or remitting depending upon the underlying pathology. Cognitive or behavioral symptoms and signs are the major manifestations in patients with dementia.

Other medical conditions present similar clinical manifestations as AD dementia (e.g., dementia with Lewy bodies, primary progressive aphasia, vascular dementia, behavior variant frontotemporal degeneration) [155]. Some of these conditions may be reversible with treatment. A patient suspected of having AD or any dementia should be given a complete workup by practitioners who are experienced in the diagnosis and treatment of dementias. An individual who has personal knowledge of the patient, particularly over an extended period of time, should be available to answer questions that assist in establishing a diagnosis. Knowing the type of dementia is critical in establishing a treatment plan and prognosis (***Table 2***).

| OVERVIEW OF MAJOR FORMS OF DEMENTIA | | | |
|---|---|---|---|
| **Disease** | **Features** | **Major Clinical Manifestations** | **Course** |
| Alzheimer disease | Involvement of higher brain structures, neurofibrillary tangles, amyloid plaques<br>Accounts for 60% to 80% of all dementias | Memory and other cognitive deficits<br>Visuospatial impairment<br>Wandering<br>Aphasia | Onset: 60 to 80 years of age<br>May progress over 3 to 20 years |
| Mild cognitive impairment | Cognitive deficits greater than expected for patient's age | Cognitive decline<br>No interference with activities of daily living | May or may not progress into dementia |
| Multi-infarct or vascular dementia | Multiple cerebral infarctions<br>May be related to cardiovascular disease and/or diabetes | Dependent on location of infarct<br>Cognitive impairment<br>Emotional lability<br>Dysarthria, dysphasia | Onset: 60 to 75 years of age<br>Outcome depends on occurrence of infarcts |
| Dementia with Lewy bodies | Accumulated bits of synuclein protein<br>Rarely familial | Cognitive impairment<br>Parkinsonian symptoms<br>REM sleep disorder<br>Hallucinations<br>Apathy | Symptoms fluctuate<br>Progressive over approximately 8 years |
| Parkinson disease | Deficiency of dopamine | Movement disorders<br>Dysarthria, dysphasia, bradykinesia<br>Late cognitive dysfunction | Onset: ≥50 years of age<br>Progression varies |
| Frontotemporal dementia (Pick disease, primary progressive aphasia, semantic dementia) | Abnormal accumulation of protein in certain neurons<br>Rare<br>Predominately genetic | Cognitive impairment<br>Depression, apathy<br>Wandering<br>Disorientation<br>Lack of inhibition | Onset: 35 to 75 years of age<br>May progress over 2 to 10 years |
| Creutzfeldt-Jakob disease | Prion protein abnormalities<br>Spongiform changes in brain<br>Rare | Cognitive impairment<br>Myoclonus<br>Extrapyramidal movements | Onset: ≤60 years of age<br>Rapidly progressive |
| Normal pressure hydrocephalus | Increase of CSF in cerebral ventricles<br>Possible causes are subarachnoid hemorrhage, infection, trauma, tumor, or post-surgical complications<br>Rare | Cognitive impairment<br>Difficulty with gait<br>Incontinence | Progression depends on cause |
| Huntington disease | Autosomal dominant order | Cognitive impairment<br>Choreiform movements<br>Dysarthria, dysphasia, bruxism | Early-onset: <20 years of age<br>Late-onset: Middle age |
| Wernicke-Korsakoff syndrome | Severe thiamine deficiency<br>Associated with alcoholism, AIDS, cancer, and hyperthyroidism | Confusion<br>Permanent memory gaps<br>Motor and coordination difficulty | Progression may be halted with treatment, but existing damage is irreversible |
| Gerstmann Sträussler Scheinker disease | Prions suggested<br>Spongiform changes in brain<br>Extremely rare<br>Usually familial | Cerebellar ataxia<br>Cognitive impairment | Onset: 35 to 55 years of age<br>May progress over 2 to 10 years |
| HIV-associated dementia or AIDS dementia complex | HIV infection | Cognitive impairment<br>Motor dysfunction paraparesis<br>Depression | Progression varies |
| Neurosyphilis | Spirochete<br>Sexually transmitted disease<br>Rare<br>Occurs with delayed treatment | Cognitive impairment<br>Tremors, ataxia<br>Dysarthria | General paresis may occur 20 to 30 years after primary infection |
| Traumatic brain injury | Consequence of head trauma | Memory impairment<br>Behavioral symptoms with or without motor and/or sensory deficits | Nonprogressive<br>Repeated injures can lead to progressive dementia |
| *Source: [113; 114; 115; 116; 117; 118; 120; 156]* | | | *Table 2* |

The symptoms of all-cause dementia include [155]:

- Uncharacteristic changes in mood or personality: Apathy, social withdrawal, socially unacceptable actions (disinhibition), loss of interest in usual activities, agitation, obsessive or compulsive behaviors
- Difficulty with communication: Speech may become impaired due to problems accessing words. Reading and writing may be affected.
- Impaired visuospatial ability: Inability to recognize, find, or understand objects (or faces) despite good vision. Difficulty knowing what to do with tools, eating utensils, or articles of clothing.
- Poor decision making, reasoning, or task planning: Self-preservation instinct seemingly becomes lost, difficulty managing finances or performing other complex tasks
- Impaired learning ability: Repeating questions or conversations, forgetting where objects were left, forgetting to keep appointments

At least two of the above domains should be identified to make a diagnosis of all-cause dementia [155]. Patients with dementia due to AD will present with additional characteristics. Although amnestic presentation is the most common syndrome in AD, memory loss is not always the primary cognitive deficit in AD dementia. Core clinical criteria of probable AD dementia include [155]:

- Onset that is insidious (i.e., over months or years) rather than sudden (i.e., over hours or days)
- Independently verified history of declining cognition
- Additional cognitive deficits that are either amnestic (e.g., impaired learning capacity/short-term memory) or nonamnestic. Nonamnestic presentation includes language impairment (e.g., word-finding); visuospatial impairment (e.g., object agnosia, simultanagnosia, alexia, impaired face recognition); and executive impairment (e.g., reasoning, problem solving, judgment).
- Differential diagnosis of AD

A diagnosis of probable AD can be made based on the medical history, physical examination, diagnostic studies, caregiver interviews, and objective cognitive assessment including either neuropsychologic testing or a "bedside" mental status examination [155]. The observation of signs and symptoms during cognitive assessment (with the ruling out of other disease processes) can support the diagnosis even in the absence of pathology reports. The earlier the diagnosis is made, the greater the benefit in managing the clinical course of the illness.

As discussed, the stage of memory impairment between normal aging and very early dementia (i.e., MCI due to AD) gives some insight into the possible etiology and treatment of AD. MCI due to AD must be differentiated from MCI due to other causes by applying the various diagnostic criteria. Specific etiologies should be ruled out (e.g., traumatic, vascular, pharmacologic, neurodegenerative), and a diagnosis of probable AD dementia should not be made when evidence of concomitant disease, trauma, or depression is found [154; 155]. Again, a detailed patient history should be obtained including family history of AD and information about changes in cognition from the patient, family members, caretakers, or clinicians. Certain genetic factors should also be taken into account. In addition, neuroimaging procedures can assist in the diagnosis [76].

The goals of the diagnostic process are to:

- Make a specific diagnosis
- Determine the type of dementia, the extent of the impairment, or the stage of the disease
- Avoid labeling a person with a diagnosis of dementia or AD when it does not exist
- Avoid implementing the wrong treatment as a result of misdiagnosis
- Identify any systemic or psychiatric illness
- Define the practical and psychosocial needs of the patient, the family, and the primary caregivers
- Plan for the future

| DISTINGUISHING DEMENTIA, DELIRIUM, AND DEPRESSION | |
|---|---|
| **Condition** | **Clinical Presentation** |
| Dementia | Gradual onset, irreversible, chronic, progressive, long duration<br>Shortened attention span<br>Impaired memory<br>Difficulty with abstraction, problems with word finding, confabulates<br>Struggles to remain independent |
| Delirium | Acute or subacute onset, reversible or alleviated with prompt appropriate treatment<br>Short duration (hours to one month)<br>Sensorium clouded<br>Impaired, fluctuating attention span<br>Impaired recent and immediate memory<br>Thinking is disorganized, distorted, speech incoherent<br>Associated with trauma, disease, infection, and/or chemical intoxication |
| Depression | Variable onset, often abrupt, reversible with treatment<br>Weeks to several years' duration<br>Sensorium clear<br>Attention span normal but easily distracted<br>Selective memory impairment<br>Intact thinking but expresses hopelessness, helplessness<br>Often coincides with major life changes |
| *Source: [25]* | *Table 3* |

As AD progresses, various mood and behavioral disorders may become prominent in many patients and may require intervention and treatment with appropriate medications. Some of these manifestations should lead to reconsideration of the diagnosis of AD. For example, hallucinations in the presence of evolving extrapyramidal symptoms should lead to consideration of Lewy body disease, whereas development of significant personality alterations in the presence of mild dementia should raise the question of Pick disease. The most common pathologic behaviors in patients with AD are apathy (70%), agitation (60%), motor abnormalities (40%), nighttime behavioral disturbances (30%), delusions (25%), disinhibited behaviors (20%), hallucinations (10%), and euphoria (2%) [6].

## DISTINGUISHING DEMENTIA FROM DELIRIUM AND DEPRESSION

Remembering the "3 Ds" (dementia, delirium, and depression) during the assessment process can help the practitioner identify the cause of the impairment. Deficits in cognition, memory, or physical function can also result from delirium and depression. Any two or all three of these conditions can be present at the same time.

### Delirium

Delirium is defined as "an acute change in cognition and a disturbance of consciousness, usually resulting from an underlying medical condition or from medication or drug withdrawal" [83]. Delirium may be related to an acute or chronic medical condition or may be substance induced. While delirium is often a forerunner of underlying disease, delirium may also have a psychosocial/environmental cause associated with the death of loved ones, sensory deprivation, or overstimulation and changes in the degree of personal control [24]. The incidence is highest among the elderly and is often misdiagnosed or missed entirely. In individuals with pre-existing dementia, it may be mistakenly assumed that the signs and symptoms are evidence of natural disease progression (***Table 3***). Knowing the patient's history of onset and type of disease progression is helpful in identifying delirium [83].

| CRITERIA FOR MAJOR DEPRESSIVE EPISODE |
|---|
| Five or more of these symptoms have been present during the same two-week period and represent a change from previous functioning. The symptoms must be present most of the day, nearly every day. At least one of the symptoms is either depressed mood or loss of interest or pleasure.<br>• Depressed mood<br>• Markedly diminished interest or pleasure in all or almost all activities<br>• 5% or greater change in weight when not dieting or decrease or increase in appetite<br>• Insomnia or hypersomnia<br>• Psychomotor agitation or retardation<br>• Fatigue or loss of energy<br>• Feelings of worthlessness or excessive or inappropriate guilt<br>• Diminished ability to think or concentrate<br>• Recurrent thoughts of death, suicidal ideation, or specific plan of suicide attempt |
| *Source: [7; 20]* *Table 4* |

Pneumonia and urinary tract infections are common causes of delirium in the older population. Elderly people do not always present the typical signs of inflammatory response, such as elevated temperature and physical pain or discomfort. Confusion may be the only sign that an infection is present. The confusion generally dissipates with appropriate treatment.

Some medications may also be a cause of delirium, including [9]:

- Diuretics
- Steroidal anti-inflammatory agents
- Opioid analgesics
- Antidepressants
- Antipsychotic agents
- Cardiac medications
- Antihypertensive agents
- H2-blocking agents
- Anticholinergic agents

**Depression**

The diagnosis of depression may be difficult to make in people with multiple medical conditions. Depression is present in 25% of individuals diagnosed with AD [133]. Left undiagnosed and untreated, depression results in an earlier onset of behavioral disturbances, cognitive deficits, and mental suffering. Depression may also be responsible for earlier admission into a long-term care facility. Depression is often recurrent and thus may be a potentially chronic illness [26]. The fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5) criteria for major depression are summarized in ***Table 4***.

Misdiagnosing dementia as depression may result in an exacerbation of the disease, because antidepressants with anticholinergic properties may worsen the confusion and memory impairment. In people with coexisting AD and depression, failure to identify and treat the depression may cause additional physical and emotional discomfort. The clinical interview is the foundation for evaluating and diagnosing depression in older adults. Self-report questionnaires can assist in screening for depression. The 30-item Geriatric Depression Scale (GDS-30) and the Center for Epidemiological Studies Depression Scale Revised (CESD-R) have proven to be reliable and valid.

It has been noted that "memory difficulty, agitation, disrupted sleep-wake cycle, and personality changes (e.g., apathy, increased dependence) are classic symptoms of AD that may be mistaken for depressive signs of poor concentration, decreased interest, changes in psychomotor activity, sleep disturbance, and fatigue" [16].

### Dementia

The DSM-5 requires the following signs to be present before a diagnosis of major neurocognitive disorder (commonly referred to as dementia) is made [20]:

- Evidence of significant cognitive decline from a previous level of performance in one or more cognitive domains (i.e., complex attention, executive function, learning and memory, language, perceptual-motor, or social cognition) based on both:
  - Concern of an individual, a knowledgeable informant, or the clinician that there has been a significant decline in cognitive function
  - A substantiated impairment in cognitive performance, preferably documented by standardized neuropsychologic testing or, in its absence, another quantified clinical assessment
- Cognitive deficits interfere with independence in everyday activities.

Dementia is not diagnosed if the symptoms occur only during the course of delirium or another mental disorder. Delirium may be superimposed on a pre-existing dementia, in which case both diagnoses are given. A specific diagnosis of AD is considered only when all other etiologies for the dementia have been ruled out.

## DIAGNOSTIC EVALUATION

### History

A complete and thorough medical history is imperative to making an accurate diagnosis. The family history may identify genetic or familial illness. Testing for impaired vision and hearing should be included. People with hearing impairments often deny the problem and will answer questions inappropriately, thus appearing confused. Visually impaired people may have problems controlling their environment and may also appear disoriented. Determine the onset and progression of the disease—whether abrupt or gradual. Identify whether the manifestations fluctuate, are gradually worsening, or if there is a stair-step progression.

The aging process causes diminished liver and kidney function. This loss may interfere with the absorption and metabolism of medications. Adverse effects of drugs such as cimetidine, digoxin, and diazepam are often noted through behavioral changes. A thorough assessment of the medication regimen should be included in the history. It is necessary to question the patient or family regarding the use of:

- All prescription medications
- Over-the-counter medications
- Eye drops, eardrops, and topical medications
- Medications prescribed for someone else
- Herbal and nutritional supplement preparations
- Alcohol
- Other chemical substances

Nutritional and hydration status can also affect cognition. Dehydration may be attributed to the fact that thirst is not sharply experienced by the elderly. Fear of incontinence also hinders the consumption of adequate fluids. Nutritional disorders, such as anemia, hypoglycemia, hyperglycemia, hypoproteinemia, and vitamin deficiencies, often present clinical manifestations similar to AD. Caretakers should be instructed to keep a food diary for three days so dietary intake can be evaluated. Poor nutrition is not uncommon among elder adults and may be related to economic factors, health problems that diminish appetite, living alone and having no motivation to cook, or functional deficits that affect the ability to purchase or prepare food. An informant should supplement the clinical history, and clinicians should use any of the informant-based questionnaires when possible [159].

### Functional Assessment

A functional assessment, to investigate the ability to complete activities of daily living, should be included in the diagnostic evaluation [159]. These activities include bathing, dressing, eating, and mobility within the home [2]. Instrumental activities of daily living include preparing meals, shopping, managing money, using the telephone,

completing housework, and taking medications. Various tools are available that measure the person's ability to perform instrumental activities (e.g., Cognitive Performance Test, Executive Function Performance Test, Kitchen Task Assessment) [23]. These tests are also useful in determining whether or not someone can live independently or the degree of assistance that is required. Activities to consider include [23]:

- Food preparation: Shopping, making coffee, preparing and cleaning up after a meal, using/turning off the stove
- Financial ability: Writing checks, paying bills, balancing a bank statement, keeping tax records, handling business affairs and documents
- Mobility: Ability to drive or arrange for and use public transportation
- Current events: Understanding television, books, magazines, and newspapers
- Appointments: Remembering family occasions, holidays, and medications
- Recreation: Engaging in hobbies, playing cards, and games of skill

**Physical and Neurologic Examination**

Full neurologic and physical exams are required [159]. The neurologic exam consists of testing speech, sensation, coordination, muscle strength, eye movement, and reflexes [157]. Other etiologies associated with neurologic dysfunction (e.g., Parkinson disease, stroke, hypothyroidism, vitamin B12 deficiency, tumors) should be ruled out.

There are many physical disorders that can cause a decrease in the cognitive function of elderly persons. Some may be elicited or suggested by a complete physical examination. The physical examination should determine if fever is present, because many infectious processes (e.g., urinary tract infections) are known to have cognitive and/or psychologic manifestations in the elderly. The assessment of cardiac status should include observation of the pulse rate and rhythm, cardiac auscultation, and blood pressure measurements while the patient is sitting and standing. The thyroid gland should be palpated to note enlargement or the presence of nodules. Pulmonary auscultation is performed to listen for rales and rhonchi and to observe the patient's ease of breathing. Examination of the abdomen for masses and organomegaly can be accomplished easily, as can an assessment of renal pain by palpating and percussing the appropriate regions of the body. Listening for bruits over the carotid arteries and palpation of all major pulses are necessary to help evaluate vascular status. Electrocardiogram and chest x-ray may be useful.

**Laboratory Tests**

All comorbid conditions must also be identified. The following tests are generally considered mandatory at the initial evaluation, both to rule out other etiologies and to establish a diagnosis of dementia [159]:

- Complete blood cell count
- Blood sedimentation rate
- Blood chemistries including electrolytes, calcium, and blood glucose level
- Urine analysis with culture (and sensitivity if indicated)
- Liver function studies
- Kidney function studies
- Thyroid stimulating hormone
- Vitamin B12 and folate levels
- Syphilis, human immunodeficiency virus (HIV), and *Borrelia* serology (in individual cases)

CSF testing with routine cell count, protein, glucose, and protein electrophoresis may be included for patients with atypical presentation or who are suspected of having chronic meningitis or certain other neurologic diseases (e.g., Creutzfeldt-Jakob disease) [159]. In patients with rapidly progressive dementia, CSF 14-3-3 or total tau measurement is recommended to identify Creutzfeldt-Jakob disease. Electroencephalography may also be useful with atypical presentations or when Creutzfeldt-Jakob disease or transient epileptic amnesia is suspected [159].

**Mental Status and Neuropsychologic Testing**

Mental status examinations alone are not definitive for establishing a diagnosis of AD; however, they are central to the diagnostic process and provide important information for developing a more complete clinical picture. Additionally, assessment offers a baseline for monitoring the progression of the disease and can be used to reassess mental status in people who have delirium or depression upon initial evaluation. All behavioral and psychologic symptoms should be assessed and documented. Delayed recall tests are particularly useful [159].

There are several mental status examinations that can be used, including the Mini-Mental State Examination, the Blessed Information-Memory-Concentration Test, the Blessed Orientation-Memory-Concentration Test, the Short Test of Mental Status, and the Mini-Cog. One study found that compared with the more commonly used Mini-Mental State Examination, the Short Test of Mental Status was slightly more sensitive in identifying individuals with cognitive impairment and was significantly better at documenting MCI due to AD and predicting progression to AD [158]. When administering and interpreting any of these tests, one must be sure to consider the presence of sensory impairments, physical disabilities, and the age, educational level, and cultural influences of the individual being studied [82].

Neuropsychologic testing may be appropriate when the mental status test is abnormal but the functional test is normal; when a family member expresses concern or dementia is suspected and results of mental status tests are within the normal range; when the patient has an advanced academic degree; or when the patient's occupation indicates high premorbid intelligence [16]. Preferably, a specialist in neuropsychology should be employed.

When mental status test results indicate cognitive impairment, the results of neuropsychologic testing must be considered with the results of other assessments and the patient's history when any of the following circumstances apply:

- Low level of formal education
- Evidence of long-term low intelligence (more than 10 years)
- Inadequate command of English for the test
- Minority racial or ethnic background
- Impairment in only one cognitive area on mental status tests
- No evidence of cognitive impairment for more than six months
- No evidence of functional impairments

Communication with patients regarding personal and family history is a necessary step in identifying dementia and obtaining and accurate diagnosis. When there is an obvious disconnect in the communication process between the practitioner and patient due to the patient's lack of proficiency in the English language, an interpreter is required.

**Neuroimaging**

Brain imaging should be included in the evaluation of patients suspected of having AD. The imaging modality of choice is MRI, which is able to assess with considerable accuracy the integrity of intracerebral structures as well as the size of the hippocampus [76]. It has been found that the volume of the hippocampus is diminished in patients with AD, compared with non-affected individuals, and that persons with some degree of atrophy are more liable to develop AD. MRI is also sensitive for detecting cerebral atrophy, vascular disease, and other structural abnormalities that may indicate contributing factors or an alternative diagnosis for dementia. Non-contrast computed tomography (CT) can also help in the diagnosis by identifying structural changes, such as infarcts or mass lesions, that may be the cause of cognitive changes [159; 160].

Single photon emission tomography (SPECT) and PET are noninvasive imaging techniques that provide information about cerebral function and regional cerebral blood flow. Cerebral glucose metabolism can be studied with PET using fluorodeoxyglucose [160]. The ability to image the regional metabolism of the brain and locate

areas of diminished function has been of particular importance in advancing the ability to diagnose AD. These techniques help to differentiate AD from other causes of dementia but should not be used as the primary imaging measure [8; 80; 81; 85; 159]. One of the benefits of these tests is the ability to help identify people in the early stages of AD or those with MCI who may benefit from treatments that are now being offered or may soon be developed.

While advances in several imaging techniques are being explored, one study has examined the use of PET in conjunction with a radioactive tracer. This tracer, known as Pittsburgh Compound B, adheres to amyloid clumps in the brain, which are then easily detected by PET scans. Due to the rapid loss of radioactivity in the tracer compound, other tracing elements were compared. AD subjects retained the tracers, while control subjects had a rapid loss of the compounds. It has been found that AD, MCI, and healthy control groups are strongly distinguished using Pittsburgh Compound B PET, and are even more clearly distinguished when combined with the results of fluorodeoxyglucose PET [160].

A novel tracer compound, 18F-AV-45, is currently being researched as an alternative to Pittsburgh Compound B [88]. In several small scale studies it has shown a high affinity for beta-amyloid plaque binding in AD brains and stained areas match reliably with postmortem exams.

## CRITERIA FOR THE DIAGNOSIS OF AD DEMENTIA

AD should be suspected in the older adult patient who presents with insidious onset and progression of impaired memory combined with other cognitive deficits that interfere with the ability to function at work or in activities of daily life. The diagnosis of AD dementia is based on careful, often repeated, clinical evaluation, as discussed. Laboratory testing and brain imaging studies are of greatest value in excluding other diagnoses.

A working group of the National Institute on Aging and the Alzheimer's Association has established clinical criteria guidance for the diagnosis of probable AD dementia [155]. In summary, the guidelines define AD as a syndrome of dementia characterized by a progressive decline in ability to function and perform usual activities, not explained by delirium or psychiatric disorder, accompanied by cognitive impairment as ascertained by medical history from the patient and a knowledgeable observer, and supported by bedside mental status examination or neuropsychologic testing. Cognitive impairment should be evident in at least two of the following domains [155]:

- Ability to acquire and remember new information
- Reasoning and handling of complex tasks
- Visuospacial recognition and abilities
- Language functions
- Personality, behavior, or comportment

Additional core criteria include [155]:

- Insidious onset and clear-cut history of worsening
- Prominent cognitive deficits defined as either amnestic (impaired learning and recall of recent information), or nonamnestic (language or word-finding deficits, visual-cognitive deficits, or impairment of reasoning, judgment, or problem-solving)
- Absence of evidence for significant cerebrovascular disease, other defined neurologic disorders, or use of medication that could impact cognition

## AFTER THE DIAGNOSIS OF ALZHEIMER DISEASE

A complete diagnostic workup for AD is lengthy and costly and may take as long as a year or more to achieve firm confidence in the diagnosis. After the diagnosis is made, the family and patient may need considerable guidance and counseling. Family members often wonder whether they should tell their loved one of the diagnosis. While it is devastating to learn that one has AD, it is frequently more stressful to be aware of the signs and symptoms and yet have no answer for the problem. The family and the patient should agree before the

diagnosis is made so appropriate actions are taken. Not knowing always presents the risk of the person finding out accidentally. Open and honest communications are usually the best, but some families have their own reasons for choosing a different path. Families often look to healthcare professionals for guidance, and it is important to respect their decisions; however, physicians are advised to disclose the diagnosis to their patient [160].

**Planning for the Future**

Patients and family members should be encouraged to make long-term plans after a diagnosis of AD. When the diagnosis is made early in the course of the disease, the patient can and should fully participate. Decisions can be given some thought if they are made before a crisis occurs. The patient and family must be aware of the need for advance planning as a mechanism for protecting the individual's self-determination. The Patient Self-Determination Act (PSDA), legislated in 1990, is legally recognized in all states. The PSDA recognizes advance directives (the durable power of attorney and in some states, the living will) as legal documents providing direction when the patient is unable to make decisions. In some states, do not resuscitate (DNR) must be also written in the medical orders for those in healthcare facilities even if the advance directives contain this statement. Various states require that DNR orders must also be posted by or on the patient's bed. In the absence of advance directives, it may be necessary to initiate guardianship when the patient becomes incompetent. After a competency hearing, the judge decides incompetency based on the criteria of that state. The judge assigns a guardian to oversee the patient and his or her estate. Guardianship can protect a vulnerable person, but the process may be lengthy and complicated [28].

In the absence of directives or in controversial situations with institutionalized individuals, the facility's bioethics committee may be required to intervene. The bioethics committee can assist healthcare providers to develop guidelines for decision making.

The family or caretaker(s) may wish to consult with an attorney or financial advisor. This is especially important if the patient is financially responsible for a spouse or dependents. The family and patient may wish to establish a trust or appoint a durable power of attorney. The care of a person with AD is expensive and can bankrupt an individual and impoverish his or her dependents. Most individuals will eventually require the services of a long-term care facility. It is a rare family that has the time, energy, and emotional strength to provide continuing care throughout the course of the illness. The cost and method of payment for such services must be considered. Knowledge about using appropriate community services can delay the need for placement of the affected person in a long-term care facility.

## PRESCRIBING A THERAPEUTIC ENVIRONMENT FOR THE HOME OR CARE FACILITY

### SAFETY ISSUES

The environment affects the behavior of people with AD. In addition to cognitive impairment related to the disease process, patients are also dealing with the usual changes of aging. This combination of factors places the patient at risk for injury. There are several risk factors associated with expected aging changes.

Sensory and perceptual alterations that diminish the ability to respond to environmental warning stimuli such as odors (e.g., fire, natural gas, spoiled food), sounds (e.g., sirens, alarms, telephone, doorbell), and visual cues (e.g., red lights, signs) are impaired. Musculoskeletal, neurologic, and sensory changes affect mobility and balance. There is a shift in the center of gravity and decreased range of motion of the hips and knees, causing a stiffer, shuffling gait. The righting response (the ability to catch oneself when starting to fall) is also diminished. Osteoporosis is common, especially in women, with approximately 40 million Americans at serious risk of osteoporosis-related fractures [138].

Persons with AD cannot rationalize cause and effect because they are unable to predict potential outcomes of their actions or to evaluate the risks involved. A person with AD may go outside during the middle of a winter night clad only in pajamas. The combination of wandering and impaired memory can be especially perilous. Patients may get lost, becoming dehydrated and ill from exposure. They may suffer thermal injuries related to fires caused by the careless use of smoking materials or inappropriate use of the stove. Loss of impulse control and hyperorality can lead to medication overdose or the ingestion of poisonous substances, such as household chemicals. Lacerations are a risk related to the use of knives and scissors. In the later stages, patients with AD often have difficulty swallowing, causing them to aspirate. Driving a car is hazardous and often presents a problem to the family when the individual is incapable of safely maneuvering a vehicle in traffic. Patients with AD require an environment that will promote health and safety while maximizing independence.

**The Use of Physical and Chemical Restraints**

It may be tempting for a busy and harried staff or family caregiver to rely on the use of medications or physical restraints in an effort to reduce the problems associated with wandering or agitated patients; however, there are serious ethical issues related to the use of restraints. Healthcare facilities traditionally relied on restraints to protect those in their care and to avoid liability for injury. In 1989, the U.S. Senate Special Committee on Aging sponsored the national symposium "Untie the Elderly: Quality Care Without Restraints." A statement by Alan R. Hunt, Esq., addresses the issue of liability [30]:

> Healthcare institutions may abandon the use of physical restraints without incurring a significant risk of being sued for malpractice. There are few precedents supporting successful malpractice claims against long-term care facilities based upon a failure to restrain. In fact, the striking conclusion from an examination of cases involving restraints both in nursing homes and hospitals is that the use of restraint has produced more successful lawsuits than nonuse.

It is clear that to be restrained severely diminishes quality of life. This is in addition to the harmful effects of both physical and chemical restraints. The improper application of physical restraints may impede circulation, inhibit breathing, and predispose the patient to muscle atrophy, pressure ulcers, and incontinence [139; 140]. The use of restraints increases disorientation and anxiety in many confused individuals. Restraints have not been proven to prevent falling and injury but have been shown to increase the risk of injury and death [140]. It is recommended that restraints only be used for medical emergencies [139].

A physical restraint is defined by the federal government as "any manual method or physical or mechanical device, material, or equipment attached or adjacent to the client's body that the individual cannot remove easily which restricts freedom of movement or normal access to one's body" [29]. To address concerns regarding the costs associated with eliminating restraints, an analysis of nearly 12,000 nursing home residents was completed in 1993, and the data showed that eliminating the use of restraints was less costly than continued use [136]. Nursing homes across the country have made significant progress in this endeavor [140]. The use of restraints in U.S. nursing homes has declined from 40% in the 1980s to 16% in the 2000s [140].

Chemical restraints are used short-term (6 to 12 weeks) in some cases for those who show anger and aggression symptoms, while other patients receive long-term treatment with psychotropic medications in an attempt to permanently alter these behaviors. There is growing evidence that long-term use of atypical antipsychotic drugs, in particular, is not beneficial and is associated with serious side effects, including increased falls, tardive dyskinesia, cerebral cell apoptosis, accelerated cognitive decline, stroke, and even death [161; 162; 163]. One small-scale study found that the three-

year survival rate of patients with AD previously on a short-course of an atypical antipsychotic was double that of patients being continually administered the active medication [163].

It is beneficial to have a discussion involving the family, patient, and the facility regarding the use of restraints. The nonuse of restraints is a decision based on a consideration of independence and mobility versus the risk of incidents. The family should be informed of the interventions that will be implemented to maintain safety. The family should report any accident the patient has had while in their care. Families that include patients with AD at home should inform their neighbors and the local police department of the situation so they may help if necessary.

In a care facility, knowledgeable staff can plan a therapeutic physical environment that is safe, warm, and comfortable. Maintaining such an environment will diminish disruptive behaviors, thus reducing or eliminating the need for physical and chemical restraints [139; 162]. Caregivers are elements of the environment and must be prepared to participate in the effort to create the appropriate milieu. The entire staff can be educated in the rationale for a restraint-free environment and how to implement interventions to prevent falls. Staff input in identifying and meeting the needs of all inpatients is encouraged. Employees from all departments should be aware of which people are at risk for falls. All employees must share responsibility for monitoring those at risk as they move about the building.

**Reducing Risks of Injury**

The physical environment should be evaluated for potential dangers. This is especially important when the patient is at home. A safe environment allows the patient freedom to move about, maximizing independence as long as possible. There are several ways to reduce the risk of trauma and injury related to poisoning, thermal injuries, lacerations, and falls. Remove or lock up:

- Knives, scissors, and other sharp objects
- Household cleaning supplies, bleach, detergents, spot removers, cleaning fluids, paints, paint thinner, insecticides, and any other chemicals
- All medications, including prescription and over-the-counter items
- Aerosol cans
- Small appliances like toasters or irons
- Power tools
- Weapons and anything that may be used as a weapon
- Fragile, breakable, or valuable items
- Smoking materials—provide constant supervision if the patient smokes, and be sure there is an adequate number of working smoke alarms

Place guards over:

- Electrical outlets
- Thermostats
- Stove knobs

Reduce the risk for falls:

- Keep pathways cleared and halls well lit.
- Avoid highly polished floors.
- Remove throw rugs and extension cords.
- Place furniture around the edge of the room to provide open walkways.
- Check stair railings and stair treads or carpet for security.
- Remove unstable or lightweight chairs.
- Remove wheels on beds, chairs, and tables. Use wheelchairs for transport rather than continued seating. Keep the bed in lowest position. Avoid moving furniture in the patient's immediate environment. Set up strategically placed seating areas around the facility that are attractive and inviting so people can sit down when fatigued. Provide safe, attractive outdoor areas for walking and visiting. An area such as an enclosed courtyard offers freedom to wander.

Reduce risks associated with wandering behavior:

- Control access to the outdoors by using double locks or safety locks on doors and windows.
- Install warning bells or buzzers on doors.
- Control access to swimming pools, ponds, lakes, or other natural hazards.
- Provide fenced areas, if possible, to allow freedom of movement.

Devices used to prevent patients from leaving the building that allow for freedom of movement:

- Door locks with keypads (subject to state regulations)
- Security bands worn by patients that will trigger a warning sound when they exit the building
- Bed guards that trigger a warning sound when the patient leaves the bed
- Television monitoring systems.
- Register the patient in the Safe Return Program (1-800-625-3780).

Those with memory deficits should be provided with identification bracelets such as MedicAlert. Have recent snapshots of patients available and always know what they are wearing.

**Attend to Physiologic and Psychosocial Needs**

Unmet needs can cause the patient with AD to become agitated and anxious. Patients may be unaware of the source of discomfort or be unable to respond to the cues resulting from unmet needs. A routine should be established that will avoid problems resulting from thirst, hunger, lack of sleep and rest, inadequate exercise, and irregular elimination patterns. It is necessary to correct underlying physiologic problems such as infections, dehydration, urinary retention, fecal impaction, hypoxia, or blood sugar imbalance. The staff should be aware if the patient has taken a laxative or is on diuretics and monitor the reaction to other drugs affecting behavior. In addition, they should: provide measures to relieve fear and anxiety; avoid situations that can trigger emotional outbursts; correct sensory deficits with glasses and hearing aids; plan varied activities appropriate for each person's abilities and interests; and give positive reinforcement at every opportunity.

**Providing Safe and Appropriate Clothing**

Clothing, grooming, and personal appearance can affect the self-esteem of patients even though they are disoriented. Poorly fitting attire can cause falls. It is important that patients wear clothing that is familiar and comfortable. Women who have always worn dresses or men who wore dress shirts and ties every day may react negatively to being dressed in jogging suits. Patients should be provided with well-fitting shoes with nonslip soles; shufflers, especially, need nonslip shoes that glide well on the floor. Shoelaces should be avoided when possible. Socks, nylons, and pants must fit properly. Prevent patients from ambulating in a long robe. In general, it helps to maintain a neat, attractive appearance.

**Controlling Environmental Stimuli**

Avoiding an overstimulating environment helps to prevent agitation, as does minimizing noise and commotion. Television can be disorienting to those who cannot distinguish between television and reality. Lowering the volume on telephones and communication systems may diminish patient agitation.

Older people in general require increased illumination, so bright, diffused lighting without glare is helpful. People with AD may become frightened by shadows produced by inconsistent light sources. Non-glare glass should be used on all pictures and artwork. Drawing the blinds or drapes at sundown helps to prevent reflections from the glass at night.

The area of care should present an inviting environment with judicious decorating, such as artwork that is familiar and objective (e.g., still life, landscape, seascape). Abstract patterns may further confuse or dazzle the disoriented person. Avoid patterns on floors and walls. Patients with AD may try to "pick" flowers off the wallpaper or may try to

walk around or jump over "holes" in the floor created by different colors in the pattern. Mirrors may frighten some who are no longer able to recognize themselves; others find comfort in the reflection.

Orientation clues for those who are able to utilize the information are also useful. These include items such as clocks and calendars with large numbers, activity boards, reminders of special events, and seasonal and holiday decorations. Redundant cueing with pictures, words, and colors are helpful. A picture with the name of the person on the door may help him or her find the right room. This idea may also be used for bathrooms.

Areas of small, comfortable seating groups draw the people in and encourage them to reach out and touch objects. Placing safe, familiar objects around may promote reminiscence. A patient may be happy using a manual carpet sweeper or browsing through a catalog of old objects.

### THE INTERPROFESSIONAL HEALTHCARE TEAM

Nursing management of patients with AD supplies the support and coordinates the contributions of the interdisciplinary team. The membership of the team is dictated by the needs of the individual and family and by the setting in which the services are rendered. Education provides caregivers at all levels with the knowledge and skills that are needed to increase the patient's quality of life. Often, the nursing assistant or housekeeper spends more time with the patient than the professional staff. Nursing assistants are quite often the direct caregivers in skilled nursing facilities. Supervisors can enhance the assistants' performance by knowing their capabilities, interests, and past work experiences. Many of them have special talents for working with patients with AD and should be included in the care planning process. This creates an atmosphere of trust and communication by listening and acting upon their observations and suggestions. They should know they are valued team members. Physicians, nurses, and supervisors should use any opportunities to teach nursing assistants.

The nurse is usually the liaison who coordinates services to meet the psychologic, social, spiritual, and economic needs of the patient and family. The nurse collaborates and consults with other team members in the assessment and identification of patient/family problems. Conferences attended by team members are useful strategies for planning interdisciplinary interventions for the resolution of problems and goal setting.

Patients and their families are vital members of the team and should be invited to participate in planning and caregiving to the extent they wish to be involved. This process helps build a trusting relationship between patients, their family, and their caregivers. Family members have often cared for the relative for several years. They can share their ideas and provide valuable information. Knowing the patients' history, characteristics, interests, and philosophies helps the team to individualize their care. Caregivers should be encouraged to engage in counseling and support activities and should be assessed for distress and burnout [160].

The interdisciplinary team should be focused on outcomes. For patients with AD, outcomes are related to the management of behaviors, maximizing independence by maintaining abilities for as long as possible, and preventing complications.

## MANAGEMENT OF ALZHEIMER DISEASE

There are no treatments that can cure or reverse the effects of AD. However, AD is not a condition for which nothing can be done. Patients and families can be helped with interventions designed to diminish the manifestations of the disease. The disease and its progression are evaluated by the behaviors exhibited by the individual. Care planning is directed toward the management of the identified behaviors. Although there are many common features, each person is unique and requires distinctive approaches based on an assessment that identifies the specific problems of each individual.

In the preclinical stage, the goal of management for susceptible patients is to prevent and/or delay the onset of the disease. Maintaining a healthy diet and lifestyle, with goals including reduction of oxidative stress and blood pressure and improving circulation, may help in preventing dementia or slowing the rate of disease progression [164]. Dietary, exercise, and pharmacologic treatment guidelines for lowering the risk of obesity, diabetes, cardiovascular disease, and particularly hypertension should be followed, as comorbidities complicate AD treatment and exacerbate the disease process. As noted, there is some evidence that certain nutrients, especially omega-3 fatty acids, can reduce the risk of dementia [79]. Engagement in cognitive activities is also highly recommended.

Management of diagnosed AD consists of pharmacologic and nonpharmacologic therapies. Some pharmacologic agents have shown modest benefits in alleviating problems with cognition and behavior in research settings, though these benefits are often not realized in clinical use [72; 79]. These agents include several cholinesterase inhibitors (ChEIs) and memantine, an *N*-methyl-d-aspartate (NMDA) receptor antagonist [89; 90]. The most common adverse effects of ChEIs are nausea, vomiting, and diarrhea, with the most serious being cardiac arrhythmia and other cardiovascular and neurologic effects [79]. Memantine produces fewer adverse effects, and the dropout rate is similar to placebo. Other medications, such as antipsychotic agents and antidepressants, are occasionally necessary, but these agents can cause many unacceptable side effects [89].

Medications for AD may provide temporary improvement in cognition for a subset of patients; however, at present there is no pharmacologic agent or other treatment modality capable of substantially altering the progression of disease. Thus, nonpharmacologic interventions, including social, environmental, and behavioral measures, are the most important elements of a management strategy for patients with AD [71].

## PHARMACOLOGIC THERAPIES

ChEIs and memantine are the primary available modes of pharmacologic AD treatment. ChEIs prevent or delay the breakdown of acetylcholine in the brain, a neurotransmitter important for learning and memory. This has been shown to produce a small but measurable temporary improvement in cognitive function and behavioral symptoms in some patients with mild-to-moderate and moderate-to-severe disease [89]. A study published in 2009 showed that while most mild patients with AD respond only minimally to ChEIs, a small cohort respond substantially to treatment [165]. Because these agents do not produce a dramatic result, families and caregivers must be informed of realistic expectations [6].

Donepezil, rivastigmine, and galantamine are ChEIs that have been approved by the U.S. Food and Drug Administration (FDA) for the treatment of AD [86; 89; 90]. Tacrine was the first ChEI to be approved; however, the drug is no longer available due to its more severe side effects, including possible hepatic dysfunction [79; 91]. Rivastigmine and galantamine have been approved for mild-to-moderate AD, while donepezil has been approved for all stages [90].

Although these drugs act in generally the same manner, it is occasionally necessary to switch from one to another in order to continue the beneficial results seen by increasing the level of acetylcholine in the brain. In a study published in 2003, Gauthier et al. showed that patients who had begun to show the loss of effect of donepezil obtained an improved result when switched to rivastigmine [85].

Memantine is the first NMDA receptor antagonist approved by the FDA for use in patients with moderate-to-severe AD [63]. This drug has several mechanisms of action, but it is thought that modulation of the activity of glutamate, a substance involved in information processing, storage, and retrieval, accounts for the therapeutic benefit in AD [4; 84]. Memantine reduces neuronal excitotoxicity by modulating the tonic (i.e., mild, con-

tinuous, chronic) activation of NMDA receptors, which should be acting in a phasic manner (i.e., reacting to stimulus) [63]. There is some evidence that beta-amyloid toxicity is also reduced by high doses of memantine [32]. Other neuroprotective drugs have been unsuccessful in clinical trials due to intolerable side effects and inefficacy [95].

EVIDENCE-BASED PRACTICE RECOMMENDATION

The European Academy of Neurology suggests that the use of a combination of cholinesterase inhibitor (ChEI) plus memantine rather than ChEI alone may provide useful benefits in patients with moderate-to-severe Alzheimer disease.

(https://onlinelibrary.wiley.com/doi/full/10.1111/ene.12707. Last accessed August 24, 2020.)

**Level of Evidence**: Expert Opinion/Consensus Statement

Medications such as antidepressants and antianxiety agents may be appropriate for some people to alleviate symptoms of concomitant depression and anxiety. A 2011 meta-analysis found that the selective serotonin reuptake inhibitors sertraline and citalopram were more effective than placebo at controlling agitation in patients with dementia and may be better tolerated than antipsychotics [168]. Selective serotonin reuptake inhibitors are recommended over tricyclic antidepressants when use of an antidepressant is indicated [159].

### Experimental or Alternative Medication Treatments

There is conflicting evidence regarding the clinical benefit of other therapies, including B vitamins, testosterone, ginkgo biloba, selegiline, and statins. Vitamin E, estrogen, and NSAIDs are generally regarded as being non-effective [79; 159].

B vitamin and folic acid supplementation have been studied in an attempt to reduce homocysteine levels in patients with AD. Improvements in cognition remain unproven, although homocysteine levels were found to diminish with consumption of vitamin combinations [87; 98; 99].

The use of hormone therapy has been debated in relation to developing AD. Estrogen replacement therapy for women has been studied and is considered generally ineffective [79]. Testosterone therapy for men, however, has shown mixed effects on cognition, with some research studies showing improved cognition [58; 60]. Part of this benefit may be the result of improvements in cardiovascular risk factors, and it is important to note that testosterone replacement is associated with increased risks of benign prostatic hypertrophy, liver toxicity, and erythrocytosis.

Ginkgo biloba is an herbal product with an unclear mechanism of action, but it may have antioxidant and anti-inflammatory effects, positively influence neurotransmitter levels, and have a protective effect on the energy metabolism of nerve cells when oxygen and glucose levels are low [97]. A certain extract of ginkgo (EGb 761) was shown in one study to produce a slight improvement in cognitive scores in patients with AD [6; 87]. However, another study found no marked improvement in patients with AD who received a daily dose of 120 mg of high-purity ginkgo biloba for six months [100]. Although ginkgo biloba would be a cost-effective treatment modality if effective, more research is needed to support its efficacy [97; 100]. As of 2014, it is not recommended [159].

Selegiline is a monoamine oxidase type B inhibitor that possesses some anticholinergic properties [79]. A meta-analysis of 17 well-designed trials found that a 10 mg per day dose was associated with a four- to six-week improvement in cognition; however, no benefit was seen after six weeks. There is currently not enough evidence to support its use [79].

The use of statins has been shown to decrease the incidence of AD but not to improve the cognitive abilities of the elderly [87]. Poor vascular health is a risk factor for AD; however, it is unknown whether it is the cholesterol-lowering properties of these agents that results in the supposed effectiveness or whether it is due to the pleiotropic functions of statins [166]. There is currently not enough evidence to support their use [159].

For some time it was believed that vitamin E could prevent or slow the progression of AD, due to a protective effect on neurons through a reduction of oxidative stress [6; 87]. However, research has not supported this use. A 2008 meta-analysis found no evidence of vitamin E effectively preventing or treatment AD or MCI, and no guidelines support its use for AD prevention or treatment [55].

NSAIDs have been studied for both treatment and prevention of AD due to their anti-inflammatory qualities. Twin studies have shown that NSAIDs used continuously for more than two years during a person's lifetime can delay the onset or reduce the likelihood of developing AD [132]. Although certain NSAIDs have been shown in epidemiologic studies to reduce the risk of AD, they have not been proven effective as a form of treatment [101; 102].

**Pharmacologic Research**

Because the accumulation of amyloid plaques and tau tangles in the brain are the key structural features of AD, drugs that decrease the amount of amyloid and tau present in the blood stream and/or CSF have been a significant area of research [91; 104; 105; 106; 107; 108; 109; 110]. Despite the efficacy of various agents in clearing aggregated plaques, certain research has shown that the course of the disease is not significantly altered by their elimination [54]. Because plaques are considered a sign of later stages of the disease, serious neural pathology is believed to occur as the result of other disease processes or amyloid-induced toxicity [53]. Preliminary studies of a monoclonal beta-amyloid antibody, gantenerumab, have found a reduced deposition of beta-amyloid in treatment-group participants' brains on PET scans versus controls [51; 91]. Trials assessing the efficacy of gantenerumab for prevention of AD in genetically susceptible individuals and treatment of existing AD are being conducted.

The results of large-scale randomized clinical trials to assess the efficacy of monoclonal antibody therapy for AD have not proved promising. Solanezumab is a humanized monoclonal antibody that binds to the mid-domain of the beta-amyloid peptide. It was designed to increase clearance of soluble beta-amyloid peptides from the brain before deposition of the toxic fibrillary form of the protein [180]. In a double-blind, placebo-controlled phase 3 trial, 2,194 patients with mild AD were assigned to receive intravenous solanezumab or placebo every 4 weeks for 76 weeks. The primary outcome was change from baseline to week 80 in the cognitive subscale of the AD Assessment Scale. Results showed that compared with placebo, solanezumab had no significant effect on cognitive decline [180].

Disruption of the GABAergic and glutamatergic systems is associated with the behavioral and psychologic symptoms of AD [63; 92; 94]. Evidence for a link between various mood disorders (including depression) and the heightened risk of developing dementia, related to disruption of GABA and l-glutamic acid levels in the central nervous system, is being sought [167]. While memantine has shown promise in regulating the glutamatergic system, it is hoped that future neuroprotective/neuromodulatory agents may be able to inhibit toxicity well before symptoms of AD. More research is clearly needed regarding the role of regulating the GABAergic and glutamatergic systems in AD treatment [93; 167].

**Antipsychotic and Antidepressant Medications**

Depending upon the disease stage, 25% to 50% of patients with AD experience concomitant psychotic symptoms [70]. Although antipsychotics have been used in the management of AD, none have been approved specifically for this use. In 2005, the FDA warned the healthcare community regarding the increased risk of mortality in elderly patients receiving atypical antipsychotic medications for dementia-related psychosis. In 2008, the FDA added this warning to typical antipsychotic medications as well [135]. In addition to the increased risk of mortality and other serious side effects, antipsychotics diminish the patient's response to stimuli and may be considered a form of chemical restraint when the sedative properties of the drug are used to facilitate patient management [89]. Even with short-term use, antipsychotic medications are associated with many adverse effects in this population, including [134; 137]:

- Increased mortality rates
- Cerebrovascular events
- Tardive dyskinesia
- Neuroleptic malignant syndrome
- Hyperlipidemia
- Weight gain
- Diabetes
- Sedation
- Parkinsonism
- Decreased cognition
- Akathisia
- Hypotension
- Peripheral anticholinergic effects

A clinical need for the use of antipsychotic medications must be established. Psychotic behavioral disturbances, including agitation, hallucinations, delusions and paranoia, and physical and verbal aggressive behavior, may justify their use [49]. Wandering, impaired memory, depression, insomnia, and anxiety do not warrant their use unless patients present a danger to themselves or to others. Evidence suggests no single drug is more effective than any other, and when a drug is effective, it requires relatively low doses [134]. Greater clinical improvement has not been noted with higher doses [67]. The goal of the therapy is to find the dose at which the identified behaviors are eradicated without causing sedation [66]. Before antipsychotic medications are prescribed [66; 152]:

- Consider that changes in behavior may be caused by a medical problem other than the dementia
- An assessment should be completed to rule out other treatable causes, including the medication itself.
- A specific treatment target should be established and documented.

Because age may alter the absorption, distribution, metabolism, and elimination of many medications, elderly individuals may be more sensitive to their effects [134]. The combination of drugs may also contribute to disorientation and confusion, and administration of multiple drugs increases the risk for adverse, interactional side effects. Ongoing evaluation is required to determine the effectiveness of these agents over time and to assess the need for their continued administration [152].

## NONPHARMACOLOGIC THERAPIES

According to the Alzheimer's Association, nonpharmacologic modes of treatment for AD have been used in the effort to maintain or improve cognitive function, enhance quality of life, and improve the ability to perform activities of daily living [4]. For some patients, this approach is also an effective adjunct to medication prescribed for control of behavioral symptoms such as depression, sleep disturbance, agitation, and depression. The modes of treatment most often studied are supervised physical activity and exercise program, cognitive stimulation, and cognitive training (e.g., computerized memory training, cognitive-behavioral therapy). Clinical reports and meta-analyses published since 2010 have shown mixed results; the impact on cognitive function in patients with mild AD has been difficult to demonstrate, or modest in degree and of uncertain duration [4]. A 2019 Cochrane systematic review found that cognitive training for persons with mild-to-moderate AD is probably associated with small-to-moderate positive effects on global cognition and verbal semantic fluency, and these benefits appear to be maintained for at least a few months [181].

An AD study group in Denmark has investigated the effect of moderate- or high-intensity exercise on cardiorespiratory fitness, as measured by peak oxygen uptake, and the association between this parameter and changes in cognition and neuropsychiatric symptoms in patients with AD. Their results show that cardiorespiratory fitness can be improved in community-dwelling patients with mild AD, and that this improvement has a positive effect on mental speed, attention, and neuropsychiatric symptoms [182].

## COMPONENTS OF CARE

The care of people with AD is based on supportive and comfort measures, restorative care, prevention of complications, and management of coexisting illnesses. The 2018 Alzheimer Association Care Practice Recommendations emphasize a philosophy of person-centered care built around the needs of the individual and contingent upon knowing the person through an interpersonal relationship. Practice recommendations for person-centered care include [183]:

- Know the person living with dementia as a unique and complete person, including his/her values, beliefs, interests, and abilities—both past and present.
- Recognize and accept the person's reality, seeing the world from the perspective of the individual living with dementia
- Identify and support ongoing opportunities for meaningful engagement. Support interests and preferences, allow for choice and success—even when dementia is severe, the person can experience joy, comfort, and meaning.
- Build and nurture authentic caring relationships. This involves concentrating on the interaction rather than the task—"doing with" rather than "doing for."
- Create and maintain a supportive community for individuals, families, and staff.
- Evaluate care practices regularly and make appropriate changes.

### SUPPORT AND COMFORT MEASURES

The concept of palliative care encompasses both symptom control and maximization of physical and emotional comfort. Behavioral symptoms are rarely the result of the disease alone but are often precipitated by the environment or the approach of the caregivers [33]. For the patient with AD, palliative care is centered on the alleviation of agitation and anxiety, the prevention of catastrophic reactions, and the management of delusions and hallucinations. Comfort may be extended in a number of ways. Members of the interdisciplinary team work together to develop interventions that will facilitate the individual patient's physical and emotional comfort.

#### Preservation of Dignity and Quality of Life

The concept of dignity is subjective and may have different meanings for each person. It is beneficial to have an understanding of what the patient was like before the illness. Remember that several aspects of individuality must be met:

- The identity of the person: How does he or she wish to be addressed? Is there a title, such as Doctor, that is appropriate?
- Respect for privacy: A person who has always disrobed in private may react negatively to being undressed by a stranger.
- The appearance of the patient: Attending to grooming and personal hygiene can improve a patient's self-esteem.
- The patient is an adult: Even though cognitive deficits exist, the patient has experienced the joys and challenges of several decades of living. To treat patients as children is inappropriate and demeaning. Using words and touch so they feel valued as individuals is beneficial. People with AD still have a need to make contributions and to feel that they have some control over their lives. They are more content when they are encouraged to remain active and involved, using their remaining strengths and abilities.
- Physical and psychologic comfort: People with AD have the same basic needs that healthy individuals have. Unmet needs will be reflected in the patient's behavior. The behavior will not change as long as the need remains unmet. Meeting physical needs can prevent discomfort related to hunger, thirst, restlessness, constipation, or the desire to void.

- When people do not feel safe they become anxious: If patients feel threatened they may strike out verbally or physically. Persons with AD may feel unsafe much of the time because they do not understand the environment and what is going on around them.
- People with AD also need to love and be loved: They have positive and negative feelings. They should be touched, be hugged, and have eye contact with caregivers. Care providers should converse with them on their level without being condescending, compliment them on their appearance, and provide quiet, private areas for visits. Spouses should know that it is acceptable to express affection.
- It is useful to plan activities compatible to the abilities of each individual so they can experience a feeling of success.
- Listen to the patient. What is expressed may not sound rational to others, but it does to them.

Family and staff should consider the wishes of the patient before initiating a treatment that may prove to be more harmful than beneficial. For example, starting an IV for feeding or administering antibiotics for an infection may not be in the best interests of the patient if he or she must be restrained to prevent dislodging of the needle. Acknowledge the individual's autonomy. When a patient is too demented to make decisions, the family must consider what their loved one would have wanted rather than what they themselves want.

Be honest with patients with AD while being optimistic when answering questions. Let them know that although the disease is progressive and there is no cure, there are still treatment options. Honesty from caregivers often encourages patients to consider the future and to make decisions about what they want as their condition worsens.

## RESTORATIVE/REHABILITATIVE CARE

Restorative care is based on the premise that quality of life is dependent on autonomous need fulfillment and self-determination. It is concerned with maintaining an individual's sense of dignity and self-worth. The concepts of restorative care are based on a philosophy that is directed towards maintaining functional levels in activities of daily living and preventing complications [34]. Unfortunately, caregivers can become focused primarily on behavioral stability, especially if patients are easily agitated and uncooperative [103]. In many cases, this leads to the patient remaining sedentary because caregivers believe it is easier and/or faster to complete tasks themselves rather than assisting the patient with the task.

Aggressive rehabilitation techniques are usually not appropriate for the management of AD. However, rehabilitation specialists may serve as consultants and provide suggestions for interventions that will delay the onset of self-care deficits. Conflict about the appropriateness of rehabilitation may arise between members of the healthcare team when a secondary problem occurs. For example, if a patient with AD factures a hip, there may be reluctance to provide physical therapy after surgery. The attitude may be "Why rehabilitate? The person has AD." The diagnosis of dementia should not be an obstacle to appropriate treatment. In this case, if the patient was ambulatory before the fracture, physical therapy should be considered. The potential for achievement is partially dependent on the degree of cognitive impairment.

## MAINTAINING AND ASSESSING FUNCTIONAL LEVELS

The manifestations related to AD have a profound effect on the ability to perform activities of daily living. The rate at which those skills are lost varies from person to person. The degree to which function diminishes depends on the complexity of the task. After a skill is lost, it generally cannot be regained. Interventions are based on maintaining a skill for as long as possible. Basic self-care activities can usually be managed through the first two stages of the disease with varying degrees of assistance.

The ability to complete instrumental activities of daily living, such as financial planning and driving, disappears early in the process. Disability associated with self-care deficits can be exacerbated by many factors other than the disease. Other illnesses, medication toxicity, increased fatigue, sensory deprivation, and inadequate support from the environment and caregivers can hasten the onset of functional loss.

Completing a functional assessment of those with AD serves several purposes. The selected tool can identify existing self-care deficits at the time of admission, allowing the care team to establish appropriate goals and interventions. Assessment data can be used to determine placement of patients in programs fitting their capabilities. Their strengths can be identified and utilized to delay the onset of deficits. Using a form that records how many minutes a caregiver spends assisting the patient with each activity (e.g., bathing, dressing, grooming, walking to activities/meals, walking for recreation, assisting with exercise, leading an exercise class, helping with class activities) can help ensure that time is devoted to maintaining functional skills [103].

## PREVENTING COMPLICATIONS

AD predisposes patients to a number of complications. In the early stages of the disease, risk is highest for injury and trauma related to wandering; inability to recognize sensory cues for danger; impaired judgment; impulsiveness; memory deficits; altered nutrition related to shortened attention span, apraxia, and agnosia; and excessive energy expenditures due to wandering. In the later stages, there is increased risk for incontinence, pressure ulcers related to impaired mobility, and possibly undernutrition and aspiration related to impaired swallowing.

Each individual should be evaluated for these risks, with appropriate interventions implemented as needed. Validated assessment tools may be used upon admission to determine the risk for pressure ulcers and altered nutrition so preventive measures can be undertaken. These also serve as a baseline for future assessments. A speech pathologist can evaluate for aspiration risk and give the nursing staff ideas for successful intervention.

## MANAGING COEXISTING ILLNESS

Many elderly people have multiple medical diagnoses, and those with AD are no exception. Patients may have coexisting chronic illnesses, such as diabetes, cardiovascular disease, osteoarthritis, or depression. Complications associated with these disorders may not be readily apparent. Manifestations of hypoglycemia or digitalis toxicity may be mistakenly attributed to progression of the disease. Patients with AD and with pain related to osteoarthritis may not be able to verbally communicate their discomfort to caregivers. Increased agitation, confusion, and body language may be the only clues. Ongoing monitoring and evaluation is therefore required in order to identify potential or existing problems.

Individuals with AD may also suffer from an acute illness. Elderly people, in general, do not always present with the typical signs and symptoms associated with acute illnesses. As noted, changes in behavior are often the only manifestation of the onset of complications related to coexisting disorders or acute illness such as infections. It is recommended to investigate any sudden or recent change, including:

- Changes in appetite
- Increased confusion
- Changes in sleep pattern
- Falling by someone who is normally a steady walker
- Change in elimination patterns

- Elevated temperature
- Increased restlessness
- Agitation and anxiety

There are four urgent problems to rule out when behavior changes are noted: constipation, pneumonia, urinary tract infection, and medication toxicity. If the evidence is inconclusive, further investigation is warranted.

## GENERAL MANAGEMENT TECHNIQUES

General management techniques are based on consistency, focusing on the individual's abilities, task breakdown, cueing, and the use of distraction.

### Consistency

Consistent caregivers should be familiar with:

- The patient's strengths and disabilities
- How to approach the patient to avoid triggering catastrophic reactions
- The patient's usual behavior and responses
- When the patient is exhibiting unusual behavior
- The safety risks applicable to the specific patient
- How to maintain a consistent routine and environment

### Task Breakdown

Each activity of daily living requires a number of steps that must be completed in sequence in order to accomplish that particular task. The functional assessment identifies the steps of an activity of daily living that the individual can and cannot perform. Using this information, an approach can be developed that allows patients with AD the opportunity to perform the steps that they are capable of performing. For example, a patient may be able to brush his or her teeth if all the needed items are set out. It is possible for well-intentioned caregivers to enforce dependency by overhelping. When a patient begins to have problems completing a task, this approach may prevent premature deterioration.

### Cueing

Cueing is a process of giving hints or clues to facilitate independence. Verbal cues require the use of simple instructions given with each step of a task. For example, a caregiver may say, "Please put on your shirt" while handing the shirt to the individual. After the shirt is on, the caregiver may say, "Please button your shirt." Demonstrating the action by buttoning the first button provides an additional cue. Redundant cueing uses several methods, such as colors, words, and pictures to communicate information. A facility may have all bathroom doors painted the same color with the word bathroom on the door and a picture of a toilet.

### Distraction

Brief attention span and memory deficits can be helped by the use of distraction techniques. Looking through a picture book may distract the patient who complains of not having dinner immediately after eating. If a patient with AD has his or her hands full while shopping, it will be difficult or impossible for the patient to pick up unnecessary items from the shelves.

## COMMUNICATING WITH PATIENTS WITH AD

Communication provides a means for utilizing information and facilitates social interaction. The brain integrates and processes information that is received through the senses. Messages are sent by means of speaking, writing, or gesturing. Messages are constantly sent and received without conscious awareness. Body language may send a more accurate message than words in some instances.

## COMMUNICATION PROBLEMS

Communication becomes impaired as AD progresses. The left brain functions of language, reasoning, and calculation are diminished while the right brain functions of feeling and intuition increase. Aphasia is a major manifestation of AD, and both receptive and expressive aphasia eventually occur. Aphasia is a language impairment involving all modalities, including speaking, reading, writing, and arithmetic.

Letters, numbers, signs, and gestures are utilized for language. To use language, one must know what the symbols mean before the information can be interpreted and understood. Speech is a motor act involving movement of the muscles of respiration as well as the lips, tongue, jaw, palate, and larynx. Advanced patients with AD have problems concentrating on what is being said, comprehending what was said, and formulating a response. They will have a flat affect and difficulty in expressing emotions. This does not mean that there is an absence of feeling.

In the first stage of AD, patients' vocabulary shrinks and they have difficulty with word finding. Word substitution may be used, as they use a word with similar meaning in place of the forgotten word. For example, "pencil" may be used for pen or "truck" for car. Patients may try to describe an object that they cannot name (e.g., "that thing I write with" or "what we ride in"). Pseudowords or inappropriate words may be used to fill the gap. Patients may make a "word salad," as several unrelated words are tossed together to compensate for lost words. Speech may be repetitious because they cannot remember what they have already said. There is occasional logorrhea (the rapid flow of speech, often incoherent). During the early stages, individuals can comprehend most messages when they are received but quickly forget the message due to memory deficits [36].

As the disease progresses, there is decreasing ability to comprehend both written and oral language. Persons with AD may be able to understand one or two words but are unable to comprehend an entire sentence or complete thoughts. Simple commands can be understood and followed. They are unable to abstract and all messages are interpreted as literal. The person who is instructed to "hop into bed" will attempt to do just that. For someone with AD, a "wet floor" sign on a freshly mopped floor may be a command to urinate on the floor. Patients will begin to confabulate, or invent fictitious details about past events, in order to disguise the inability to remember. Confabulation is the result of memory deficits but also affects communication. Social phrases such as "please," "thank you," and "how are you" may be retained for a surprisingly long time [36].

Eventually, patients with advanced AD become mute because they are unable to use language in either written or oral form. Perseveration may be evident, as patients repeat the same word over and over. Although there is no verbal exchange between the patient and caregivers, communication does take place. It is helpful for caregivers to remember that patients often understand more than we think they do, but they are unable to verbally express this understanding. Those with AD can "read" the people around them and will respond accordingly. In spite of the words used, the body language, facial expression, and "touch" of the caregiver may send conflicting messages. Patients are very sensitive to the emotional climate and environment.

In the early stage, patients may make statements that seem to make no sense to caregivers. Frequently, these expressions represent their experiential history being given in a fragmented and illogical sequence. Asking key questions about the statement helps develop a sense of trust between caregiver and patient. For example, Patient C fre-

quently made comments about her students. She was happy and content when a caregiver followed up on her comments. By asking questions, such as, "What subject did you teach?" or "Can you tell me about some of your students?" the interest expressed by the caregiver acknowledged and validated Patient C's worth. When caregivers discredit a statement by correcting the patient or pointing out that it is untrue, alienation and distrust occur. In the last stage, patients have little ability to communicate. Excessive mumbling, striking out, or resisting care may be the only avenue left by which to express mental or physical discomfort.

## SUGGESTIONS FOR IMPROVING COMMUNICATION

Use of effective techniques can facilitate the communication process and will avoid physician, caregiver, and patient frustration. All healthcare staff should understand and utilize these techniques.

The patient should always be acknowledged as an adult person, with the same feelings and emotional needs as any adult. Communication should be on an adult level, avoiding the use of jargon, demeaning expressions, or baby talk. It is important to be positive, confident, and hopeful and give praise for small achievements and successes in a respectful manner. It is best to identify and respond to feelings rather than facts. For example, if the patient with AD says, "I'm going Christmas shopping" in the middle of April, one can respond by asking follow-up questions, such as, "What kind of gifts did your children like?" Identify and acknowledge emotions and comments, such as, "This must be really frustrating to you" or "It's okay to feel angry."

The caregiver should tell patients what is being done and prepare them for what is happening by saying "I'm going to move your wheelchair over by the table," or "I will walk with you to the dining room."

Time has little meaning. Saying, "Your son will be here after lunch" is preferable to saying, "Your son will be here at 1 p.m." Asking questions requiring yes/no answers as opposed to open-ended responses is preferable. Instead of asking, "What do you want to wear today?" one could ask, "Do you want to wear the green dress or the blue dress?" as both dresses are held up.

It helps to make sure patients can see and hear the speaker. Placing oneself at eye level, identifying yourself, and calling the patient by name when beginning conversations may also be beneficial. Use eye contact and place yourself at the patient's level. Use facial expressions and touch, point to, or show items as cues to augment verbal communication.

Eliminate all environmental distractions. Turn off the radio and television. Take patients to a quiet place, if necessary. Limit the number of people conversing at one time. Patients cannot keep track of the topic and who said what.

Processing messages also takes longer. Give patients time to hear you and to formulate a response. If they become stuck, help them find the right word through association. Provide the right word if you know what is meant.

Resist attempts to use logic or to reason with patients with advanced AD. Cognitive deficits associated with AD have undone their ability to be logical and reasonable. Phrases such as, "I just told you that" or "this is the last time I am going to tell you" are humiliating and frustrating. Remember that they are easily distracted. If a patient repeatedly says he or she has to go to the bank, for example, distract the patient by looking at pictures with him or her or asking for assistance with a simple task.

Be aware of the impact of body language. Studies have found that throughout the course of dementia, people remain responsive to nonverbal emotional messages. They react positively to a warm smile, friendly tone of voice, and gentle touch. They may become anxious when approached by a stern face, impatient tone, or a too firm grasp of the wrist. Anxiety leads to agitation and possibly catastrophic reactions. Words and actions must match. Words may be caring and kind, but the person will pick up on tension reflected in facial expressions, body movements, and tone of voice.

Be aware that there are differences in the learned meanings of words and that cultural backgrounds can alter interpretations. Dinner for one individual may be the noon meal and for another the evening meal. Carbonated beverages are called "soda" in some parts of the country and "pop" in another section. In Britain, a face cloth is called a "terry" and gasoline is called "petrol." Be selective in the use of healthcare terms that have ambiguous sounds, such as, "I'm going to take your vitals now" or "It's time to go to therapy."

Avoid giving choices for situations in which a choice may not be reasonable. For example, asking, "Do you want to take a bath now?" implies a choice. If the bath really needs to be given now, say, "It's time to take a bath now. I will help you."

Touch the person gently on the arm or hand if necessary to get his or her attention. Speak slowly and softly in a low, calm voice. Stay about an arm's length away. Use short, specific, familiar words and simple sentences. Give only one direction at a time. For example, hand the patient a washcloth and say, "Please wash your face."

Avoid asking questions that patients may not be able to answer. In the early stages, patients will be embarrassed and frustrated with yet another reminder that their abilities are diminishing.

Listen carefully. If you do not understand, say so. Never assume that comments are the result of confusion or delusions. The patient may be reliving experiences from years ago. Listen to stories even if you have heard them several times before.

Remember that "white lies" are permissible. The physical safety and emotional feelings of the individual are priority. When someone says, "I'm waiting for my husband to come for supper," responding with, "Don't you remember your husband died five years ago?" is cruel and unnecessary. Respond with a question: "What did your husband like for supper?"

Humor is always beneficial when used at the appropriate time. People with AD enjoy the camaraderie that evolves when people laugh together. However, teasing, sarcasm, or laughing at someone with AD is never appropriate.

## COMMUNICATING WITH TOUCH

When used judiciously, touch is very effective when working with people who have AD. The need to touch and be touched may increase with age as other senses such as vision and hearing tend to become diminished. "Skin hunger" may occur when there is lack of human physical contact with others, and researchers have compared lack of touch to malnutrition [40]. All forms of touch convey a message that is either positive or negative. Touch can be therapeutic and give the most pleasure of all senses. The significance of touch is often overlooked in this age of technology. Touching can build one's self-esteem when it implies acceptance of the person, and it can prevent feelings of rejection and loneliness. Touch can be functional or affectionate. Touch can be comforting and soothing. Gently rubbing the temples or giving a back massage has a calming influence. Caregivers use functional touch when they give a bath, take a pulse, or perform other nursing duties. Holding a hand or giving a hug reflects affection and caring. Touch can say, "I care about you." It builds trust and a feeling of security. Caregivers also

"touch" with their voices, eyes, and facial expressions. Nonphysical touch occurs when you enter someone's personal space. The response of the individual depends on the situation. Patients may respond with verbal or physical violence if they are agitated or experiencing a catastrophic reaction.

Touching may not be appropriate for all people. Be sure the patient sees you first. If a patient is startled by your presence, he or she may react by striking out. Know the person—some people just do not like to be touched. Others may associate all touching as a prelude to sexual activity. Someone who has been physically abused may connect touching with pain and respond accordingly.

## COMPANIONSHIP, INTIMACY, SEXUALITY, AND COMMUNICATION

For reasons that are not yet understood, changes in sexual behavior may become apparent in people with AD. Psychologic reactions, such as depression and anxiety, that affect the general population, may also result in sexual dysfunction in the person with AD. Structural changes in the brain and nervous system may also account for sexual dysfunction. Coping with memory deficits may be so stressful that there is little energy or desire left for sexual activity.

The impaired partner may not remember the spouse as a sexual partner. The healthy spouse may be too physically and emotionally fatigued to be interested in sex [39]. In some cases, spousal caregivers find it difficult to view their partners as sexual beings when they must provide for all their physical needs. Healthy partners may feel that it is not proper to expect the spouse with AD to participate in sexual activity. People with AD and their partners are often reluctant to discuss sexual matters. Support and counseling, especially for the healthy person, may be needed in order to cope with the changes brought about by the disease. Sexual intercourse is only one aspect of sexuality. Many couples find renewed meaning in companionship and intimacy. They often experience fulfillment in keeping the commitment to "love for better or worse, in sickness and in health" [39].

Sexuality raises additional issues among residents of long-term care facilities. Staff members are concerned about legal issues, patient's rights, and the family. In some situations, staff members have received little education about sexuality and may react to incidents involving sexuality inappropriately. Sexual functions are closely linked with physical and psychologic well-being; ideally, a sexual assessment would be completed for every resident and used in planning care [39]. In the residential setting, a patient may initiate a relationship with another resident. When one or both patients are married, the reaction of the healthy spouse is a legitimate concern for staff members. Assessment and care planning regarding sexual activity is necessary to determine whether both parties are aware of the relationship, if either party is being exploited or exploiting the other party, and if both parties are aware of any risks that may be inherent in the relationship.

In the early stages of AD, the patient may be capable of making decisions regarding sexuality. The staff may need to adapt a viewpoint that asks, "What would we do if this person was living in the community?" For example, a staff member may not approve of homosexuality, or an affair between two married people, but that person does not assume responsibility for forcing those values on the involved parties.

Partners of residents should be given privacy when they visit. Remind staff members not to enter a room with a closed door. Assure the partner that it is acceptable behavior to be intimate if this is the desire of both people.

Interventions may be required when sexual behaviors are carried out in public. The behaviors may not necessarily be rooted in sexual feelings. The person who disrobes at inappropriate times or in unsuitable settings may be feeling uncomfortable because clothing is too tight or too warm. The patient does not realize that clothes should not be removed in public. Exposure may also mean the patient has to go to the bathroom or wants to go to bed. A change of clothing may avoid future situations. It may be necessary to dress patients in dresses that zip up the back or in pull-on pants without a zipper so they cannot be easily removed. Patients who wander at night may crawl into bed with other residents. The person who has slept with a spouse for half a century may be looking for the comfort derived from sleeping with another person in the same bed. Lead them from the room and try to distract them with another activity.

Patients with AD may become jealous and suspicious, accusing their spouse of having an affair. Arguing or trying to convince them otherwise will only escalate the level of anxiety; it is better to patiently distract them with another activity.

Masturbation is not an uncommon behavior for people residing in long-term care facilities. It is an acceptable and therapeutic method for relieving sexual tension. Patients who masturbate in public areas should be taken to their room and provided with privacy. Staff members must observe their right to privacy. Residents may make sexual advances to staff members. Calmly removing their hand or giving them something to hold while care is being rendered may resolve the situation.

## MAINTAINING NUTRITIONAL STATUS

Healthy elderly people require 1,500–2,000 calories per day to maintain nutritional status. The person in the middle stages of AD may require an additional 600 or more calories per day to prevent weight loss due to constant walking or pacing. Fluid requirements are 30 mL/kg of body weight [42].

Several studies have linked AD to nutritional deficiencies. Persons with AD tend to have decreased body weight and different fat composition, neither of which is explained by dietary intake, activity, or malabsorption. Several studies report that men and women with AD have vitamin deficiencies. A diet high in nutrients and vitamins has been shown to be of benefit [43]. As with other elderly shut-ins who receive insufficient sunlight, patients with AD are prone to vitamin D deficiency; periodic assessment of serum vitamin D, and supplementation when levels are low, is an important component of follow-up care.

### IDENTIFYING ALTERED NUTRITION AND DEHYDRATION

The nutritional and fluid intake of people with AD must be closely monitored. Patients should be weighed at least monthly. Weight loss is considered significant if:

- There is a 5% weight loss in one month; weight loss greater than 5% is considered severe
- There is a 7.5% weight loss over a three-month period; anything greater is considered severe
- There is a 10% weight loss over a six-month period; anything greater is considered a severe weight loss

The Nutrition Screening Initiative has identified the following warning signs of people at risk for unintended weight loss [44]:

- Needs help to eat or drink
- Eats less than half of meals/snacks served
- Has mouth pain
- Has dentures that do not fit correctly
- Has a hard time chewing or swallowing
- Has sadness, crying spells, or withdrawal from others
- Is confused, wanders, or paces
- Has diabetes, chronic obstructive pulmonary disease, cancer, HIV, or other chronic disease

EVIDENCE-BASED PRACTICE RECOMMENDATION

The Hartford Institute for Geriatric Nursing recommends assessing persons with moderate- to late-stage dementia for mealtime difficulties using the Edinburgh Feeding Evaluation in Dementia Scale. (https://www.guidelinecentral.com/summaries/assessment-and-management-of-mealtime-difficulties-in-evidence-based-geriatric-nursing-protocols-for-best-practice. Last accessed August 24, 2020.)

**Level of Evidence**: III (Quasi-experimental studies)

Undernutrition may be identified by pale, scaling skin with dark areas on the cheeks and under the eyes. The tongue may be swollen and discolored and covered with lesions. Spongy, bleeding gums and dental cavities are other signs. Lack of subcutaneous fat and weak, atrophied muscles may also be noted. Disorientation is common with undernutrition. Signs of dehydration include dry oral mucous membranes, orthostatic hypotension, increases in pulse and respiration, decrease in blood pressure, disorientation, and diminished skin turgor [44].

## NUTRITION AND EATING PATTERNS IN PATIENTS WITH AD

There are many factors that interfere with food consumption and absorption among the population with AD. The person who lives alone may lack the cognitive resources to shop for, plan, and cook a nourishing meal. A loss of coordination may make it difficult to pick up utensils and to get food and drink to the mouth. Spilling food may embarrass the person in the early stages of AD. In the later stages, loss of oral control and hyperorality may make it difficult to get adequate nourishment.

Factors that may hinder proper eating and nutrition in patients with AD may be assessed by considering the "A's of Alzheimer's" [122]:

- Aphasia: Difficulty articulating preferences orally
- Apraxia: Difficulty maneuvering food utensils, difficulty chewing and swallowing food
- Agnosia: Difficulty recognizing utensils and food
- Amnesia: May not remember eating or distinguishing the need to eat
- Anorexia: Decreased appetite (psychologic cause possible)

Cognitive deficits related to short attention span, disorientation, and memory loss all contribute to the inability to complete a meal. Food may be hidden or thrown away. The patient may be unaware of or unable to respond to hunger and thirst sensations. Sensory-perceptual deficits interfere with eating skills. Those who have agnosia are not able to identify eating utensils and may try to comb their hair with the fork. The patient with apraxia may know what the fork is and how to use it but be unable to pick it up and bring food to the mouth. Some may perseverate during eating, chewing the same mouthful of food over and over. Others may tire of eating or lose interest before the meal is completed.

Poor positioning also impedes the eating process. The table may be too high and the food too far away. Poor oral hygiene can predispose the patient to problems that cause loss of appetite, difficulty in chewing, and pain from oral lesions. In the later stages, dysphagia obstructs nutritional intake. The late-stage patient is unable to feed him or herself and may refuse to eat. Decisions should be made regarding aggressive nutrition and dehydration measures.

Food texture must be adapted to the diminishing skills. Barring other medical conditions, the patient can be placed on a regular diet, avoiding tough, stringy meats and foods that are difficult to chew, such as caramels. A mechanically soft diet with ground or chopped foods may become necessary. Eventually, a pureed diet is usually required. Commercial thickeners added to fluids facilitate swallowing.


According to the American Occupational Therapy Association, Montessori methods and spaced retrieval techniques may improve self-feeding in patients with Alzheimer disease.

(https://www.guidelinecentral.com/share/summary/5b160ada07940. Last accessed August 24, 2020.)

**Level of Evidence**: B (There is moderate evidence that occupational therapy practitioners should routinely provide the intervention to eligible clients. There is high certainty that the net benefit is moderate, or there is moderate certainty that the net benefit is moderate to substantial.)

## ASSESSING THE ACTIVITIES OF DAILY LIVING

Activities of daily living are skills learned in childhood that are completed without conscious thought throughout adulthood. Physical and cognitive disabilities can interfere with the mastery required for these skills. The adaptation of the environment and simplification of the task can enable one to function with minimal assistance throughout the first stages of the disease. The diminishing abilities are often the impetus for admission to a long-term care facility. Instrumental activities of daily living are lost early in the course of AD because proficiency in judgment and problem solving skills are required. As previously noted, money management, use of a telephone, driving, and household management are examples of instrumental activities of daily living.

### INDEPENDENCE AND LETTING GO

Adults take their independence for granted. Caring for oneself, running a household, and managing money are tasks that are carried out daily. People in the initial stages of AD are no different. The individual may still go to work every day, drive a car, pay the bills, and balance the checkbook. As the disease progresses, the person's capabilities are gradually lost, resulting in total dependence. This stage is particularly difficult for both the individual and family because the patient with AD is aware that his or her abilities are ebbing away. The patient often experiences difficulty with financial planning and driving, activities that are important to independence. However, it is difficult for family members to suggest that it may be time to retire from a job or to give up driving.

EVIDENCE-BASED PRACTICE RECOMMENDATION

According to the European Academy of Neurology, assessment of driving ability should be made after dementia diagnosis with particular attention paid to visuospatial, visuoperceptual, and executive abilities. Advice either to allow driving, but to review after an interval, to cease driving, or to refer for retesting should be given.

(https://www.uems-neuroboard.org/web/images/docs/exam/EAN-guideline-diseases-associated-with-dementia.pdf. Last accessed August 24, 2020.)

**Level of Evidence**: Good Practice Point

### Money Management

Determine whether the patient still writes checks with legible handwriting, adds and subtracts in order to balance a monthly statement, handles cash (i.e., paying for purchases and receiving change), or comprehends the routine of paying taxes. Does the patient have an awareness of the family's overall financial status?

As the patient begins to lose the ability to handle financial matters, family members must gradually assume responsibility for these tasks. Patients may make accusations that someone is stealing from them. Allow them to keep small sums of money in their pockets. Consultation with an attorney may be needed to assure fairness to the patient and to the family.

### Driving

Losing a driver's license causes a considerable loss of independence. According to the Alzheimer's Association position statement on driving safety, a diagnosis of AD alone should not be considered grounds to revoke a patient's driving privileges [123]. Other factors must be present and considered, such as the degree of cognitive decline, comorbidities, and prescription of medications that may affect driving abilities [123; 124]. Formal assessments, such as an on-the-road driving test, should be considered when appropriate [123]. Physicians carry the responsibility of recommending driving cessation in patients with AD when necessary. As some states have reporting laws, physicians should be aware of their own state's reporting laws. This situation is difficult, especially in the case of the patient who refuses to give up driving. There are several issues that physicians are faced with, including [124]:

- Patient reaction
- Family or caregiver reaction
- Patient confidentiality
- Patient safety
- Public safety
- Third-party liability

Healthcare professionals should work with each patients' caregiver and family to explore all options, including taking away the car keys, disabling the car, or selling the car.

### Employment, Termination, or Retirement

It is wise for patients with AD to inform their employers of the diagnosis. It may be possible to switch to a simpler job or one with fewer responsibilities as ability declines; retirement may also be an option. The family can investigate the availability of counseling through an employee assistance program or a social service agency. The family also must determine whether or not any benefits, like a pension or health insurance, will be available to the worker if employment is to be terminated. They should also contact the local Social Security office to find out whether the patient is eligible for benefits.

## ETIOLOGIES OF SELF-CARE DEFICITS

A functional assessment will identify which tasks or which steps in the task the affected individual cannot complete. It is useful to monitor patients while they are attempting an activity of daily living to gather data upon which to formulate an appropriate intervention. The etiology for a self-care deficit cannot usually be reversed. However, an understanding of the etiology will result in setting reasonable goals.

### Memory Loss

Patients with AD do not remember that they have to take a shower, brush their teeth, and shave. They may forget how to find the bathroom, how to turn the water on, or where their toothbrush is when they get there. Knowledge of how to get toothpaste onto the brush or how to use the razor may also be lost.

### Shortened Attention Span

Even with reminders, patients often cannot attend to a task long enough to complete it. For example, they may start shaving or brushing their teeth and quit before they are finished.

### Sensory-Perceptual Deficits: Agnosia and Apraxia

Patients with AD may also have a figure-ground deficit, which means that when a number of items are laid out (e.g., toothbrush, toothpaste, razor), they are unable to distinguish one from another. The individual who perseverates may wash the same side of his or her face over and over, unable to move on to another part of the body. Sequencing deficits (the inability to complete the required steps in the correct order) are common in AD. For example, when dressing, patients may put underwear on top of outer clothing or try to put a sock on over a shoe.

Some individuals may suffer excess disability. This is defined as disability beyond that expected by the disease process itself. Treating the excess disability is a priority for people with AD. The condition may be caused by medication toxicity from drugs such as digoxin or phenytoin; other diseases, such as arthritis, cardiac disease, or coexisting mental illness; increased level of fatigue or stress; and vision or hearing impairments. Caregivers may unwittingly contribute to or hasten the onset of dependence by decreasing their expectations. Caregivers can over help because of their desire to spare their loved one. It can be due to impatience with the decreasing abilities, a lack of understanding of the disease, or because it is "just easier" to do it themselves [103].

## INTERVENTIONS FOR DELAYING THE LOSS OF FUNCTIONAL SKILLS

Although the changes resulting from AD cannot be reversed, abilities in activities of daily living may be maintained for a longer time if the patient receives personal and environmental support. However, caregivers must remember that once a skill is lost, it is likely lost forever.

A plan must be developed for care that includes specific interventions and goals based on the functional assessment. Appropriate communication techniques must be considered and included. Physicians and other healthcare providers may be involved in the development of the overall plan.

All caregivers must be aware of the care plan to ensure that a consistent approach is used. Lack of consistency or differing expectations of caregivers may impede success. It helps if all caregivers understand the ramifications of the self-care deficits, maintain the patient's dignity, and have all activities of daily living performed in privacy.

Identify strengths and focus on remaining abilities. It may be that the patient can no longer cut the meat on his or her plate, but if the patient is still able to butter the bread, he or she should not only be allowed but encouraged to do this.

Patients should not be expected to perform an activity of daily living when they are fatigued or agitated. Caregivers should let it go for the time being, and attempt it later, when both parties are rested or calmed down.

EVIDENCE-BASED PRACTICE RECOMMENDATION

The Hartford Institute for Geriatric Nursing asserts that healthcare professionals should maximize the functional capacity of patients with dementia by maintaining mobility and encouraging independence as long as possible; providing graded assistance as needed with activities of daily living; providing scheduled toileting and prompted voiding to reduce urinary incontinence; encouraging an exercise routine that expends energy and promotes fatigue at bedtime; and establishing bedtime routine and rituals.

(https://www.guidelinecentral.com/summaries/recognition-and-management-of-dementia-in-evidence-based-geriatric-nursing-protocols-for-best-practice. Last accessed August 24, 2020.)

**Level of Evidence**: Expert Opinion/Consensus Statement

Tasks should be broken into their separate components (***Table 5***). Interventions should be based on the steps of the task that the patient is unable to perform.

Include the use of cues in the care plan and be aware of how and when to use verbal or nonverbal cues, demonstration, hand-over-hand techniques, or physical guidance. Verbal cues consist of brief, simple instructions to the patient, such as "Please drink your milk" while presenting the glass of milk. Nonverbal cues consist of touching or pointing. It is often helpful to touch the person's hand and point to the milk. To demonstrate, pick up the glass of milk and raise it to your mouth. To use hand-over-hand techniques, place the glass of milk in the patient's hand and place your hand on the glass as well. Then raise the glass of milk to the patient's mouth. Handing the milk provides physical guidance. A combination of cues may be utilized for an activity.

Simplify tasks whenever possible. For example, it is easier to fasten shoes with a Velcro closure than it is to lace and tie.

**STEPS OF ACTIVITIES OF DAILY LIVING**

| Activity | Steps |
|---|---|
| Bathing | Gets to tub/sink/shower<br>Gathers items needed for task<br>Regulates water<br>Washes/rinses upper body<br>Dries body |
| Dressing/ undressing | Obtains/selects clothing<br>Puts on/takes off slipover top<br>Puts on/takes off cardigan top<br>Manages buttons, snaps, ties, zippers<br>Puts on/takes off skirt/pants<br>Buckles belt<br>Puts on shoes/socks |
| Eating | Gets to table<br>Uses spoon, fork, knife appropriately<br>Opens, pours<br>Brings food to mouth<br>Chews, swallows<br>Uses napkin |
| Toileting | Gets to commode/toilet<br>Manipulates clothing<br>Sits on toilet<br>Cleans self<br>Gets clothing in place<br>Washes hands |
| Mobility | Gets self to side of bed<br>Maintains upright position<br>Comes to standing position<br>Places self in position to sit in chair<br>Locks wheelchair brakes<br>Turns body to sit<br>Lowers self into chair<br>Propels wheelchair<br>Repositions self in chair<br>Raises self from chair<br>Places self in position to sit on edge of bed<br>Walks alone/with assistance<br>Uses assistive device(s) |

*Source: [34]* *Table 5*

It is important to remember that disruptive behavior during personal care may be triggered by:

- Misinterpretation of environmental cues
- Intrusion of the caregiver into the patient's personal space and territory
- Poor communication between caregiver and patient
- Feelings of poor self-esteem due to increasing dependence

- Feelings of insecurity
- Changes in routine, environment, or personnel
- Physical discomfort

## MANAGING PATIENT BEHAVIOR

Managing behavior is the greatest challenge associated with the care of people with AD. To meet the challenge successfully, caregivers must be educated about the disease process and its influence on behavior. Physicians who may deal with patients with AD should especially be knowledgeable in this area.

### ALTERING CAREGIVER PERCEPTIONS

All behavior has a reason, although the cause may not be immediately known. Behavior is a response to the environment, caregivers, or internal stimuli. Problems may develop when the expectations of the caregiver do not match the abilities of the patient. The patient has a need for supervision and assistance because of increasing functional disability. The management of behavior is directed toward adapting the environment and approaches to the needs of the individual. Caregivers cannot cure the disease or teach patients to remember. They cannot resolve behavioral issues by using logic, by trying to reason with the person, or by coaxing or using flattery. Caregivers should have a healthy sense of humor and be flexible, creative, and patient.

The medical model of care is no longer effective for patients with late-stage AD. Rigid routines that require vital signs to be taken at 8 a.m., showers/baths to be completed by 11 a.m., and all residents in bed by 8 p.m. are unnecessary and unworkable. Creativity allows the caregiver to acknowledge that sleeping in a bed wearing nightclothes is not necessarily the "norm" for all patients with AD. Behavioral management is successful when caregivers can enter the patient's reality and utilize techniques that show respect for adult feelings rather than dwelling on childlike behavior. The behavior of a cognitively impaired person is logical within his or her own frame of reference. A knowledge of history is helpful, as it facilitates understanding of the person who is reliving the 1940s, 1950s, or 1960s. An awareness of the patient's personal history is essential because it helps to know where the individual is "coming from" when he or she relives the past.

Avoid the use of labels in describing behavior. Words such as "uncooperative" are subjective and usually mean that the patient will not complete the desired task when it is asked. When staff members use such labels, the tone is set for all future contacts with the patient. Caregivers may assume that the patient will be difficult and thus elicit the poor behavior that is expected.

### STRESSORS AFFECTING PATIENTS WITH AD

Stress affects patients with AD just as it would any other person. The stress is intensified because patients lack control over themselves and their environment. There are many causes for stress, for example, unmet physical needs such as hunger, thirst, constipation, fatigue, and immobility. These can elicit a negative response from the patient. When anxiety and agitation are displayed, patients may be experiencing discomfort related to pain, nausea, or infections. In the early stages of AD, patients often feel anxiety associated with the diagnosis and manifestations of the disease. They know they are "slipping away" and that they are unable to do anything about it. Patients with AD also have the same emotional needs as anyone else. Family and friends may withdraw as the illness progresses, leaving the patient to feel rejected and isolated. Patients may be deprived of intimacy and physical closeness with a partner. The environment may produce a number of stresses related to sensory overload, for example, too many changes in caregivers and a lack of personal and environmental space. Cognitive impairment may cause patients to misperceive the environment or to suffer delusions and hallucinations.

## PROMOTING POSITIVE BEHAVIORS

Caregivers should make every effort to meet the patient's physical, safety, and emotional needs and to identify and treat health problems. The goal is to arrange an environment that is calm, safe, and serene but provides adequate sensory stimuli. Caregivers should be taught how to communicate effectively with those in their care. They should try to promote the individual's feeling of security by establishing flexible routines. Security can be enhanced by having the same people take care of the patient. They should focus on the individual patient's strengths and avoid emphasis on skills that have been lost. Caregivers use nonverbal, indirect, and creative encouragement to bolster the patient's sense of self.

## SUGGESTED MANAGEMENT SKILLS FOR CAREGIVERS

The problem solving approach can help to control annoying behaviors. When bad behaviors are identified and evaluated, interventions can be established. If the intervention is successful, it is permanently written into the care plan to avoid future similar problems. If the intervention does not have a positive effect on the behavior, further evaluation is needed. Did it fail because of misidentification of the problem or because someone did not understand or follow through with consistency?

### Identifying and Evaluating Behaviors

When a behavior is disturbing to caregivers, the specific actions of the patient must be identified. Using subjective descriptions such as "He became violent" or "She is aggressive" provide no clues as to a possible cause or how to intervene. The statement "Mr. J said he didn't want a shower and bit me when I attempted to take him to the shower room," provides a starting point for problem resolution.

The next step is to evaluate the behavior by further investigation. In this situation, the problem may be directly related to the shower or it may be due to other factors. To determine triggers for problem behaviors, the following questions may be helpful:

- What events occurred just prior to the incident? Did the patient feel embarrassed because he or she was incontinent and needed to be changed?
- What was the environment like? Were there too many people around; too much noise and commotion?
- Does the behavior arise from a specific issue (every time a shower is attempted) or does it happen to only one staff member?
- Does the behavior affect only one resident and one staff member?
- Is the behavior symbolic of an unrecognized problem? For example, flushing dentures down the toilet may be the only way the person knows how to communicate that the dentures are uncomfortable to wear.

With this information in hand, interventions can be developed.

There are clear-cut solutions to resolving problems caused by unmet needs or an upsetting environment. Other situations may require more deliberation. It may be helpful to discuss the problem with other staff members. Is the interaction between a patient and a particular staff member especially positive? Remember that it may be a housekeeper, a volunteer, or other individual who has the most substantial relationship with the individual. Try to identify the reasons and share this information so these approaches can be used consistently. Before establishing interventions, determine whether the safety or health of the patient or other individuals is at risk as a result of the behavior and whether the problem is truly a patient problem or a staff problem. In some cases, actions are only troubling to the staff and are not hindering the safety or health of anyone. For example, a patient with dementia who is masturbating in the privacy of his or her room is not a problem except to those members of the staff who consider it delinquent behavior.

### Redirecting Behaviors

Redirecting behaviors uses distraction techniques and patients' memory deficits, and short attention spans help to ensure the success of distraction. Used correctly, it avoids confrontation and the risk of catastrophic reactions.

### The Use of "Self"

The effective use of one's self as a therapeutic medium is the greatest intervention of all. Caregivers who are successful realize that the responses of the patient are frequently related to the approach of the caregiver. The most successful are those who are willing to "listen" to the patient's unspoken messages and use this information in their interactions. When a disturbing behavior occurs, they view it as a challenge for which they can find a solution rather than placing the responsibility for the behavior on the patient. They learn as much as they can about patients and their pasts through their contacts with the patients' families and others who know them.

As an example, Patient D was agitated one morning and repeatedly called out, saying, "I have to go outside." Because it was a beautiful spring morning, a nursing assistant wheeled Patient D to a window where he could view the trees and the blooming spring flowers. Patient D became more agitated and began pounding the table. Another nursing assistant who knew him suggested that he was upset because for several years he had been a gardener for a public park. The spring was his busiest time; sitting by the window reminded him that he had to get outside to "get his chores done." The nursing assistant also knew that he enjoyed ball games and moved him to the TV where he could watch his favorite team playing.

Caregivers with the therapeutic touch have the ability to go where the patient is at the present time. They can sing Christmas carols in the middle of July if that makes the patient happy. They know when hugs are appropriate and sense when a hand massage is in order. Most importantly, those who make use of "self" truly enjoy working with the patients and are proud of their accomplishments.

## SPECIFIC BEHAVIORAL INTERVENTIONS FOR PATIENTS WITH AD

Following the general guidelines provided in the previous section can help in preventing disturbing behaviors. However, disruptive behaviors may occur even in the best of circumstances. Most people with AD do not have simple, uncomplicated dementia. As noted, it is estimated that at least 25% of individuals also have concomitant depression and another 25% have concomitant psychosis [70; 133]. A small number of patients with AD may also have frontal lobe syndrome, which is characterized by responsive aggression [141]. Aggressive behavior may become increasingly physical if the caregiver does not understand the individual's inability to cope with the situation. Psychotic behavioral disturbances include agitation, delusions and hallucinations, and aggressive behavior [49].

In severe cases of potential danger, pharmacologic treatment may be required for disruptive psychotic behaviors along with the implementation of behavioral strategies. As noted, before starting pharmacologic management, assess all disruptive behaviors to rule out causes such as unmet physical needs, physical discomfort, acute medical problems, excessive environmental stimuli, or caregiver improprieties. The bizarre behaviors exhibited by persons with AD may be the only remaining methods by which they can communicate with the world. Vocal and motor activities often viewed as combative, hostile, agitated, or aggressive by members of the staff may be the person's only way of telling caregivers something is not right.

### Shadowing

Shadowing occurs when the patient follows or "hovers" around the caregiver and may persist in talking or asking questions. Safety is not usually a concern related to shadowing. However, it can become irritating and annoying to the caregiver, particularly when it involves a family member at home. Remember that the caregiver represents

security to the patient. The shadowing may be accompanied by agitated behavior that should be addressed. An assessment of the behavior will help determine if the behavior happens at a specific time of day or if it is triggered by certain people or environments.

### *Interventions for Shadowing*

If certain people or environments trigger shadowing, then adjustments or avoidance is necessary. If the behavior happens at a certain time of day, an activity may be planned to keep the person occupied, such as dusting or winding a ball of yarn. The Alzheimer's Association suggests, "gum therapy" or "cereal therapy" if the person can safely chew and swallow. Chewing is another form of distraction and redirection of energies.

## Wandering

Wandering is defined as ambulation that may appear aimless but often has a purpose. There are many unproven theories for wandering. The patient with AD may be looking for something or someone, or it may be a way of coping with stress or of alleviating feelings of loneliness and isolation. The perception of the caregiver, the type of wandering pattern, and the environment help determine whether wandering is considered a problem. Purposeful wandering occurs when the individual has intent for the movement. He or she may be walking to escape boredom or to exercise. Purposeful wanderers are usually predictable and consistently walk the same route. They do not attempt to leave the building, and they are "safe" wanderers. This type of wandering should be considered normal unless the pattern changes. When mobility skills begin to diminish, falling may become a problem. Aimless wandering is characterized by purposeless movement by a disoriented person who may enter other rooms or take another's belongings. The escapist usually has a destination, planning on "going home" or to some other familiar place.

An example is Patient W, who was very determined to leave the facility so he could visit his sister. When all the staff was busy, he managed to get the nurse's car keys from the counter in the nurse's station. He knew which car was hers and drove away from the premises. He was missed about 15 minutes later. When a search of the grounds and building proved fruitless and when the nurse noted her car missing, the police were notified. Following the staff's advice, the police found Patient W at his sister's house. He had driven 65 miles on an interstate highway without incident.

The most dangerous type of wandering is done by the critical wanderer. This individual tries to leave the premises but is unaware of the hazards involved. He or she may wander into the middle of a busy highway or into a pond of water without any comprehension of cause and effect.

Not all people with AD will wander. Those who may not have wandered at home may do so in the long-term care facility. The first two weeks after admission are critical. The staff should monitor the individual for specific behaviors. The goal is not necessarily to stop the wandering but to ensure the safety of the individual and to avoid intrusion on others.

### *Interventions for Wandering*

- Create a safe environment so the patient can wander without incident.
- Make sure the patient has an identification band or bracelet on at all times. In a long-term care facility, provide a list of wanderers to all staff members.
- Always know what the patient is wearing. Place his or her name in all pieces of outer clothing.
- Install gates on stairwells.
- Install alarms on all exit doors.
- Make safe wandering paths; remove clutter, throw rugs, furniture with sharp corners, and electrical cords.

- Provide a warm, homelike environment.
- Ask the family to bring in pictures and other small items from home.
- Provide activities that correlate with their abilities and interests.
- Place the individual's name and a familiar object on the door of his or her room.
- Remove items that may activate the desire to leave, such as coats, hats, and purses.
- Provide local police with information regarding AD and wandering. They ordinarily will not initiate a search for a missing person for 24 hours. Inform the officer that, for a patient with AD, this is critical. Have a written procedure to follow in the event someone is missing.
- Camouflage exit doors by painting them the same color as the walls.
- Take patients for a walk outdoors, weather permitting.
- Approach a fleeing patient cautiously. If the patient exits the building, approach him or her from the front, calmly walk alongside, and gradually angle back toward the door. The patient may be overwhelmed if several people attempt to overtake him or her.

**Sundowning**

Sundown syndrome occurs when the patient becomes restless in the evening or during the night. As with wandering, the cause is unknown. Experts feel it may be due to overfatigue, physical discomfort, reduced sensory stimulation, too much caffeine, shadows caused by the lighting, disturbing dreams or feelings of insecurity, or loneliness during the night.

***Interventions for Sundowning***

- Evaluate medications, time of administration, and their side effects.
- Question the family regarding the patient's sleep habits. Is the patient used to sleeping with a window open, with a night light, with soft music playing, with socks on, with two pillows? Incorporate these habits into the bedtime routine.
- Avoid caffeine and alcohol in the evening.
- Determine whether the patient is sleeping during the day. If this is the problem, keep him or her up and active. On the other hand, the patient may become fatigued and need a short nap early in the afternoon.
- Determine whether the patient is getting enough exercise. One or two vigorous walks (unless he or she is a frequent wanderer) earlier in the day may promote sleep at bedtime.
- Avoid putting clothes out for the next day. The patient may take this as a cue to get up and get dressed.
- Evaluate the bedtime routine:
  - Maintain a set time and routine.
  - Help the patient to the bathroom.
  - Avoid exercise or stimulation just prior to bedtime.
  - Give a light bedtime snack.
  - Give an analgesic for arthritis or other sources of pain and discomfort.
  - Give a gentle back or foot massage.
  - Place a commode or urinal at the bedside if finding the bathroom is a problem.
  - Provide adequate night lighting.
  - Close the blinds or draperies to eliminate shadows.

If these interventions fail and sundowning persists, repeat the bedtime routine (take the patient to the bathroom, provide a glass of warm milk, etc.). If all else fails, allow the patient to stay up in a recliner or beanbag chair by the nurse's station. The patient may willingly return to bed later. If in the patient's home, the caregiver may need to adapt the sleep/wake schedule to match the patient, or a sitter may be hired to remain with the patient while the caregiver sleeps.

Psychotropic medications may be needed for agitation, delusions, or hallucinations. Sleeping medications are not recommended. The effects are short-term and may add to confusion on awakening.

Persistent sundowning is a common reason for admission to the long-term care facility. The caregiver becomes stressed from lack of sleep. The situation may also become dangerous if the patient wanders outside, turns on the stove, or turns up the thermostat.

**Rummaging, Hoarding, and Pillaging**

The degree to which rummaging, pillaging, and hoarding is a problem depends on whether the individual is at home or in a facility and whether or not it is infringing upon the rights of others. Consider Patient J, who goes from room to room aimlessly picking up items from others. She may take the items to her room or she may leave them in someone else's room. This is one of the most disturbing behaviors for other residents in the facility. The family of Patient F noted that she had over 200 rolls of toilet paper in her basement. Patient P had stacks of newspapers throughout the house, with only a narrow walkway going from room to room. Theorists believe these patients may be searching for something or attempting to maintain control of the environment.

***Interventions for Rummaging, Pillaging, and Hoarding***

In a dementia unit, patients may pillage from one another. This may present more of a problem to family than to the patient. In some facilities, the night-shift staff collects the items and returns them to the proper rooms.

- Monitor the patient with AD so the privacy and possessions of others are protected.
- Label every item that all residents bring into the facility on admission and throughout the stay.
- Try to note the pillaging habits. Many take the same type of items; for example, envelopes and other "mail" type items. Watch what patients do with the objects they take. They will frequently take them to the same place. This observation will help the staff find the objects.

**Agitated Behavior/Aggression**

Agitation is defined as improper behavior that may be verbal or physical and is not explained by an unmet need, confusion, or pain. Aggression is a hostile action directed toward other people, oneself, or objects. Agitation may be a result or a cause of many other behaviors associated with AD. Agitation may cause sundowning, shadowing, and/or wandering. It may result from delusions or hallucinations. Other causes of agitation include delirium, psychiatric disorders, medical problems, depression, drug side effects, sleep problems, and social and environmental factors. As the disease progresses, the AD sufferer's insecurity increases. The coping mechanisms used earlier to block out awareness of functional losses are no longer effective. Agitation may change to verbal or physical aggression if not managed appropriately. It is estimated that more than 75% of those with dementia will exhibit agitation [52].

***Interventions for Agitated Behavior***

- Assess the situation to identify a possible cause for the behavior.
- Always use a calm, reassuring approach. If several people approach the patient or if attempts are made to "grab" or restrain them, the patient may be overwhelmed and will respond with increasing agitation, possibly striking out in an attempt of self-protection. Be aware of the significance of tone of voice. The patient may perceive anger and impatience even though the words are meant to be soothing.
- Remember that even severely demented persons are responsive to the people around them. They can sense tension and will respond with agitation. Use a firm, confident approach, but avoid sounding authoritative. It is patronizing when the caregiver sounds like a parent scolding a child.
- Avoid trying to use reason or logic or lengthy explanations. Comments such as, "If you are quiet, I will get you some ice cream" or "Don't you realize you're keeping everyone awake" are meaningless. This approach also denies the patient his feelings.
- Avoid trying to force patients to do something they clearly do not wish to do. Agitation will become aggression.
- Distraction may be an effective intervention if the appropriate approach is used.
- Try simulated response therapy (SRT). SRT is based on the belief that family members can influence and stabilize behaviors. The therapy uses audiotapes composed of a family member's side of a telephone conversation and blank spaces that correspond to the patient's side of the conversation. The family member reminisces about cherished and loved experiences of the person's life. By utilizing selected memories, SRT creates comfort by altering their environment. Use headphones to exclude environmental sounds and a lightweight cassette player.
- Move the individual to a tranquil, quiet setting. A soothing voice or calming touch is often effective.

Patient H, for example, is seated at the table waiting for breakfast. The dining room is a flurry of commotion. Several call-ins mean the nursing assistants are trying to hurry in an effort to catch up on the day's tasks. Patient H is showing signs of agitation. His breakfast has been served, and he is able to feed himself; however, he is not eating. The nurse approaches him and urges him to eat. "You have to eat; this food is good for you. Here, just take a bite of cereal." At the same time she is attempting to get him to drink by holding a glass of juice up to his mouth. He pushes the glass away, and the nurse responds, "Why did you do that? That wasn't nice. Here, you need to drink this juice." The nurse continues her attempts to coerce him to eat. Finally, Patient H slaps the glass out of the nurse's hand, spilling juice down the front of her uniform. The nursing assistant approaches Patient H when the nurse leaves to clean her uniform. He gently touches him on the hand and tells him that he is going to move him to a quieter place. The nursing assistant sits down next to Patient H and gains eye contact. He places a bowl of cereal in front of him but makes no attempt to coax him into eating. Patient H picks up the spoon and begins to eat his cereal. The nurse reports and documents that Patient H is "combative."

This scenario is an example of agitation changing to aggression. The interventions for agitation and aggression are the same. If those interventions are implemented during agitation, aggression can usually be avoided. Physical aggression often contains an element of danger. The patient may strike out at the caregiver or other residents. Occasionally, two patients will "feed into" one another, causing each person to become aggressive, striking one another if within close range. The only solution is to keep the two parties separated at all times. When a person is physically aggressive, assess the level of danger for the caregiver, the individual, and other residents. Avoid a "hands on" approach unless the situation is leading to immediate peril.

**Catastrophic Reactions**

A catastrophic reaction is defined as an overstated emotional response triggered by task failure. The patient feels he or she is expected to perform beyond capacity and feels frustrated and angry. A catastrophic reaction may have components of agitation or aggression but does not necessarily have violent tendencies. Assess the situation in an effort to determine what may have precipitated the reaction; in this way, further incidents may be avoided. Regularly assess the individual's abilities so the staff does not expect more than the patient is capable of doing.

In an example of distraction, Patient G was told that she would have a new roommate. The medical condition of her present roommate necessitated moving her to a different level of care. After the new roommate was admitted, Patient G began pacing the hallway. She muttered over and over, "I can't do it. I can't take care of her. I can't do it." This continued as various staff members attempted to calm her. Taking her to her room was not a solution. Seeing her roommate in bed only increased her agitation. Her daughter later came to visit and suggested she take her mother out for a ride and some ice cream. This was successful. Upon her return, Patient G was calm and went to bed that night without further incident.

**Delusions and Hallucinations**

Delusions and hallucinations are psychotic symptoms of dementia. AD is not considered a psychiatric illness, but the patient may have concomitant psychiatric illness with AD. These manifestations may be triggered by medications, physiologic malfunction, environmental stress, or insecurity. As previously noted, delusions are fixed false ideas or beliefs and may result from the person's misinterpretation of a situation. One evening at an activity, Patient R kept talking about "the people over there who were having a party." Patient R was looking at the reflection in the window of the people in the room but misinterpreted what she saw. Hallucinations are sensory experiences that cannot be verified by anyone else. They may be auditory or visual and are usually disorganized and fragmented. An illusion is a misperception and is common among the general population; for example, one may bend over to pick up a piece of foil from the floor, thinking it is a dime.

Delusions and hallucinations may not need aggressive treatment unless they are bothersome to the patient who may then respond with aggression, fear, or violence. An assessment, as described earlier, may identify events that trigger these manifestations.

***Interventions for Delusions and Hallucinations***

Never argue or disagree with patients with AD about what they think they see or hear. They may become agitated and even violent. It is real to them and no amount of persuasion will change their minds. If a patient asks you, "Do you see that person over there?" saying, "I know you see something, but I don't see it" does not deny the truth. If the patient is upset or frightened, be calm and reassuring with statements such as, "I know you are frightened, but we will keep you safe." You are responding in a manner that will assist the patient and consider his or her feelings.

Check the environment for noises that may be misinterpreted and for lighting that may cast shadows. Assess for impaired hearing and vision because correcting deficits with hearing aids or glasses may improve the symptoms.

Consider whether the delusion has some basis in reality. In another example, it was reported by the nurse that Mrs. S was delusional; she insisted that she was going to California in a few days to visit her daughter. Three days later her son and daughter-in-law came to get her and flew with her to California. Similarly, the patient who claims her son is taking her money may be correct. These types of statements may be worthy of tactful investigation.

Consider whether the delusion is based on a past event from years ago. The person who talks about getting home to her children or getting up early to milk the cows may be reliving a happier time of life. These types of delusions are harmless. The staff should not feed into them, but it is important they understand that these beliefs are filling a need. In these situations, it is not the task of the staff to determine whose reality is appropriate.

Determine whether the delusion may be rooted in television. Patients with AD cannot always distinguish reality from fiction. Witnessing acts of violence on the screen can be frightening and upsetting.

Use distraction for delusions that appear distressful. Music, going for a walk, looking at pictures, or quiet conversation may be effective. Cover or remove mirrors if a patient becomes upset when the image is mistaken for that of someone else. Pharmacologic therapy must be considered when someone experiences frequent delusions or hallucinations that result in further behavior disturbances.

## RESTORATIVE MEASURES TO MODIFY DISEASE PROGRESSION

In addition to medications and behavior management, a restorative approach and activities are beneficial and recuperative when planned and implemented effectively. It is useful for all healthcare providers to be aware of these techniques.

Reality orientation, reminiscence, and validation therapy are programs with specific purposes that may be utilized. Reminiscing is a natural process that people of all ages enjoy, but it is also stimulated in the elderly by the realization that life does not go on forever. For those with AD, reminiscing can be used as an intervention. In the early stage of AD, reminiscing can give a sense of pride and accomplishment to individuals who realize they are losing their grasp on reality.

Reality orientation and validation therapy have been in existence for decades. Whether or not these programs have an effect on cognitive or functional status is controversial. Few rigorous scientific studies have been completed to validate or refute their worth.

### REMINISCENCE

To reminisce is to think about or relate one's past experiences, especially those personally deemed most significant. Reminiscing may extol the past and berate the present, it may enhance one's self-esteem and provide gratification, or it may be an obsessive process dwelling upon a particular past situation that resulted in depression and despair. Life review, a form of reminiscence, is a recall of life experiences for the purpose of reevaluating the past, to settle and integrate past conflicts. It involves the need to justify one's life. Most clinicians use the two terms interchangeably.

Reminiscing can be planned as a structured group activity for those in the early stages of AD. To be able to reminisce, one must have the capacity to remember the past; fortunately, long-term memory may remain for a long time. Attendance is voluntary and participants are not expected to talk about memories that they do not wish to share. The group process provides an opportunity for active participants to share memories of the past and to enjoy each other's company. When used correctly, reminiscing can be used as an intervention for anxiety, disturbances in self-concept, impaired adjustment, and hopelessness.

Avoid placing patients with AD and mentally unimpaired elders in the same group. Attendance may not be appropriate for those who have had unhappy lives or who have episodes of paranoia. The group should be no larger than four or five people, depending on the capabilities of the members. The leader (a staff member) introduces the topic.

For people with AD, reminiscing about general topics is often preferable to specific situations in the members' lives. The leader chooses a subject that reflects the current season, an upcoming holiday, or other special events. Weddings are a popular topic in June, and participants can be invited to bring their wedding pictures for others to see. Objects or pictures relevant to the topic can stimulate discussion and add to the enjoyment. Pictures of old cars, clothing, and household appliances usually trigger memories. Conducting reminiscing sessions with cognitively impaired elders requires sensitivity and vigilance on the part of the leader. The leader should "listen" to the feelings of the individuals rather than just hear the words. Giving positive feedback and asking questions encourages the process and may elicit even deeper memories. Participants who show signs of agitation or anxiety should be gently removed from the group. Lamenting reminiscences are past events that the individual interprets negatively. A person who laments frequently about one topic may benefit from counseling by a qualified therapist to resolve feelings about those experiences. Lamenting about many topics from the past may be a reflection of an individual's pessimistic but staple personality.

Individual reminiscence may be suitable for a person who has difficulty interacting with a group. Besides the benefits of improved mood and elevated self-esteem, the patient may develop a deeper trust in the listener, enabling the listener to achieve success with subsequent behavioral interventions.

## REALITY ORIENTATION

Reality orientation (RO) was first described in the early 1960s by Taulbee and Folsom. RO is a planned, structured process designed to increase an individual's comprehension of person, place, time, and situation. This concept originated as a rehabilitation technique for traumatized war veterans [126]. However, it has been used for people who have moderate-to-severe degrees of confusion [56].

Professional articles written in the 1960s and 1970s promoted the use of RO as an intervention that was effective in minimizing or reversing behavioral or cognitive decline. However, there is little evidence that RO has long-term effectiveness [57]. RO is routinely used in some facilities based on the assumption that patients can benefit from reality. Although repeatedly attempted, RO seldom succeeds in correcting the perceptions of the cognitively impaired person. Short-term memory loss is one of the most significant manifestations of AD. The affected person is unable to retain information, and the use of RO techniques is generally an exercise in futility. Questions of time, date, and place should be answered honestly, but to persist in repeating this information is frustrating to both the patient with AD and caregiver. RO may be appropriate for people with depression or those who have confusion related to delirium. It may provide reassurance for those in the very early stages who are aware that they are losing their grip on reality. It does not work with patients with irreversible dementia because they no longer understand reality. More research is necessary to establish the population, disease stage, and parts of RO that prove most effective [125; 126].

### Scenarios

Mrs. R had been a businesswoman prior to retirement 15 years ago. She commuted to Chicago every workday for 30 years. For the last five years she has resided in a long-term care facility. Every morning she walks to the nurse's station to "buy a ticket" so she can take the train to work. For several days, the staff would intervene with RO. "Mrs. R, you are in the nursing home now. You are retired and no longer work in Chicago." Mrs. R's agitation would sometimes escalate to a catastrophic reaction. One day, the nurse gave Mrs. R a "ticket" without comment. Mrs. R took the ticket and walked away contented. This approach was incorporated into the care plan, and there have been no further incidents.

Mrs. S waits by the door every night for her husband to come home. Mr. S died 15 years ago, but his wife does not remember this. For a staff person to say, "Mrs. S, your husband died 15 years ago" would be upsetting and needless. The staff members allow her to sit, knowing that in a few minutes she will have forgotten why she is sitting there. She will soon get up and move on to something else.

Caregivers and staff must take every patient's unique situation into consideration. The benefits of attempting to make patients with AD aware of present reality should always be weighed against possible adverse effects. It is the caring of the staff, the ability to "go with the moment" and to connect with their patients by accepting them as they are, that enhances the patient's behavior.

### VALIDATION THERAPY

Naomi Feil developed validation therapy between 1963 and 1980 [119]. Feil de-emphasizes the significance of orientation and instead utilizes specific techniques to explore the meaning and motivation for confused statements [59]. Validation therapy is based on the premise that there is logic behind all behaviors and there are different stages and levels of disorientation among those diagnosed with an irreversible dementia. Validation assists disoriented individuals to restore the past, make closure, and justify their lives. The goal of validation therapy is to give the person a sense of identity, dignity, and self-worth through validation of the person's feelings. A structured learning program for the staff presented by a qualified consultant would be required in order to fully implement validation therapy as an intervention. Of the studies that have been performed to measure the efficacy of validation therapy, none have shown it to be significantly more effective than social contact or other therapies [119].

## CARING FOR THE PATIENT WITH END-STAGE ALZHEIMER DISEASE

Every person with AD will eventually reach the terminal stage of the illness. No one can predict the onset or how long it will last. The final stage may last for a few weeks, or it may continue for several years. As the patient becomes more dependent, physical care requires more of the caregiver's time. Behavior poses fewer problems as the capacity for wandering, pillaging, and sundowning diminishes. The person with advanced AD is unable to initiate any interaction but may passively accept the attentions of familiar caregivers.

There are several manifestations of end-stage AD. Vocabulary is limited to five to six words or less, and the patient is nonambulatory, cannot sit up without assistance, and has little facial expression. The patient is inconsistent with bowel and bladder function, has difficulty swallowing, and may be losing weight. In addition, there may be recurrent infections, frequently of the urinary or respiratory tract.

Approximately 10% of patients in the late stage of AD experience seizures [142]. Conventional antiseizure medications such as phenytoin may be used; however, they may result in worsening of the cognitive and functional state. If the seizures are rare and the patient is in a safe environment, it may be decided not to use medications [6].

The primary goal of care during the terminal stage is to prevent complications associated with immobility and impaired physical functioning. Comfort should be paramount, with life extension generally no longer a consideration. Hospice services may be considered, with discontinuation of all life-sustaining measures or medicines. Special care should be exercised to prevent decubitus pressure ulcers, which may become a significant source of patient discomfort [6].

## INTERVENTIONS TO CONSIDER

### Impaired Mobility

At the beginning of the last stage, the patient may still be wandering but will exhibit significant changes in posture, gait, and balance. The hips appear to be internally rotated, causing a shuffling, scissor-type gait. Eventually, it will take two people to transfer and to assist the patient to walk. As mobility skills diminish, patients may be transferred out of bed with an automatic lifting device and placed in a recliner type chair. Supportive devices are needed to maintain body alignment and to relieve pressure. Contractures and rigidity will develop without appropriate intervention. In addition to frequent repositioning and adequate support, passive range of motion exercises should be completed two times per day, doing each motion at least three to four times.

### High Risk for Impaired Skin Integrity

Immobility and incontinence place the patient at risk for pressure ulcers. A Pressure Ulcer Risk Potential assessment will identify areas requiring aggressive intervention. As mobility skills diminish, it becomes exceedingly difficult to maintain a scheduled toileting routine. The use of incontinence briefs avoids the soiling of outer clothing and enables the individual to participate in activities geared to his or her cognitive level. The briefs should be checked every two hours and perineal care given with each incontinent episode. A skin barrier provides additional protection. Soaps can be irritating and difficult to remove from the skin; therefore, caregivers should carefully and regularly inspect the skin for signs of breakdown.

Adhering to a positioning schedule and doing range of motion exercises, as described, are additional preventive measures. Use a turning sheet to avoid friction when moving the patient in bed. High protein supplements given between meals may be necessary to maintain adequate nutritional status. The fragility of the patient's skin presents a risk of skin tears and easy bruising. The staff should be aware how to handle the person to avoid these injuries.

### Nutritional Considerations

As AD progresses, nutritional intake becomes a major concern. Ideally, the family and patient will have made decisions regarding the use of enteral feeding tubes in the early stage of the disease, should it become an issue. If this is not the case, the family should be encouraged to consider the possibility so a mutually agreed upon decision can be made if the need arises.

Eating alterations are made throughout the course of the disease. Adaptive eating devices may allow the affected individual to maintain independent eating skills for a longer period of time. Spoons will replace knives and forks. Patients may be able to manage a smaller, plastic glass better than a larger one. A "sippy" type cup often works better than a straw. Providing nourishing finger foods allows patients to self-feed. Adding thickeners to liquids increases ease of drinking and swallowing. By the terminal stage of AD, pureed or chopped foods are usually needed and the patient must be fed.

### Risk of Aspiration

Diminishing cognitive awareness leads to dysphagia, which increases the risk of aspiration. The visual and olfactory stimulation that activates the swallowing mechanism in the brain stem is no longer effective. An evaluation by a speech-language pathologist may identify specific interventions that the staff can implement.

General caregiver guidelines for feeding those at risk for aspiration include:

- Allow the patient to rest before eating, as fatigue increases the risk for aspiration.
- Place the patient in an upright position at a 60- to 90-degree angle before, during, and for one hour after eating whether in bed or chair. Sit facing the patient.
- Maintain the patient's head in midline with his or her neck slightly flexed during swallowing. Keep the head in alignment. Use supportive devices if needed.
- Minimize environmental distractions.

- Use a regular metal teaspoon for feeding, giving only ½ teaspoonful of food at a time.
- Allow the patient to see and smell the food, giving brief verbal descriptions.

The manifestations of the terminal stage place the patient with AD at risk for urinary tract and respiratory tract infections. Adequate fluid intake is an effective preventive measure for both types of infection. Indwelling catheters are not recommended; their use often agitates the person, predisposing to urethral tears. Frequent changes of position and prevention of aspiration may preclude respiratory infections.

### Sensory/Perceptual Alterations

Severe cognitive impairment places the patient with AD at risk for sensory deprivation. Although the patient is minimally expressive, proper amounts of stimulation are needed to prevent continuous sleeping and agitation. The use of recliner type chairs enables dependent patients to be moved out of their room and to participate in appropriate activities. Listening to soothing music, hand massages, quiet talking, and olfactory stimulation with familiar odors are examples of sensory-centered activities.

## HOSPICE CARE

The hospice philosophy is particularly suited to those with end-stage AD. The patient and entire family are considered the unit of care, and emphasis is placed on the quality of life rather than the length of life. Death is neither hastened nor postponed; the rendering of palliative care is the premise of hospice care. A person in the end stage is considered terminally ill and similar to any other individual with an incurable, fatal disease. Medicare payment is available for covered patients when the anticipated survival time is certified by a physician as being six months or less, if the disease runs its usual course. Should the patient live past the six-month time period and still be considered terminal by his or her physician, the patient can be recertified to continue receiving hospice care [11].

The hospice philosophy can form the basis for care even though an agency is not involved. If the patient is in a long-term care facility, he or she has probably been there for some months or years. The staff is knowledgeable about the individual and knows the family. A therapeutic relationship nurtured over the years will continue. Occasionally, there is a patient who has no significant others left in his or her life. Family members have predeceased the patient or have drifted away, emotionally and physically separating themselves from the situation. In these cases, the staff members or caring volunteers become family by proxy, providing the love and attention that the dying person deserves.

Knowledge of the individual's status in regard to "heroic measures" is mandatory. By this time, most families realize the futility of prolonging life and seek a peaceful, dignified end for their loved one. In these cases, advance directives and DNR orders are taken care of well before they become an issue. Some states require that all attempts be made toward saving the life in situations where a legal guardian has been appointed. In some cases, this statute may be reversed through the efforts of the ethics committee and the state guardianship office. If the status of the individual is not known, implementing or not implementing lifesaving measures can lead to legal dilemmas for the facility and staff.

## FAMILY ROLE AND COMMUNITY RESOURCES

Families are the other victims of AD. The disease is frequently not diagnosed until the person has manifested symptoms for a few years. The family is bewildered and distressed by the behavior of the patient. As the disease progresses, family members weather a number of crises and experience many emotional upheavals. One spouse described AD as a "funeral that never ends." There is no doubt that family members, especially spouses, will face many challenges throughout the course of the disease.

However, many also experience feelings of great love, commitment, and devotion and find rewards in an unchangeable situation. A sense of humor is helpful to filling the role of caregiver. The patients also benefit from shared humor and laughter.

## ROLE CHANGES AND REVERSALS

It may be difficult for the family to accept a diagnosis of AD. There is a sense of finality associated with the disease that implies hopelessness and despair. The family's ability to cope with future demands may well depend upon the information they receive at the time of diagnosis. This is the time for the family unit to communicate with each other in an open and straightforward manner. The spouse may be reluctant to share information with the children in an effort to prevent worry. The children may be hesitant to verbalize their concerns about the changes they note in the parent. There may be an unspoken group effort to deny the realities of the situation. Some spouses cover so well for the impaired person that other family members may not be aware of the problem until the caregiving spouse becomes ill or dies.

Gradual awareness of the implications of AD for the caregiver become evident as the spouse begins to realize that he or she must take on the responsibilities formerly assumed by the patient with AD. The realization may occur abruptly when the spouse realizes that he or she has never balanced the monthly bank statement, prepared an income tax form, or used the lawnmower or the washing machine. Assisting the affected individual with personal care becomes a challenge when, for example, the wife tries to help her husband shave or the husband tries to help his wife put on pantyhose and make-up.

## FAMILY CAREGIVING ROUTINES

Families who deal successfully with AD tend to develop a workable routine early in the course of the illness. Flexibility is imperative. The affected individuals generally respond positively to consistent, predictable routines. It is helpful if the caregiver remembers what has always been important to the patient. If shaving twice per day, brushing teeth after every meal, or going to the hairdresser weekly was a custom, then that routine should be continued, if possible. Perhaps reading the paper with the morning coffee or going for a walk was an enjoyable beginning to the day that can be carried on.

## IMPACT OF CHRONIC STRESS ON PRIMARY CAREGIVERS AND EXTENDED FAMILY MEMBERS

Families are systems with a power structure, lines of authority, assigned (albeit unspoken) roles and responsibilities, forms of communication or lack thereof, and problem-solving methods. The strengths and weaknesses of the family unit are revealed in a time of crisis. Children may find it difficult to make decisions for an impaired parent and the parent may resent the children's efforts. The healthy parent may be unable to successfully cope, expecting the children to take over additional responsibilities. When there are several children, one or two may be unofficially designated as being "in charge" while the others seek release from any obligations. Each family is different; making judgments is not the responsibility of healthcare providers.

Grief is an expected reaction to a critical situation that requires adjustment and response. Grieving is necessary; it allows loved ones to face reality, adapt, and adjust to present circumstances. The shock of hearing the diagnosis usually results in a sense of disbelief and denial. This response allows loved ones the time to assimilate the information and to integrate it into a frame of reference. The primary caregiver (and other family members) may experience feelings of anger as they realize the lifestyle changes that will have to be made with the situation (e.g., "It isn't fair that after 50 years of marriage, we have to deal with this."); with the patient (e.g., "If he asks me that question one more time, I'll scream."); and with other family members or friends who do not understand what is going

on. Depression marked by feelings of despair and helplessness may be the beginning of grief resolution and adjustment. During the grieving process, it is not unusual for caregivers to socially withdraw from friends and previously enjoyable activities.

While grieving is normal and necessary, unresolved grief may result in dysfunctional responses. If denial, anger, or depression is unrelenting, referral to a physician or mental health clinic is justified. Even in the best situations, caregivers, whether they are the spouse or adult child, will inevitably experience periodic moments of stress. Persistent signs of anxiety, exhaustion, sleeplessness, irritability, or lack of concentration may indicate a need for professional support.

Guilt is a common feeling among caregivers and usually stems from unrealistic expectations they may have for themselves. Adult children who have spouses, children, and jobs feel distressed when they witness the frustration and exhaustion of the caregiving parent. The wife who promised never to place her husband in a nursing home finds that it is impossible to keep that vow. The husband who arranges for adult care two days per week finds that he is unable to enjoy any activities during that time. Joining an AD support group is often effective in helping families deal with feelings of guilt in a productive manner.

## ASSISTING FAMILY MEMBERS TO COPE

When the diagnosis is AD, the family and affected individual need support, education, information, and encouragement. The family can benefit from a family meeting to acknowledge the disease, to identify the ways in which it may disrupt family life, and to clarify the tasks and roles of family members. Families will cope more effectively if they are educated about the disease so they will have some idea of what to expect as AD progresses.

### Legal and Financial Issues

As the family adjusts to the situation, they may need encouragement to think about the future and any legal actions that should be taken in regard to legal and financial planning. Eventually, patients with AD will be unable to manage their own affairs, but they are usually able to participate and help with decision making when done early in the course of the disease. To delay this process can result in many financial and legal problems.

### Admission to a Healthcare Facility

Physicians and other healthcare professionals may be required to consider the admission of a patient with AD to an advanced healthcare facility.

Most families experience mixed emotions of relief and guilt when they realize they can no longer care for their loved one. The healthcare team must fully understand the impact of AD and institutionalization on the family so they can effectively help them deal with their grief. Intervention begins when the family visits the facility prior to admission. Their future adjustment may be influenced by what they observe during this time. Introduction to the staff gives the family the opportunity to identify key people in various departments. They should be provided information that describes the facility routine and a typical day. Most importantly, the family should be encouraged to communicate openly and honestly with staff. It is helpful if there is a specific person they can go to for discussion and answers. They should know that their feelings are normal and that staff is not judging them because of the patient's behavior.

Families may need suggestions for visiting. It is sometimes awkward to visit with a person who thinks the spouse is a sibling or the child is the spouse. The family is encouraged to bring old photos as a way of stimulating a response from the patient. The staff should direct them to other areas of the unit or building where they can take the patient when they come to visit and be invited

to participate in care planning conferences and activities. Some families take great pleasure in feeding their loved ones, getting them ready for bed, or helping them bathe. On the other hand, there should be no pressure on those who choose not to help. Some families are exhausted from their caregiving demands prior to admission and welcome relief from further responsibilities.

### COMMUNITY RESOURCES

Knowledge of resources enables one to give assistance to families who need information. There are services available in many communities that, when utilized, can ease caregiving burdens.

#### Hospice Care

Hospice agencies can be a tremendous help for those who qualify for the service. Care may be rendered at home or in a healthcare facility. Staff members are truly concerned with the total family unit. They are knowledgeable about community resources and can link the family to other services that they may require.

#### Respite Care

Respite care, or adult day care, may be a solution for spouses who are still employed. Care may be available 8 to 10 hours per day, 5 days per week. The recipient receives nourishing meals and snacks, and appropriate activities are offered. Other services may be available depending on the type of agency sponsoring the day care. Adult day care may be utilized for family caregivers who do not need full-time care but who would benefit from release of responsibilities once or twice per week, either for the entire day or a few hours.

Some nursing facilities offer temporary nursing care to allow caregivers to have freedom from care for a weekend or for a few weeks at a time. This allows the caregiver to take a vacation or to recuperate from illness.

Homemaker services are frequently available through family service organizations or nursing agencies. The homemaker provides no nursing care but will come to the home to prepare and serve a meal, do laundry and light housekeeping, run errands, or to stay with the patient while the caregiver performs those tasks. Home-delivered meals (Meals on Wheels) may be arranged in most communities where there is a documented need for such a service.

The Alzheimer's Association website also provides a wealth of information and education to patient's families and healthcare providers (http://www.alz.org). The Association also sponsors support groups located in every state. The Social Services department of hospitals and long-term care facilities can offer information about the availability of community services.

## CONCLUSION

The incidence of AD continues to rise. It is a difficult disease to treat medically and handle emotionally. This review presents some of the elements of pathology, medical treatment, and care of victims of this progressive disease. It is hoped that the continued research into the causes of AD will provide some of the necessary information about the prevention and treatment of this relentless and socially damaging disease.

The following appendices contain information about specific nursing interventions and the management of a specialized nursing facility.

# APPENDIX I: SPECIFIC NURSING AND CAREGIVER INTERVENTIONS

## MAINTAINING NUTRITION AND ENHANCING MEAL TIME

Periodic functional assessments will identify problems related to nutrition and food intake. Interventions are altered to correlate with the problems as they arise. In the first stage, there may be only a need for a tray "setup," with liquids poured, food cut up, and bread buttered. As the disease progresses, the patient may continue to self-feed when appropriate assistance and cues are given. By the terminal stage, the affected person is dependent on caregivers for all fluid and food intake.

There are many ways to add additional calories to the diet of patients with advanced AD. Because they may not eat much, it is especially important that patients' food be nutrient-dense. Protein powders, such as those used by athletes, can be added to a number of foods. Calorie-rich shakes or bars are a way to add both extra calories and protein. Nutrient supplementation may be needed, and nutrient levels should be assessed periodically. Nutritious oils, such as flax oil, fish oils, and uncooked olive oil, can be added to food in small amounts; these provide both calories and nutritional value. Seasonings can help to stimulate a fading sense of taste. The staff can serve finger foods for snacks, such as crackers with peanut butter or cheese spread, small sandwiches, small pieces of peeled fruit and vegetables, raisins or other dried fruit, or small pieces of cheese. Cooking meat or chicken with vegetables, then straining or pureeing together can make broth or creamed soup.

### Caregivers Should Establish a Regular Routine

Meals should be served at the same time each day and in the same place. In the long-term care facility, having a specific seating arrangement and making sure all residents are seated before serving begins is helpful.

Remove items such as extra silverware and condiments from the table. It may become necessary to place only one food at a time in front of a specific resident. Too many foods can be confusing and frustrating.

The patient should be taken to the toilet before each meal and assisted with hand washing. Make sure the patient's mouth is clean and that dentures are in place and in good condition. Note whether he or she wears glasses or a hearing aid. Make sure the patient is in a comfortable position, in good body alignment with feet flat on the floor. In the last stage, pillows or supportive devices are often needed to support a patient's head. Transfer patients from wheelchairs to dining chairs for eating.

All caregivers should use the same or similar methods of assistance, such as verbal cues, hand-over-hand techniques, or demonstration. Light pressure on the lips may remind the patient to open his or her mouth. Monitor individuals at each meal because their ability often fluctuates. A given patient may be able to eat independently for one meal and require assistance or feeding at the next meal.

### Improving the Dining Environment

Avoid distractions by turning off radios and televisions in order to maintain a calm, quiet environment. Establish a cheerful dining room conducive to social interaction. Use tables that seat four to eight people. Place a clear plastic tablecloth over a colorful cloth or use plastic place mats. Having snapshots at the table may help ambulatory residents find their table. Set a small centerpiece in the middle of the table, but remove it if someone thinks it is edible. One study at a nursing home in Sweden noted significant improvements in behavioral symptoms (e.g., irritability, anxiety, depression) and nutritional intake when soothing music was played during meals [45].

### The Use of Appropriate Dinnerware

Use plain dinnerware because plates with patterns can be confusing. Use dishes that are a different color from the tablecloth. Avoid the use of plastic eating utensils that can break in one's mouth. A spoon may work better than a fork. Use cups for soup to help facilitate patients' independence.

Use assistive devices to expedite mealtime. Plate guards prevent food from being scooped onto the table. Nonslip material or a wet washcloth under the plate prevents sliding. Convalescent feeding cups avoid dribbles and spills.

### Serving Food to Patients with Advanced Disease

Serve familiar foods prepared in the usual way. Check the temperature of foods before serving them and debone all meats. Cut food into bite-sized pieces. Remove all wrappers, open all cartons, and pour beverages. Add condiments if the resident desires, then remove them from the table. Avoid tough, stringy, or dry foods. Crumbly foods such as hamburger are difficult to control in the mouth and may cause choking. Dry cereal in milk and soups containing pieces of food are confusing; patients may not know whether to chew or to swallow.

Meeting nutritional needs requires an interdisciplinary approach throughout the progression of the disease. The attending staff should consult with the dietician for suggestions about appealing, nutritious, and easy to handle foods. The speech-language pathologist can conduct a bedside swallow evaluation and instruct the staff on feeding techniques for the dysphagic individual. The benefits of assistive-eating devices can be evaluated by the occupational therapist. With accurate assessment and knowledgeable planning, the patient with AD can maintain adequate nutritional status throughout the course of the illness.

## BATHING AND GROOMING SUGGESTIONS

Bathing procedures are often beset with disruptive behavior. Bathing can be a positive experience for both the patient with AD and caregiver if approaches are individualized for each patient. First, what were the patient's bathing habits? Did he or she take a tub bath, a shower, or a sponge bath? Patients who have never taken showers will be understandably upset when the water streams down over them. Is the patient used to bathing in the morning or evening? In long-term care facilities, bathing is usually done on both day and evening shifts. However, an individual who always took a shower upon arising may not adapt to having a shower after lunch. Did the patient bathe every day or only once or twice per week?

The staff should be aware of the individual's personal history. For example, nursing assistants dreaded taking Patient B for her shower. While she walked willingly to the shower room, once inside she became agitated, hitting and scratching the nursing assistant. Upon questioning the family, it was learned that she was a Holocaust survivor. The long, dark, green-tiled shower triggered horrible memories of gas chambers for Patient B. Giving a tub bath solved the problem.

The bathroom should be checked before the patient enters to be sure that all the necessary supplies are available. The patient is approached in a positive manner, saying, "It is time for your bath (shower) now and I will help you." Asking, "Do you want your bath now?" is likely to elicit a "no" answer.

With some individuals, it may be easier to start walking with them toward the bathroom and when ready to enter, tell them it is time for the bath. If they refuse, regardless of the approach used, avoid forcing the issue; wait and try later. A bath or shower may be omitted, substituting a sponge bath instead. Tell the patient in brief phrases what is happening with each step of the procedure. To start the shower without warning, for example, is quite likely to disturb them.

Special attention is paid to body areas where skin surfaces rub together, such as under the breasts, the underarms, genitalia, and thighs. The caregiver must wash and dry these areas if the patient cannot. Avoid the use of powders and cornstarch as they tend to "pill," causing even more skin irritation.

People with AD will frequently grab the caregiver's hands during the bath. Giving them a washcloth during the bath and a towel while drying is helpful. Never leave the person unattended in the bathroom. Use the time to inspect the skin for rashes, bruises, pressure ulcers, and growths. Patients may feel less vulnerable if towels are placed over their body, thereby avoiding total exposure.

The staff should think creatively and relinquish rigid ideas of how procedures should be performed. For example, Patient K always became agitated when the nursing assistant attempted to remove her clothing, whether for a bath or shower. After she was seated in the shower chair, the nursing assistant decided to forego undressing and to use the handheld shower to gently begin wetting Patient K's hands and arms. Upon feeling the water, Patient K immediately began taking her clothes off. This approach was written into the care plan.

Avoid the use of lotions, oils, or anything that may make a tub or shower slippery. Towel and lotion baths that can be completed in bed may be an acceptable substitute for some people. Saturate towels with warm lotion (so they are damp, not soggy) and place over the body, one area at a time, gently patting. Use washcloths for the face and for perineal care. Cover the patient with a bath blanket during the procedure. Rinsing and drying are not required.

Evaluate the bathing environment from the affected individual's perspective. Most facility bathrooms are large and cold, very different from a private home. Extra equipment is often stored in the bathroom, making it look ugly and frightening to the patient. Check the temperature of the water and of the room (most elderly people are easily chilled), the lighting (bright, but without glare), and the color. Green or blue walls look gray and muddy to elderly eyes. While it may not be possible to renovate bathrooms, a few simple changes can improve the environment:

- Hang artificial plants and pictures that might cue the resident to bathing
- Have the walls painted or papered in shades of pink or yellow
- Add a colorful privacy curtain around the tub or across the end of the shower to enclose space
- Add towel racks and hang colorful towels. These are only for decoration; infection control policies forbid their use for patients

Evaluate the shower chair for comfort and safety. Consider adding grab bars and providing waterproof shoes for those who prefer to stand.

It may be more efficient to shampoo the patient's hair during the bath or shower. A simple wash-and-wear style is easier to maintain. In many cases, the patient with AD continues to go to the hair stylist well into the disease. An attractive hairstyle may increase self-esteem. If a woman has always worn make-up, encourage her to continue but supervise the task so that it is applied appropriately and looks attractive. Fingernails need frequent observation. File and trim nails regularly to prevent injuries from scratching. It is best to trim toenails straight across. The services of a podiatrist may be needed for some patients. Volunteers in long-term care facilities may be willing to give manicures for women who enjoy having their nails polished.

Shaving is a daily task for most men and contributes to a well-groomed appearance. Most men can handle an electric razor with supervision until the later stages of the disease. Applying aftershave can increase self-esteem. Provide assistance for those with beards and moustaches. Keep the beard free of food particles that may become imbedded during meals. For women who are used to shaving, cream depilatories may be used for legs and underarms. Perform a skin patch test first to determine if a patient is sensitive to the product. Some older women develop hair growth on the upper lip and chin. These areas can be shaved or waxed regularly.

### Dressing Hints for the Staff or Caregiver

Dressing is a complex activity of daily living. To dress, one must have fine and gross motor skills, balance, the ability to sequence, and the ability to tell right from left and top from bottom. The task can be overwhelming for patients with advanced AD. If a patient can make choices, take him or her to the closet to pick out the clothing. If this is too complicated, hold out two garments and ask the patient to choose one. When patients can no longer cope, the caregiver must make the choice. Dressing is easier if the clothing is large enough and made of a soft, slick, stretchy fabric. Try to maintain the individual's dressing style. As patients become more dependent, it will be necessary to adapt clothing to their needs. To facilitate dressing/undressing, follow the guidelines that are appropriate for the individual's abilities:

- Remove clothing from closets and drawers that is out of season or no longer fits. This simplifies decision making and avoids the problem of choosing inappropriate attire.
- Hang complete outfits together: pants, shirt, jacket, etc.
- Place pictures on dresser drawers to indicate the contents.
- Provide privacy for dressing.
- Provide duplicate outfits or arrange for daily laundering for patients who insist on wearing the same clothes every day.
- Lay out clothes in the order they are put on. Make sure the clothes are right side out.

Remember that putting on an article of clothing like underwear requires the patient to distinguish back from front, which foot to put in first and in which opening, and how to pull underwear up.

Adapt clothing to the individual's abilities as the disease progresses. Elastic waistbands and Velcro closures are easier to manage. Cardigan style tops may be easier than pullover styles for caregivers to handle.

## ORAL CARE REQUIREMENTS

Preventive oral care will decrease the risk of needing extensive dental treatments later. Dentists should receive complete information regarding patients' medical history and current status. Almost all patients need oral care at least twice per day, for two minutes each time, if possible. Do the last brushing after the evening meal. Oral care is a complex task, and the patient may be unable to open the toothpaste container or to apply paste to the brush. The patient may forget to spit the toothpaste out or to rinse the mouth with water. Supervision is needed early in the disease to ensure that oral care is adequate. Flossing is recommended but may be difficult for the patient or caregiver to complete. A Proxabrush may be used to clean between the teeth. A fluoride toothpaste and fluoride rinses (available without prescription) will protect from decay. A soft toothbrush can be used to clean the mouths of those with dentures. Inspect the dentures regularly for fit and for condition. Evaluate the patient's medications to identify potential oral problems resulting from their use. Assess the patient for xerostomia, which may be a side effect of haloperidol or other medications. Artificial saliva may be administered.

## SUGGESTIONS TO THE CAREGIVERS FOR BOWEL AND BLADDER ELIMINATION

Incontinence does not usually occur until the later stages of AD. As the disease progresses, the patient with AD experiences a number of physical and cognitive changes that inhibit the ability to use the toilet independently. A sudden change in urinary elimination habits should be investigated to rule out other causes, such as infection [48].

There are several types of incontinence. Functional incontinence is usually associated with AD. The involuntary passage of urine is related to cognitive, physical, or psychologic functioning or to environmental barriers. The person with AD may be functionally incontinent due to the inability to:

- Recognize the signs of a full bladder due to changes in the brain that affect urinary control
- Articulate the need to void
- Manipulate clothing as a result of perceptual and fine motor control deficits
- Comprehend directions to the bathroom
- Find the bathroom due to disorientation
- Walk to the bathroom

Environmental reasons for functional incontinence:

- The bathroom is too far from the patient's room
- The bed is too high or has side rails, so the patient cannot get up and out
- The patient is restrained, making mobility impossible
- The patient is not able to identify the bathroom due to lack of cues
- Poor lighting makes it difficult to find the bathroom
- A lack of color contrast between the toilet seat and the floor causes confusion
- The patient mistakes the sink or wastebasket for the toilet

Incontinence can also have a psychologic basis. The individual may receive behavioral messages from caregivers that incontinence is acceptable and is rewarded with attention and touch when caregivers remove soiled clothing. By this stage of the illness, the patient has relinquished control over many body functions and incontinence may be a means of exerting control over a bodily function [48].

There may be physiologic reasons for other types of incontinence. Prostatic hyperplasia causes overflow incontinence. Stress incontinence is associated with increased abdominal pressure and urethral sphincter failure. Urinary tract infections, inadequate fluid intake leading to bladder irritation, and certain medications are known to cause incontinence.

**Staff Interventions for Incontinence**

Complete a bowel and bladder assessment to rule out reversible causes of incontinence and provide appropriate treatment if required. Incontinence resulting from the disease process cannot be reversed; however, adaptations can be made to prevent soiling.

Steps to modify the environment for the patient:

- Place a picture of a toilet and the word "toilet" on the bathroom door.
- Increase lighting in the bathroom and hallway if needed.
- Check the room temperature. Arrange a warm, comfortable bathroom. Remove clutter from the bathroom that may distract the patient.
- Add an elevated toilet seat with arms to increase feelings of security. Install grab bars to facilitate independence.
- Avoid the use of restraints and side rails if possible. Keep the bed in the lowest position.
- Remove mirrors. The patient may see his or her reflection and think another person is already in the bathroom.
- Provide privacy. Group toileting in the long-term care facility is not conducive to successful voiding.
- Make sure the toilet seat is a contrasting color to the floor.
- Provide clothing that is easy to manipulate.

Behavioral interventions that the staff can implement [48]:

- Monitor the individual to identify signs of a full bladder, such as wandering, rubbing the genitals, or irritability.
- Ask the family what word the patient may use to indicate the need to toilet. Words such as "tinkle," "pee," or "take a leak" may be more familiar to the patient.
- Provide at least 6 cups of fluid daily. Do not assume the patient will drink just because fluids are available. Avoid fluids such as coffee and tea that may irritate the bladder.
- Implement a scheduled toileting, prompted voiding, or habit-training program. Each program requires caregiver assistance. Scheduled toileting and habit training are suitable for all patients with AD as long as they can sit safely on the toilet.
- Scheduled toileting requires a timed schedule for voiding. Take the individual to the bathroom every two hours and implement techniques to facilitate urination; if necessary, run water, dip the person's hand in warm water, or pour warm water over the genitalia.
- Habit training is based on the person's individual pattern of voiding. An assessment is required to identify the usual voiding times. The person is then taken to the bathroom at these times every day.
- Prompted voiding is a supplement to habit training and utilizes social reinforcement for appropriate toileting behavior. Patients are checked on a regular basis and asked to report verbally if wet or dry. They are prompted to use the toilet and are praised for maintaining continence and for attempting to use the toilet. Patients must be able to recognize some degree of bladder fullness or the need to void.

Eventually, the individual will become incontinent regardless of caregiver efforts. The use of adult diapers will prevent embarrassment from soiling clothing. Change the diapers frequently and provide adequate skin cleansing and drying to avoid skin breakdown. Giving the patients cranberry juice to drink may help eliminate odor and urinary tract infections.

## FACILITATING MOBILITY

Mobility, like other skills, deteriorates as AD progresses. Most patients remain ambulatory for a surprisingly long time, but eventually they require assistance with getting out of bed and walking. In the last stage, the patient is immobile, with little weight-bearing ability. Diminishing mobility increases the risk for falls. Gait disturbances, such as leaning and shuffling, along with balance and coordination deficits are causes of impaired mobility.

To facilitate mobility:

- Investigate and treat any possible underlying cause of immobility. The person with impaired vision may need glasses; those with bunions or calluses may require the services of a podiatrist.
- Provide clothing that promotes mobility. Check laces on shoes, and make sure the shoes are comfortable, the right size, and slip proof. Check the length of slacks. Slacks or skirts that are too large or too long hinder walking.
- Consult with a physical therapist to determine the need for muscle strengthening exercises or for techniques to use for those with perceptual deficits.
- Implement range of motion exercises twice daily to maintain joint flexibility.
- Avoid the use of restraints. The associated inactivity promotes muscle atrophy and poor balance.

- Instruct all caregivers in correct techniques when the patient is unable to get out of bed independently. A one or two person pivot transfer with a transfer (gait) belt is appropriate if there is weight-bearing ability.
- Use a mechanical lifting device for those who have lost weight-bearing ability. Getting the patient out of bed provides a change of scene and encourages participation in activities.
- Avoid the use of assistive devices like walkers or canes. Most patients with AD are unable to safely use them because of cognitive impairment.

## ACTIVITIES FOR THE PERSON WITH ALZHEIMER DISEASE: SUGGESTIONS FOR CAREGIVERS

Appropriate activities are an important component of the total plan of care for people with AD. The overall purpose of providing activities is to enhance their self-esteem and to benefit their emotional well-being. Activities focus on their remaining strengths rather than their limitations, in an attempt to provide structure and to normalize life as much as possible. Activities can promote physical exercise, stimulate mental activity, and help the patient maintain social and religious practices. Activities are used as a behavioral management technique by preventing boredom and reducing agitation and to prolong functional capabilities. Involvement should be voluntary. In the earlier stages, patients may resist participating in activities due to feelings of inadequacy and fear of failure. It may take two or three invitations for them to feel comfortable in accepting help. In the later stages, dependent patients must be taken to the activity. If caregivers know the individual, they will be aware of what types of activities they are likely to enjoy. Patients with AD in the later stages must be monitored throughout an activity so agitation and anxiety are quickly detected by the staff.

The activities area is a significant factor in the success of the program. Ideally, the room is quiet and free of distractions. Unfortunately, public areas of a facility where staff, visitors, and others must pass through are often used. A secure environment will allow those who wander to do so without intervention. People with AD are unable to focus on a task when they are continually responding to the sights and sounds around them. Easy access to bathrooms is a priority. It is less disruptive if patients can get up and go to the bathroom when the need arises. Patients with AD generally feel safer and more comfortable if activities are held in the same area every day. While they may not cognitively remember the room, their affective memories influence their feelings about the environment.

### General Guidelines for Caregivers About Activities

#### *Safety*

Safety is the first concern when planning activities. Choose nontoxic supplies for activities such as painting or clay modeling. Avoid activities that require scissors or other potentially dangerous tools. Games that utilize many small pieces may be unsafe for patients with hyperorality. Food-related activities are popular, but staff members must be aware of dietary modifications (e.g., the use of thickeners or pureed foods) required by a person or any swallowing problems that may occur.

Monitor patients for agitation and signs of discomfort, incontinence, or choking, and initiate appropriate action if necessary. Utilize in-service opportunities to teach the activities staff how to respond to emergencies. They should also learn how to safely transfer patients from wheelchairs to dining chairs, how to assist with eating, and how to help their charges in the bathroom. Patients benefit tremendously when the staff has participated in AD classes and are knowledgeable in appropriate behavior management techniques.

### *Planning*

Activities should be dignified, avoiding those that may be perceived as demeaning or childish. A well-planned and implemented program brings meaning, purpose, and joy to the patient's life. An assessment done upon admission will identify previous and current pastimes enjoyed by the person, and past roles and lifestyles can be validated. However, to ask someone to do a simplified version of a craft he or she once excelled in may not be successful. For example, an artist who is given a paint-by-number set or a child's coloring book may become frustrated and angry with the reminder that the mastery is disappearing. On the other hand, some skills remain even when patients are severely impaired. Given the opportunity, someone who enjoyed playing the piano may be able to sit down and render a familiar tune.

Activities that focus on routine daily tasks can improve the quality of life by maintaining these skills for a longer period of time. Combing hair, applying makeup, and polishing fingernails improve self-esteem and can delay functional loss. Household tasks are also effective activities.

### *Implementation of Activities*

Activities should be:

- Purpose driven (e.g., making greeting cards to give to family)
- Voluntary on the part of the patient
- Noncompetitive
- Planned for small groups or on a one-to-one basis
- Planned for short periods of time
- Possible with only a few simple items
- Geared to the patient's present abilities with available staff/volunteers to assist
- Geared to the time of day (bathing and grooming or setting a table for a meal)

It is important to allow for quiet time. It is not necessary for the patient to be busy all of the time, as overstimulation causes anxiety and fatigue.

Activities have a greater chance for success when all staff members appreciate their value. Not all patients with AD can attend events, so it may be helpful for the activity staff to tell the nursing personnel which people would benefit most from a particular session. These patients can then be dressed and be taken to the toilet in time to attend. In some dementia special care units, the nursing assistants are trained to plan and present the activities. This simplifies the amount of coordination that is required between departments.

## Other Activities That Caregivers Can Provide

### *Spiritual Activities*

Participation in spiritual activities is very beneficial for those who were involved in religious activities in the past. The background and faith of the individual must be considered so the services are familiar and comforting. Clergy in the community may rotate their services to ensure that all faiths are represented during the year. Ask the members of the clergy to dress in their traditional garments. The environment can promote the feeling of a spiritual setting by holding services in a chapel or by utilizing items appropriate for specific religions, such as a cross or a rosary. Those who have received strength and reassurance in the past from their spiritual beliefs may continue to find support from such activities even into the later stages of AD. Religious services are most beneficial when the program is familiar; for example, well-known hymns and passages from religious text are comforting.

### *Music Activities*

Singing, listening to music and dancing are entertaining for many patients. Musical programs may be either passive (listening) or active (singing or dancing). Consider the age and era of the audience when selecting the music. Adequate space and safe flooring are needed for dancing. Block out other environmental sounds to avoid excessive stimulation.

### *Arts and Crafts*

Some patients enjoy arts and crafts that are within the realm of their abilities, and the end product gives a sense of accomplishment and productivity. Much planning and assistance may be required of the staff to avoid frustration. Arts and crafts are noncompetitive. There is no right or wrong, and one individual's product is not compared to anyone else's. A group activity provides the socialization and camaraderie of being in a group. For higher functioning individuals, consider quilting, woodworking, or ceramics. One facility adopted a project whereby the patients made rag dolls for children in a nearby pediatric chronic care hospital. Those in the advanced stages of AD may enjoy painting with their fingers, a large brush, or a sponge or working with clay. Art projects can also serve as communication tools, providing opportunities to control colors and designs.

An autobiography project may be satisfying to the patient and helpful to the staff. The project usually requires the help of the family. Photos from the person's past, up through the present time, are placed in a scrapbook with names printed underneath. Family members, friends, pets, and former homes may be included. The book should be readily accessible and can be used to help calm patients when they are anxious.

### *Pet Therapy*

The therapeutic use of small animals provides sensory stimulation and encourages movement, reminiscence, social interaction, and opportunities for nonverbal communication. Pets provide unconditional affection and approval. Some facilities adopt one or more permanent pets. This requires preplanning and commitment on the part of the staff. Other facilities use an animal visitation program with pets provided at specific times by staff members, by volunteers, or from a local animal shelter. Everyone who wishes should have an opportunity to interact with the animal. Kittens or puppies are especially effective in drawing positive responses from those in the advanced stages of AD. Watching fish in an aquarium or listening to birds is often a pleasant pastime. Patients' allergies should be taken into consideration.

### *Horticulture*

Horticulture activities are often familiar and have healing and therapeutic properties. With proper care, plants grow and produce new shoots, giving them the opportunity for nurturing and caring. Plants provide sensory stimulation when the patient feels the soil, sees and smells the blossoms, or tastes a tomato fresh from the vine. Plants can be correlated with seasons, with tulips and Easter lilies for spring and poinsettias for Christmas. Avoid poisonous or possibly harmful plants. Projects should be small and manageable. Hardy individual houseplants require little attention. Some facilities plant small outdoor raised gardens for those who enjoy more involvement. Plants can also be used as a foundation for other activities, such as reminiscing, as door prizes for patient-sponsored programs, or as gifts to family members. However, it is the process and not the end product that is the important feature of a horticulture program.

### *Physical/Recreational Activities*

Regular physical exercise is beneficial for patients with AD. Consider wandering habits when planning programs to avoid physically exhausting the person. Physical activity facilitates bowel regularity, reduces tension, increases appetite, and may prevent complications associated with immobility. Exercise activities may include:

- Going for a walk
- Active range of motion exercises done to music; these can be done by patients in wheelchairs
- Balloon toss
- Horseshoes (with modified equipment)
- Bowling (with modified equipment)

- Exercise trails set up indoors or outside with items such as a finger ladder and exercise wheel
- Water therapy for facilities that have access to a pool (although this activity requires a high staff to participant ratio)

### *Intergenerational Programming*

Interaction between children and patients can have many positive results for both generations. In one facility, a group of mothers and their preschool children and infants joined the residents once a month for morning exercises. In another facility, elementary school children each "adopted" a patient whom they visited weekly. It is better to avoid large groups of children at one time. Give the children prior instruction and encourage the participation of parents or teachers.

### *Community Activities*

Activities outside of the facility require additional staff, a mode of transportation, and places to go that are accessible and accepted by the participants. Community activities are well worth the effort and planning. Staff members should identify restaurants, stores, museums, shopping malls, and other public places that will welcome patients with AD. Plan the outing for the time of day and day of the week that are the least busy, and choose places that have minimal stimulation. Make reservations when a restaurant outing is planned. Inform other staff members in advance which residents will be out of the building. For lengthy outings, it may be necessary to take patients' medications. Community outings can be very simple; examples include a ride through the country in the spring to see newly planted fields or in the fall to view changing colors, visiting the hometowns where patients once lived, going to a drive-in for an ice cream cone, or visiting a park. Going to country fairs, fishing at nearby lakes, having picnics, or attending theater productions requires more extensive planning but may be very enjoyable for those with early stage disease.

### *Individual Activities*

Having items available for individual activities may soothe the patient's behavior. Boxes can be filled with objects that meet the individual's need to rummage. Picture books, greeting cards, playing cards, balls of yarn, and other small, safe items are suggested. Children's toys (e.g., abacus, clock, workbench, large strands of beads) may stimulate interest. Rocking is comforting to some patients; the availability of gliding rockers meets this need. Others may find comfort in stuffed animals or dolls. Some caregivers may feel this is demeaning. It is not the object that is demeaning, but rather the attitude of staff towards those who are attached to the objects. Whether or not it is appropriate depends on the response of the individual patient.

## APPENDIX II: SPECIAL CARE UNITS

Admission to a long-term care facility at some point is inevitable for most people with AD. Few families have the emotional resources and energy to cope with care given 24 hours per day, 7 days per week. Like advanced directives, the topic of nursing home or long-term care facility placement should be discussed at the time of initial diagnosis. Making the decision for placement at a time of crisis places undue stress on everyone involved. The availability of special care units (SCUs) increases the options for families who must make decisions regarding a loved one.

### PHILOSOPHY OF A SPECIAL CARE UNIT

Planning an SCU begins with developing a philosophy of care for those affected by AD. Each facility is different, and all must determine the best approaches to care for the needs of their residents. The written program philosophy describes the approaches to care that will be rendered. It is essential that the philosophy be understood and implemented by all staff members and that it is reflected in their interactions with patients and families.

The National Institute of Aging has completed research at SCUs around the country and has developed seven attributes that distinguish these units from other types of care [8]:

- A greater degree of separation between patients with and without dementia in physical space and social activities
- A greater effort to eliminate noxious auditory stimulation
- A greater number of simple activities planned for patients
- A greater tolerance of problematic behaviors
- A greater degree of participation in organized recreational programs by patients with dementia
- Less participation by patients in therapeutic programs aimed at promoting activities of daily living
- More methods used to train staff about dementia care

A study conducted in Canada identified several major characteristics of SCUs that contributed to positive outcomes in behaviors [62]:

- Patient's feelings of personal space
- Expression of personhood
- An unforced routine
- Patients choose their own schedule for self-care and daily activities
- Staff not restricted to traditional role boundaries
- A fully equipped unit kitchen
- Support from administration and family members

## ADMISSION AND DISCHARGE CRITERIA

Persons with AD in different stages have very diverse needs. The purpose of an SCU is to provide individualized quality care. This goal is more readily achieved if the patients require similar management approaches. Admission should be restricted to those who are in corresponding stages of disease. The unit may be set up to care for residents in either the early or the middle stages of the disease.

Early stage units are designed to care for individuals who are wandering, pillaging, sundowning, and exhibiting other behaviors of this stage. Because it takes a great deal of staff time to effectively manage early stage individuals, those with heavy physical requirements are excluded from placement. The philosophy spells out the type of person for whom care will be provided. As the disease progresses, the needs of the residents change and transfer out of this specific stage unit will be necessary.

Middle stage units are prepared to care for individuals who manifest the behaviors of early stage but who also require more assistance in the activities of daily living. Mutual feelings of trust and friendship often develop between family members and staff. This relationship can be beneficial to the patient, but it may create resistance from the family when the transfer from the unit becomes inevitable. To avoid misunderstandings, written criteria for admission and discharge procedures are essential. Staff and family members must be informed of the criteria and the rationale for these standards.

Admission criteria may include:

- A score on a mental status examination within a certain range
- A medical diagnosis for AD or other irreversible dementia
- A specific level of mobility skill
- That the person does not need skilled nursing care
- The expectation (from history and assessment) that the patient will benefit from placement in the SCU

Before appropriate placement can be made, the following items must be completed:

- Assessment of the level of functioning
- Mental status examination
- Review of the personal medical history
- Review of the present medical status
- Interview with the family and patient
- Tour of the SCU by the family and patient

It may be advisable to write a policy that clearly states conditions for exclusion from the unit. Restrictions may be based upon an individual's:

- Lack of background medical data to support need for placement on unit
- History of serious medical problems or needs that require skilled care
- Inability to participate or benefit from the activity-focused program planned to meet the physical, cognitive, and/or psychosocial objectives
- Inability to respond to other residents, staff, family, or the environment
- Behaviors that present serious safety hazards to self or others
- Inability to respond to distraction techniques
- Problems related to substance abuse
- Ability to function at a level that would allow them to reside on a regular nursing unit

Discharge from the unit may be necessary when the patient:

- Needs skilled nursing intervention and care
- Requires assistance in mobility (in an early stage unit)
- Is unable to respond to other residents, staff, family, or the environment
- Presents serious and/or life-threatening safety hazards to self or others
- Is consistently unable to respond to distraction techniques

## OBJECTIVES OF THE SPECIAL CARE UNIT

Delineating the objectives of the SCU and the approaches to meeting these objectives provides the staff with guidance in the planning of care.

***Objective:***

To maintain the patient's mobility and physical fitness for as long as possible.

***Approach:***

- Complete restorative assessments regularly
- Implement exercise and restorative programming
- Use physical restraints only when all other behavioral interventions have failed and when the life of the person or others is in danger

***Objective:***

To maintain optimal nutritional and hydration status.

***Approach:***

- Complete nutritional assessments regularly
- Plan food focused activity programs
- Plan activities with in-between meal nourishments
- Use behavioral interventions for food- or eating-based problems

***Objective:***

To avoid incontinent episodes.

***Approach:***

- Complete bowel and bladder assessments regularly
- Develop individualized toileting plans

***Objective:***

To involve residents in the activities of daily living.

***Approach:***

- Complete rehabilitation assessments regularly
- Plan and implement activities of daily living/restorative programs on the unit
- Assist patients to function at their highest physical level

***Objective:***

To enhance the cognitive well-being of the patients.

***Approach:***

- Encourage independence by utilizing their strengths
- Complete activity assessments regularly
- Use cueing and task simplification
- Use effective verbal and nonverbal stimulation

***Objective:***

To conserve psychosocial well-being.

***Approach:***

- Complete social service and activity assessments regularly
- Consult with mental health specialists, if necessary
- Focus on individual abilities rather than disabilities
- Focus on socialization skills
- Support and facilitate a peer community
- Educate the staff and family so they understand and have the skills to manage behaviors
- Provide a physical environment that is calm and soothing
- Provide furniture conducive to comfort
- Restrict the numbers of individuals (other than families) entering the unit
- Plan for dedicated staffing on the unit
- Avoid the use of physical and chemical restraints
- Encourage and assist residents to continue with previous spiritual activities
- Assist residents to attend church services when appropriate
- Provide one-to-one spiritual activities as required by care plan

***Objective:***

To foster the emotional well-being of the families.

***Approach:***

- Invite families to participate in care plan conferences
- Encourage families to assist in care plan approaches
- Facilitate the formation of family support groups
- Provide educational programs and resources to families

***Objective:***

To nurture the well-being of the staff.

***Approach:***

- Facilitate an interdisciplinary support system
- Invite all staff members on the unit to assist in care planning
- Emphasize the importance of the interdisciplinary process
- Provide continuing education for all aspects of care
- Participate in staff meetings

## STAFF SELECTION

Choosing employees to staff the SCU is a crucial task that deserves much consideration. Assignment to the unit should be voluntary with dedicated staffing. The knowledge and commitment of the supervising nurse or manager will influence the total milieu of the unit. Ideally, all staff members will have a sincere desire to work with patients with AD and will have:

- Patience
- Tolerance of unusual behaviors
- Ability to handle stressful situations
- A calm, quiet demeanor
- The skills to interrelate with patients and families on all levels
- Flexibility and creativity
- Knowledge of dementia and behavioral management techniques

Departments of nursing, activities, social services, rehabilitation, and all nondirect staff (i.e., housekeepers, dietary and maintenance personnel, and administrators) who work with or have contact with patients and families should participate in an orientation program and ongoing training programs. The cost of training is exceeded by the benefits to patients, families, and staff.

## ENVIRONMENT OF THE SPECIAL CARE UNIT

The impact of environment on the well-being of cognitively impaired people is well documented. Anxiety and aggressive behaviors frequently occur as a result of excessive environmental stimuli. On the other hand, physical and mental deterioration set in when there is a lack of stimuli. The SCU is planned to provide an environment that is safe, soothing, and serene, with appropriate sensory stimulation. Specific aspects of the SCU environment include:

- Minimum of 20 beds
- Locked unit in compliance with state regulations
- Use of lighting, colors, design, and texture to produce a calming effect
- Locked top drawer of dressers for safe storage of hearing aids, glasses, and dentures
- Minimal noise; intercom for emergency use only and non-ringing telephones; elimination of televisions and radios from public areas of the unit
- Tops of dressers and bedside stands free of personal belongings
- Restrictions on people entering unit to reduce excessive noise and stimuli
- Furniture in community areas that is accessible and conducive to physical comfort
- Carpeted halls to reduce noise level
- Use of labels and pictures for redundant cueing
- Locked storage areas
- Wandering trails
- Spaces for activities and dining
- Equipment and space for simple cooking projects
- Access to the outdoors

Continuous quality improvement programs may be used to measure the outcomes of AD care programming. Potential positive indicators include decreased episodes of agitation and catastrophic reactions and fewer symptoms of depression with improved mood, continence, and sleeping patterns of patients. A happy, relaxed appearance and interactions with staff and other residents are measurable benefits of the SCU. Other hypothesized outcomes include family indicators, cost indicators, and staff satisfaction.

## Works Cited


1. National Institute on Aging. Basics of Alzheimer's Disease and Dementia. Available at https://www.nia.nih.gov/health/alzheimers/basics. Last accessed August 14, 2020.
2. Administration on Aging. *A Profile of Older Americans: 2019*. Rockville, MD: U.S. Department of Health and Human Services; 2019.
3. Abeti R, Abramov AY, Duchen MR. Beta-amyloid activates PARP causing astrocytic metabolic failure and neuronal death. *Brain*. 2011;134(Pt 6):1658-1672.
4. Alzheimer's Association. 2020 Alzheimer's Disease Facts and Figures. Available at https://www.alz.org/media/Documents/alzheimers-facts-and-figures_1.pdf. Last accessed August 11, 2020.
5. Morris JC. *Alzheimer's Disease: Unique, Differentiable and Treatable*. 52nd Annual Meeting of the American Academy of Neurology; 2000.
6. Kuller LH, Lopez OL, Becker JT, et al. Risk of dementia and death in the long-term follow-up of the Pittsburgh Cardiovascular Health Study–Cognition Study. *Alzheimers Dement*. 2016;12(2):170-183.
7. Gist YJ, Hetzel LI, U.S. Census Bureau. *We the People: Aging in the United States*. Rockville, MD: U.S. Census Bureau; 2004.
8. Alzheimer's Disease Education and Referral Center. *2003 Progress Report on Alzheimer's Disease: Research Advances at NIH*. Rockville, MD: U.S. Department of Health and Human Services; 2003.
9. Aarfa A. Drug-Induced Delirium. Available at https://www.clinicaladvisor.com/home/decision-support-in-medicine/hospital-medicine/drug-induced-delirium/. Last accessed August 14, 2020.
10. U.S. Census Bureau. Selected Social Characteristics in the United States, 2018. Available at https://www.census.gov/acs/www/data/data-tables-and-tools/data-profiles/. Last accessed August 14, 2020.
11. U.S. Department of Health and Human Services. *Medicare and You 2001*. Baltimore, MD: Health Care Financing Administration; 2001.
12. Williams J. Recent breakthroughs in our understanding the genetics of Alzheimer's disease. *Int J Neuropsychopharmacol*. 2000;3(Suppl 1):S59.
13. Bertram L, Tanzi RE. Thirty years of Alzheimer's disease genetics: the implications of systematic meta-analyses. *Nat Rev Neurosci*. 2008;9:768-778.
14. Shapira J, Schlesinger R, Cummings JL. Distinguishing dementias. *Am J Nurs*. 1986;86(6):698-702.
15. Alzheimer's Association. About. Available at https://www.alz.org/about. Last accessed August 14, 2020.
16. Agency for Health Care Policy and Research. *Recognition and Initial Assessment of Alzheimer's Disease and Related Dementias*. Rockville, MD: U.S. Department of Health and Human Services; 1996.
17. Alzheimer's Association. What is Dementia? Available at https://www.alz.org/alzheimers-dementia/what-is-dementia. Last accessed August 14, 2020.
18. National Institute on Aging. What Causes Alzheimer's Disease? Available at https://www.nia.nih.gov/health/what-causes-alzheimers-disease. Last accessed August 14, 2020.
19. Vincent AS, Roebuck-Spencer TM, Cernich A. Cognitive changes and dementia risk after traumatic brain injury: implications for aging military personnel. *Alzheimers Dement*. 2014;10(3 Suppl):S174-S187.
20. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*. 5th ed. Washington, DC: American Psychiatric Association; 2013.
21. Alzheimer's Association. Types of Dementia. Available at https://www.alz.org/alzheimers-dementia/what-is-dementia/types-of-dementia. Last accessed August 14, 2020.
22. National Institute of Neurological Disorders and Stroke. Dementia Information Page. Available at https://www.ninds.nih.gov/Disorders/All-Disorders/Dementia-Information-Page. Last accessed August 14, 2020.
23. Schaber P. *Occupational Therapy Practice Guidelines for Adults with Alzheimer's Disease and Related Disorders*. Bethesda, MD: American Occupational Therapy Association, Inc.; 2010.
24. McCusker J, Cole MG, Voyer P, et al. Environmental factors predict the severity of delirium symptoms in long-term care residents with and without delirium. *J Am Geriatr Soc*. 2013;61(4):502-511.
25. Arnold E. Sorting out the 3 D's: delirium, dementia, and depression. *Nursing*. 2004;34(6):36-42.
26. van Asch IF, Nuyen J, Veerbeek MA, Frijters DH, Achterberg WP, Pot AM. The diagnosis of depression and use of antidepressants in nursing home residents with and without dementia. *Int J Geriatr Psychiatry*. 2013;28(3):312-318.
27. National Institute on Aging. *Unraveling the Mystery: The Impact of Alzheimer's Disease*. Rockville, MD: U.S. Department of Health and Human Services; 2003.
28. Schwartz J, Fried LB. Legal issues for caregivers of individuals with Alzheimer's disease. In: Zarit SH, Talley RC (eds). *Caregiving for Alzheimer's Disease and Related Disorders*. New York, NY: Springer; 2013: 165-179.

29. U.S. Department of Health and Human Services. *Federal Register*. Vol. 56. Baltimore, MD: Health Care Financing Administration; 1991.
30. United States Senate Special Committee on Aging. *Untie the Elderly: Quality Care without Restraints*. Washington, DC: United States Government Printing Office; 1990.
31. Alzheimer's Disease International. Dementia in the Asia Pacific Region: The Epidemic is Here. Available at https://www.alz.co.uk/research/files/apreportexecsum.pdf. Last accessed August 14, 2020.
32. Miguel-Hidalgo JJ, Alvarez XA, Cacabelos R, Quack G. Neuroprotection by memantine against neurodegeneration induced by beta-amyloid (1-40). *Brain Res*. 2002;958(1):210-221.
33. Smith M, Buckwalter K. Behaviors associated with dementia: whether resisting care or exhibiting apathy, an older adult with dementia is attempting communication. Nurses and other caregivers must learn to "hear" this language. *Am J Nurs*. 2005;105(7):40-52.
34. Needham JF. *Gerontological Nursing: A Restorative Approach*. Albany, NY: Delmar Publishers Inc.; 1993.
35. Academy of Nutrition and Dietetics. *Food and Nutrition for Older Adults Promoting Health and Wellness*. Chicago, IL: Academy of Nutrition and Dietetics; 2012.
36. Bayles KA, Tomoeda CK. *Effective Interventions for Improving Communication Function*. Fifth National Alzheimer's Disease Education Conference. Alzheimer's Association; 1996.
37. National Institutes of Health office of Dietary Supplements. Vitamin E: Fact Sheet for Health Professionals. Available at https://ods.od.nih.gov/factsheets/VitaminE-HealthProfessional. Last accessed August 14, 2020.
38. Morris MC, Evans DA, Tangney CC, et al. Relation of the tocopherol forms to incident Alzheimer disease and to cognitive change. *Am J Clin Nutr*. 2005;81(2):508-514.
39. Abdo CH. Sexuality and couple intimacy in dementia. *Curr Opin Psychiatry*. 2013;26(6):593-598.
40. Parsons Y. Private acts, public places. *Contemp Longterm Care*. 1995;18(3):48-49,51,53-55.
41. Barnard ND, Bush AI, Ceccarelli A, et al. Dietary and lifestyle guidelines for the prevention of Alzheimer's disease. *Neurobiol Aging*. 2014;35(S2):S74-S78.
42. Roy R. *Shaping Nutritional Care for the Alzheimer's Client*. Fifth National Alzheimer's Disease Education Conference. Alzheimer's Association; 1996.
43. Mohajeri MH, Troesch B, Weber P. Inadequate supply of vitamins and DHA in the elderly: implications for brain aging and Alzheimer's type dementia. *Nutrition*. 2015;31(2):261-275.
44. Health Care Financing Administration. *Nutrition Care Alerts*. Washington, DC: American Academy of Family Physicians, the American Dietetic Association, National Council on the Aging; 2003.
45. Ragneskog H, Bråne G, Karlsson I, Kihlgren M. Influence of dinner music on food intake and symptoms common in dementia. *Scand J Caring Sci*. 1996;10(1):11-17.
46. Brandes RP, Weissmann N, Schröder K. NADPH oxidases in cardiovascular disease. *Free Radic Biol Med*. 2010;49(5):687-706.
47. Block ML. NADPH oxidase as a therapeutic target in Alzheimer's disease. *BMC Neurosci*. 2008;9(Suppl 2):S8.
48. Agency for Health Care Policy and Research. *Urinary Incontinence in Adults: Clinical Practice Guideline Update*. Rockville, MD: U.S. Department of Health and Human Services; 1996.
49. Ballard C, Corbett A. Agitation and aggression in people with Alzheimer's disease. *Curr Opin Psychiatry*. 2013;26(3):252-259.
50. Altenhöfer S, Radermacher KA, Kleikers PW, Wingler K, Schmidt HH. Evolution of NADPH oxidase inhibitors: selectivity and mechanisms for target engagement. *Antioxid Redox Signal*. 2015;23(5):406-427.
51. Panza F, Solfrizzi V, Imbimbo BP, et al. Efficacy and safety studies of gantenerumab in patients with Alzheimer's disease. *Expert Rev Neurother*. 2014;14(9):973-986.
52. Van der Mussele S, Le Bastard N, Saerens J, et al. Agitation-associated behavioral symptoms in mild cognitive impairment and Alzheimer's dementia. *Aging Ment Health*. 2015;19(3):247-257.
53. Sheline YI, Morris JC, Snyder AZ, et al. APOE4 allele disrupts resting state fMRI connectivity in the absence of amyloid plaques or decreased CSF Aß42. *J Neurosci*. 2010;30(50):17035-17040.
54. Maarouf CL, Daugs ID, Kokjohn TA, et al. The biochemical aftermath of anti-amyloid immunotherapy. *Mol Neurodegener*. 2010;5:39.
55. Isaac MG, Quinn R, Tabet N. Vitamin E for Alzheimer's disease and mild cognitive impairment. *Cochrane Database Syst Rev*. 2008;(3):CD002854.
56. Akanuma K, Meguro K, Meguro M, et al. Improved social interaction and increased anterior cingulate metabolism after group reminiscence with reality orientation approach for vascular dementia. *Psychiatry Res*. 2011;192(3):183-187.
57. Douglas S, James I, Ballard C. Non-pharmacological interventions in dementia. *Advances in Psychiatric Treatment*. 2004;10:171-177.
58. Emmelot-Vonk MH, Verhaar HJJ, Nakhai Pour HR, et al. Effect of testosterone supplementation on functional mobility, cognition, and other parameters in older men: a randomized controlled trial. *JAMA*. 2008;299(1):39-52.

59. Scanland SG, Emershaw LE. Reality orientation and validation therapy: dementia, depression and functional status. *J Gerontol Nurs*. 1993;19(6):7-11.
60. Bassil N, Alkaade S, Morley JE. The benefits and risks of testosterone replacement therapy: a review. *Ther Clin Risk Manag*. 2009;5:427-448.
61. de la Monte SM, Wands JR. Alzheimer's disease is type 3 diabetes: evidence reviewed. *J Diabetes Sci Technol*. 2008;2(6):1101-1113.
62. Donovan C, Dupuis M. Specialized care unit: family and staff perceptions of significant elements. *Geriatr Nurs*. 2000;21(1):30-33.
63. Parsons CG, Stöffler A, Danysz W. Memantine: a NMDA receptor antagonist that improves memory by restoration of homeostasis in the glutamatergic system-too little activation is bad, too much is even worse. *Neuropharmacology*. 2007;53(6):699-723.
64. Graham NL, Emery T, Hodges JR. Distinctive cognitive profiles in Alzheimer's disease and subcortical vascular dementia. *J Neurol Neurosurg Psychiatry*. 2004;75(1):61-71.
65. Smith G. Early-Onset Alzheimer's: When Symptoms Begin Before 65. Available at https://www.mayoclinic.org/diseases-conditions/alzheimers-disease/in-depth/alzheimers/art-20048356. Last accessed August 14, 2020.
66. Sadock BJ, Sadock VA. *Kaplan & Sadock's Concise Textbook of Clinical Psychiatry*. 3rd ed. Philidelphia, PA: Lippincott Williams & Wilkins; 2008.
67. Taipale H, Koponen M, Tanskanen A, Tolppanen AM, Tiihonen J, Hartikainen S. Antipsychotic doses among community-dwelling persons with Alzheimer disease in Finland. *J Clin Psychopharmacol*. 2014;34(4):435-440.
68. Evans R. Clinical Features and New Therapies for Dementia. 125th Annual Meeting of the American Neurological Association. 2000.
69. Vlad SC, Miller DR, Kowall NW, Felson DT. Protective effects of NSAIDs on the development of Alzheimer disease. *Neurology*. 2007;70:1672-1677.
70. Motsinger CD, Perron GA, Lacy TJ. Use of atypical antipsychotic drugs in patients with dementia. *Am Fam Physician*. 2003;67(11):231-241.
71. Beier MT. Treatment strategies for the behavioral symptoms of Alzheimer's disease: focus on early pharmacologic intervention. *Pharmacotherapy*. 2007;27(3):399-411.
72. Seltzer B. Cholinesterase inhibitors in the clinical management of Alzheimer's disease: importance of early and persistent treatment. *J Int Med Res*. 2006;34(4):339-347.
73. Scahill RI, Schott JM, Stevens JM, Rossor MN, Fox NC. Mapping the evolution of regional atrophy in Alzheimer's disease: unbiased analysis of fluid-registered serial MRI. *Proc Natl Acad Sci USA*. 2002;99(7):4703-4707.
74. Trinh N, Hoblyn J, Subhanjoy M, Yaffe K. Efficacy of cholinesterase inhibitors in the treatment of neuropsychiatric symptoms and functional impairment in Alzheimer disease. *JAMA*. 2003;289(2):210-216.
75. Bennett DA, Schneider JA, Wilson RS, Bienias JL, Arnold SE. Neurofibrillary tangles mediate the association of amyloid load with clinical Alzheimer's disease and level of cognitive function. *Arch Neurol*. 2004;61(3):378-384.
76. Grundman M, Petersen RC, Ferris SH, et al. Mild cognitive impairment can be distinguished from Alzheimer's disease and normal aging for clinical trials. *Arch Neurol*. 2004;61(1):59-66.
77. Mulnard RA, Cotman CW, Kawas C, et al. Estrogen replacement therapy for treatment of mild to moderate Alzheimer's disease. *JAMA*. 2000;283(8):1007-1015.
78. Berlau DJ, Corrada MM, Head E, Kawas CH. APOEε2 is associated with intact cognition but increased Alzheimer pathology in the oldest old. *Neurology*. 2009;72(9):829-834.
79. Winslow BT, Onysko MK, Stob CM, Hazlewood KA. Treatment of Alzheimer disease. *Am Fam Physician*. 2011;83(12):1403-1412.
80. Bonte FJ, Harris TS, Roney CA, Hynan LS. Differential diagnosis between Alzheimer's and frontotemporal disease by the posterior cingulate sign. *J Nucl Med*. 2004;45(5):771-774.
81. Scarmeas N, Zarahn E, Anderson KE, et al. Cognitive reserve-mediated modulation of positron emission tomographic activations during memory tasks in Alzheimer disease. *Arch Neurol*. 2004;61(1):73-78.
82. Ready RE, Paulsen JS. Neuropsychological studies in geriatric psychiatry. *Curr Opin Psychiatry*. 2003;16(6):643-648.
83. Gleason OC. Delirium. *Am Fam Physician*. 2003;67(5):1027-1034.
84. Johnson JW, Kotermanski SE. Mechanism of action of memantine. *Curr Opin Pharmacol*. 2006;6(1):61-67.
85. Gauthier S, Emire M, Farlow MR, Bullock R, Grossberg GT, Potkin SG. Strategies for continued successful treatment of Alzheimer's disease: switching cholinesterase inhibitors. *Curr Med Res Opin*. 2003;19(8):707-714.
86. Silverman DH. Brain F-FDG PET in the diagnosis of neurodegenerative dementias: comparison with perfusion SPECT and with clinical evaluations lacking nuclear imaging. *J Nucl Med*. 2004;45(4):594-607.
87. Schneider LS. Choosing treatment for Alzheimer's patients and their caregivers. *Geriatrics*. 2003;58(Suppl 1):3-18.
88. Okamura N, Yanai K. Florbetapir (18F), a PET imaging agent that binds to amyloid plaques for the potential detection of Alzheimer's disease. *IDrugs*. 2010;13(12):890-899.

89. National Institute on Aging. How is Alzheimer's Disease Treated? Available at https://www.nia.nih.gov/health/how-alzheimers-disease-treated. Last accessed August 14, 2020.
90. Alzheimer's Association. Medications for Memory Loss. Available at http://www.alz.org/alzheimers_disease_standard_prescriptions.asp. Last accessed July 29, 2017.
91. Alzheimer's Association. FDA-Approved Treatments for Alzheimer's. Available at http://www.alz.org/national/documents/topicsheet_treatments.pdf. Last accessed August 14, 2020.
92. Lanctôt KL, Herrmann N, Rothenburg L, Eryavec G. Behavioral correlates of GABAergic disruption in Alzheimer's disease. *Int Psychogeriatr*. 2007;19(1):151-158.
93. Rissman RA, De Blas AL, Armstrong DM. GABA(A) receptors in aging and Alzheimer's disease. *J Neurochem*. 2007;103(4):1285-1292.
94. Garcia-Alloza M, Tsang SW, Gil-Bea FJ, et al. Involvement of the GABAergic system in depressive symptoms of Alzheimer's disease. *Neurobiol Aging*. 2006;27(8):1110-1117.
95. Lipton SA. Pathologically-activated therapeutics for neuroprotection: mechanism of NMDA receptor block by memantine and S-nitrosylation. *Curr Drug Targets*. 2007;8(5):621-632.
96. Alzheimer's Society. Dementia Risk Factors and Prevention. Available at https://www.alzheimers.org.uk/about-dementia/dementia-risk-factors-and-prevention?documentID=102. Last accessed August 14, 2020.
97. Alzheimer's Association. Alternative Treatments. Available at https://www.alz.org/alzheimers-dementia/treatments/alternative-treatments. Last accessed August 14, 2020.
98. McMahon JA, Green, TJ, Skeaff CM, et al. A controlled trial of homocysteine lowering and cognitive performance. *N Engl J Med*. 2006;354(26):2764-2772.
99. Kim JM, Stewart R, Kim SW, et al. Changes in folate, vitamin B12, and homocysteine associated with incident dementia. *J Neurol Neurosurg Psychiatry*. 2008;79(8):864-868.
100. McCarney R, Fisher P, Iliffe S, et al. Ginkgo biloba for mild to moderate dementia in a community setting: a pragmatic, randomised, parallel-group, double-blind, placebo-controlled trial. *Int J Geriatr Psychiatry*. 2008;23(12):1222-1230.
101. Szekely CA, Gree RC, Breitner JCS, et al. No advantage of Aß42-lowering NSAIDS for prevention of Alzheimer dementia in six pooled cohort studies. *Neurology*. 2008;70:2291-2298.
102. Tabet N, Feldman H. Ibuprofen for Alzheimer's disease. *Cochrane Database Syst Rev*. 2003;2:CD004031.
103. Resnick B, Boltz M, Galik E, Pretzer-Aboff I. *Restorative Care Nursing for Older Adults: A Guide for All Care Settings*. 2nd ed. New York, NY: Springer; 2012.
104. Rajendran L, Schneider A, Schlechtingen G, et al. Efficient inhibition of the Alzheimer's disease beta-secretase by membrane targeting. *Science*. 2008;320(5875):520-523.
105. Imbimbo BP. Therapeutic potential of gamma-secretase inhibitors and modulators. *Curr Top Med Chem*. 2008;8(1):54-61.
106. Lichtlen P, Mohajeri MH. Antibody-based approaches in Alzheimer's research: safety, pharmacokinetics, metabolism, and analytical tools. *J Neurochem*. 2008;104(4):859-874.
107. Steinitz M. Developing injectable immunoglobulins to treat cognitive impairment in Alzheimer's disease. *Expert Opin Biol Ther*. 2008;8(5):633-642.
108. Bacskai BJ, Kajdasz ST, Christie RH, et al. Imaging of amyloid-beta deposits in brains of living mice permits direct observation of clearance of plaques with immunotherapy. *Nat Med*. 2001;7(3):369-372.
109. Hooper C, Killick R, Lovestone S. The GSK3 hypothesis of Alzheimer's disease. *J Neurochem*. 2008;104(6):1433-1439.
110. Terwel D, Muyllaert D, Dewachter I, et al. Amyloid activates GSK-3beta to aggravate neuronal taupathy in bigenic mice. *Am J Pathol*. 2008;172(3):786-798.
111. Thomas G, McGirt MJ, Woodworth G, et al. Baseline neuropsychological profile and cognitive response to cerebrospinal fluid shunting for idiopathic normal pressure hydrocephalus. *Dement Geriatr Cogn Disord*. 2005;20(2-3):163-168.
112. Silverberg GD, Mayo M, Saul T, Fellmann J, Carvalho J, McGuire D. Continuous CSF drainage in AD: results of a double-blind, randomized, placebo-controlled study. *Neurology*. 2008;71(3):202-209.
113. National Institute of Neurological Disorders and Stroke. Disorder Index. Available at https://www.ninds.nih.gov/Disorders/All-Disorders. Last accessed August 14, 2020.
114. Alzheimer's Association. Differential Diagnosis. Available at https://www.alz.org/professionals/health-systems-clinicians/dementia-diagnosis/differential-diagnosis. Last accessed August 14, 2020.
115. Chapman DP, Williams SM, Stine TW, Anda RF, Moore MJ. Dementia and its implications for public health. *Prev Chronic Dis*. 2006;3(2):A34.
116. Mayo Clinic. Huntington's Disease: Symptoms and Causes. Available at https://www.mayoclinic.org/diseases-conditions/huntingtons-disease/symptoms-causes/syc-20356117. Last accessed August 14, 2020.

117. AETC National Resource Center. HRSA Guide for HIV/AIDS Clinical Care. Available at https://www.aidsetc.org/resource/hrsa-guide-hivaids-clinical-care. Last accessed August 14, 2020.
118. Buchacz K, Patel P, Taylor M. Syphilis increases HIV viral load and decreases CD4 cell counts in HIV-infected patients with new syphilis infections. *AIDS*. 2004;18(15):2075-2079.
119. Neal M, Wright B. Validation therapy for dementia. *Cochrane Database Syst Rev*. 2003;2:CD001394.
120. Knudsen RP. Neurosyphilis: Overview of Syphilis of the CNS. Available at https://emedicine.medscape.com/article/1169231-overview. Last accessed August 14, 2020.
121. Fisher Center for Alzheimer's Research Foundation. Top Ten Alzheimer's Signs and Symptoms. Available at https://www.alzinfo.org/understand-alzheimers/top-ten-signs-of-alzheimers. Last accessed August 14, 2020.
122. Amella EJ, Aselage MB. Mealtime difficulties. In: Boltz M, Capezuti E, Fulmer T, Zwicker DA (eds). *Geriatric Nursing Protocols for Best Practice*. 4th ed. New York, NY: Springer Publishing Company, Inc.; 2012.
123. Alzheimer's Association. Driving and Dementia. Available at http://www.alz.org/national/documents/statements_driving.pdf. Last accessed August 14, 2020.
124. American Medical Association. Physician's Guide to Assessing and Counseling Older Drivers. Available at http://www.nhtsa.gov/people/injury/olddrive/physician_guide/PhysiciansGuide.pdf. Last accessed August 14, 2020.
125. Zanetti O, Oriani M, Geroldi C, et al. Predictors of cognitive improvement after reality orientation in Alzheimer's disease. *Age Ageing*. 2002;31(3):193-196.
126. Spector A, Orrell M, Davies S, Woods B. Reality orientation for dementia. *Cochrane Database Syst Rev*. 2007;3:CD001119.
127. National Institute on Aging. Alzheimer's Disease Genetics Fact Sheet. Available at https://www.nia.nih.gov/health/alzheimers-disease-genetics-fact-sheet. Last accessed August 14, 2020.
128. Ballard CG, Greig NH, Guillozet-Bongaarts AL, Enz A, Darvesh S. Cholinesterases: roles in the brain during health and disease. *Curr Alzheimer Res*. 2005;2(3):307-318.
129. McMurtray AM, Ringman J, Chao SZ, Licht E, Saul RE, Mendez MF. Family history of dementia in early-onset versus very late-onset Alzheimer's disease. *Int J Geriatr Psychiatry*. 2006;21(6):597-598.
130. Coppus AM, Schuur M, Vergeer J, et al. Plasmaβamyloid and the risk of Alzheimer's disease in Down syndrome. *Neurobiol Aging*. 2012;33(9):1988-1994.
131. Giffard B, Desgranges B, Nore-Mary F, et al. The nature of semantic memory deficits in Alzheimer's disease. *Brain*. 2001;124(8):1522-1532.
132. Breitner JC, Gau BA, Welsh KA, et al. Inverse association of anti-inflammatory treatments and Alzheimer's disease: initial results of a co-twin control study. *Neurology*. 1994;44(2):227-232.
133. Lyketsos CG, DelCampo L, Steinberg M, et al. Treating depression in Alzheimer's disease. *Arch Gen Psychitry*. 2003;60(7):737-746.
134. American Psychiatric Association. *Practice Guideline for the Treatment of Patients with Alzheimer's Disease and Other Dementias*. Arlington, VA: American Psychiatric Association; 2007.
135. U.S. Food and Drug Administration. Information on Conventional Antipsychotics. Available at https://wayback.archive-it.org/7993/20171101120041/https://www.fda.gov/Drugs/DrugSafety/PostmarketDrugSafetyInformationforPatientsandProviders/ucm107211.htm. Last accessed August 14, 2020.
136. Phillips CD, Hawes C, Fries BE. Reducing the use of physical restraints in nursing homes: will it increase costs? *Am J Public Health*. 1993;83(3):342-348.
137. Rochon PA, Normand SL, Gomes T. Antipsychotic therapy and short-term serious events in older adults with dementia. *Arch Intern Med*. 2008;168(10):1090-1096.
138. National Institute of Arthritis and Musculoskeletal and Skin Diseases. Osteoporosis. Available at https://www.bones.nih.gov/health-info/bone/osteoporosis. Last accessed August 14, 2020.
139. Alzheimer's Association. Dementia Care Practice Recommendations for Residential Living. Available at http://www.alz.org/national/documents/brochure_DCPRphases1n2.pdf. Last accessed August 14, 2020.
140. Centers for Disease Control and Prevention. Older Adult Falls. Available at https://www.cdc.gov/homeandrecreationalsafety/falls/index.html. Last accessed August 14, 2020.
141. Kirshner HS. Frontotemporal Dementia and Frontotemporal Lobar Degeneration. Available at https://emedicine.medscape.com/article/1135164-overview. Last accessed August 14, 2020.
142. Vélez L, Selwa LM. Seizure disorders in the elderly. *Am Fam Physician*. 2003;67:325-332.
143. Oddo S, LaFerla FM. The role of nicotinic acetylcholine receptors in Alzheimer's disease. *J Physiol Paris*. 2006;99(2-3):172-179.
144. Frisardi V, Solfrizzi V, Capurso C, et al. Aluminum in the diet and Alzheimer's disease: from current epidemiology to possible disease-modifying treatment. *J Alzheimers Dis*. 2010;20(1):17-30.
145. Rondeau V, Jacqmin-Gadda H, Commenges D, Helmer C, Dartigues JF. Aluminum and silica in drinking water and the risk of Alzheimer's disease or cognitive decline: findings from 15-year follow-up of the PAQUID cohort. *Am J Epidemiol*. 2009;169(4):489-496.

146. Varner JA, Jensen KF, Horvath W, Isaacson RL. Chronic administration of aluminum-fluoride or sodium-fluoride to rats in drinking water: alterations in neuronal and cerebrovascular integrity. *Brain Res*. 1998;784(1-2):284-298.

147. Wozniak MA, Itzhaki RF. Antiviral agents in Alzheimer's disease: hope for the future? *Ther Adv Neurol Disord*. 2010;3(3):141-152.

148. Steen E, Terry BM, Rivera EJ, et al. Impaired insulin and insulin-like growth factor expression and signaling mechanisms in Alzheimer's disease-is this type 3 diabetes? *J Alzheimers Dis*. 2005;7(1):63-80.

149. Lester-Coll N, Rivera EJ, Soscia SJ, Doiron K, Wands JR, de la Monte SM. Intracerebral streptozotocin model of type 3 diabetes: relevance to sporadic Alzheimer's disease. *J Alzheimers Dis*.2006;9(1):13-33.

150. Cole SL, Vassar R. Linking vascular disorders and Alzheimer's disease: potential involvement of BACE1. *Neurobiol Aging*. 2009;30(10):1535-1544.

151. Schrag M, Mueller C, Oyoyo U, Kirsch WM. Iron, zinc and copper in the Alzheimer's disease brain: a quantitative meta-analysis. Some insight on the influence of citation bias on scientific opinion. *Prog Neurobiol*. 2011;94(3):296-306.

152. American Society of Consultant Pharmacists. ASCP policy statement use of antipsychotic medications in nursing facility residents. *Consult Pharm*. 2011;26(8):583-586.

153. Daviglus ML, Bell CC, Berrettini W, et al. National Institutes of Health State-of-the-Science Conference statement: preventing Alzheimer disease and cognitive decline. *NIH Consens State Sci Statements*. 2010;27(4):1230.

154. Albert MS, Dekosky ST, Dickson D, et al. The diagnosis of mild cognitive impairment due to Alzheimer's disease: recommendations from the National Institute on Aging-Alzheimer's Association workgroups on diagnostic guidelines for Alzheimer's disease. *Alzheimers Dement*. 2011;7(3):270-279.

155. McKhann GM, Knopman DS, Chertkow H, et al. The diagnosis of dementia due to Alzheimer's disease: recommendations from the National Institute on Aging-Alzheimer's Association workgroups on diagnostic guidelines for Alzheimer's disease. *Alzheimers Dement*.2011;7(3):263-269.

156. Alzheimer's Association. Stages of Alzheimer's. Available at https://www.alz.org/alzheimers-dementia/stages. Last accessed August 14, 2020.

157. Alzheimer's Association. How is Alzheimer's Disease Diagnosed? Available at https://www.alz.org/alzheimers-dementia/diagnosis. Last accessed August 14, 2020.

158. Tang-Wai DF, Knopman DS, Geda YE, et al. Comparison of the short test of mental status and the mini-mental state examination in mild cognitive impairment. *Arch Neurol*. 2003;60(12):1777-1781.

159. Hort J, O'Brien JT, Gainotti G, et al. EFNS guidelines for the diagnosis and management of Alzheimer's disease. *Eur J Neurol*. 2010;17(10):1236-1248.

160. Devanand DP, Mikhno A, Pelton GH, et al. Pittsburgh compound B (11C-PIB) and fluorodeoxyglucose (18 F-FDG) PET in patients with Alzheimer disease, mild cognitive impairment, and healthy controls. *J Geriatr Psychiatry Neurol*. 2010;23(3): 185-198.

161. Bonelli RM, Hofmann P, Aschoff A, et al. The influence of psychotropic drugs on cerebral cell death: female neurovulnerability to antipsychotics. *Int Clin Psychopharmacol*.2005;20(3):145-149.

162. Ballard CG, Gauthier S, Cummings JL, et al. Management of agitation and aggression associated with Alzheimer disease. *Nat Rev Neurol*. 2009;5(5):245-255.

163. Ballard C, Hanney ML, Theodoulou M, et al. The dementia antipsychotic withdrawal trial (DART-AD): long-term follow-up of a randomised placebo-controlled trial. *Lancet Neurol*. 2009;8(2):151-157.

164. Solfrizzi V, Frisardi V, Seripa D, et al. Mediterranean diet in predementia and dementia syndromes. *Curr Alzheimer Res*. 2011;8(5):520-542.

165. Venneri A, McGeown WJ, Shanks MF. Responders to ChEI treatment of Alzheimer's disease show restitution of normal regional cortical activation. *Curr Alzheimer Res*.2009;6(2):97-111.

166. Butterfield DA, Barone E, Mancuso C. Cholesterol-independent neuroprotective and neurotoxic activities of statins: perspectives for statin use in Alzheimer disease and other age-related neurodegenerative disorders. *Pharmacol Res*. 2011;64(3):180-186.

167. Frisardi V, Panza F, Farooqui AA. Late-life depression and Alzheimer's disease: the glutamatergic system inside of this mirror relationship. *Brain Res Rev*. 2011;67(1-2):344-355.

168. Seitz DP, Adunuri N, Gill SS, Gruneir A, Herrmann N, Rochon P. Antidepressants for agitation and psychosis in dementia. *Cochrane Database Syst Rev*. 2011;(2):CD008191.

169. Harvey RJ, Skelton-Robinson M, Rossor MN. The prevalence and causes of dementia in people under the age of 65 years. *J Neurol Neurosurg Psychiatry*. 2003;74:1206-1209.

170. Hamer M, Chida Y. Physical activity and risk of neurodegenerative disease: a systemic review of prospective evidence. *Psychol Med*. 2009;39:3-11.

171. Ahlskog JE, Geda YE, Graff-Radford NR, Petersen RC. Physical exercise as a preventive or disease-modifying treatment of dementia and brain aging. *Mayo Clin Proc*. 2011;86(9):876-884.

172. Taylor, CA, Greenlund SF, McClure LC, et al. Deaths from Alzheimer's disease—United States, 1999–2014. *MMWR*. 2017;66:521-526.

173. Gottesman RF, Schneider ALC, Yun Z, et al. Association between midlife vascular risk factors and estimated brain amyloid deposition. *JAMA*. 2017;317:1443-1450.

174. Rabin JS, Schulltz AP, Hedden T, et al. Interactive associations of vascular risk and beta-amyloid burden with cognitive decline in clinically normal elderly individuals: findings from the Harvard Aging Brain Study. *JAMA Neurol*. 2018;75:1124-1131.

175. Brinton R, Yao J, Yin F, et al. Perimenopause as a neurological transition state. *Nat Rev Endocrinol*. 2015;11:393-405.

176. Mosconi L, Berti V, Quinn C, et al. Sex differences in Alzheimer risk: brain imaging of endocrine vs chronologic aging. *Neurology*. 2017;89:1382-1390.

177. Demarist TG, Varma V, Estrada D, et al. Biological sex and DNA repair deficiency drive Alzheimer's disease via systemic metabolic remodeling and brain mitochondrial dysfunction. *Acta Neuropathol*. 2020;140:25-47.

178. Rahman A, Schelbaum E, Hoffman K, et al. Sex-driven modifiers of Alzheimer risk: a multimodality brain imaging study. *Neurology*. 2020;95(2):e166-e178.

179. Klodian D, Evans D, Rajan K, et al. Healthy lifestyle and the risk of Alzheimer dementia. *Neurology*. 2020; [Epub ahead of print].

180. Honig LS, Vellas B, Woodward M, et al. Trial of solanezumab for mild dementia due to Alzheimer's disease. *N Engl J Med*. 2018;378:321-330.

181. Bahar-Fuchs A, Martyr A, Goh AMY, et al. Cognitive training for people with mild to moderate dementia. *Cochrane Database Syst Rev*. 2018;(7):CD013069.

182. Sobol NA, Dali CH, Hogh P, et al. Change in fitness and the relation to change in cognition and neuropsychiatric symptoms after aerobic exercise in patients with mild Alzheimer's disease. *J Alzheimers Dis*. 2018;65:137-145.

183. Fazio S, Pace D, Maslow K, et al. Alzheimer Association Dementia Care Practice Recommendations. Available at https://www.alz.org/professionals/professional-providers/dementia_care_practice_recommendations. Last accessed August 11, 2020.

## *Evidence-Based Practice Recommendations Citations*

Johnson KA, Minoshima S, Bohnen NI, et al. Appropriate use criteria for amyloid PET: a report of the Amyloid Imaging Task Force, the Society of Nuclear Medicine and Molecular Imaging, and the Alzheimer's Association. *J Nucl Med*. 2013;54(3):476-490. Available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3733252. Last accessed August 24, 2020.

Schmidt R, Hofer E, Bouwman FH, et al. EFNS-ENS/EAN guideline on concomitant use of cholinesterase inhibitors and memantine in moderate to severe Alzheimer's disease. *Eur J Neurol*. 2015;22(6):889-898. Available at https://onlinelibrary.wiley.com/doi/full/10.1111/ene.12707. Last accessed August 24, 2020.

Amella EJ, Aselage MB. Mealtime difficulties. In: Boltz M, Capezuti E, Fulmer T, Zwicker D (eds). *Evidence-Based Geriatric Nursing Protocols for Best Practice*. 4th ed. New York, NY: Springer Publishing Company; 2012. Summary retrieved from Guideline Central at https://www.guidelinecentral.com/summaries/assessment-and-management-of-mealtime-difficulties-in-evidence-based-geriatric-nursing-protocols-for-best-practice. Last accessed August 24, 2020.

Piersol CV, Jensen L. *Occupational Therapy Practice Guidelines for Adults With Alzheimer's Disease and Related Major Neurocognitive Disorders*. Bethesda, MD: AOTA Press; 2017. Summary retrieved from Guideline Central at https://www.guidelinecentral.com/share/summary/5b160ada07940. Last accessed August 24, 2020.

Sorbi S, Hort J, Erkinjuntti T, et al. EFNS-ENS guidelines on the diagnosis and management of disorders associated with dementia. *Eur J Neurol*. 2012;19(9):1159-1179. Available at https://www.uems-neuroboard.org/web/images/docs/exam/EAN-guideline-diseases-associated-with-dementia.pdf. Last accessed August 24, 2020.

Fletcher K. Recognition and management of dementia. In: Boltz M, Capezuti E, Fulmer T, Zwicker D (eds). *Evidence-Based Geriatric Nursing Protocols for Best Practice*. 4th ed. New York, NY: Springer Publishing Company; 2012. Summary retrieved from Guideline Central at https://www.guidelinecentral.com/summaries/recognition-and-management-of-dementia-in-evidence-based-geriatric-nursing-protocols-for-best-practice. Last accessed August 24, 2020.