The Aging Brain

HOW TO RECEIVE CREDIT

- Read the enclosed course.
- Complete the questions at the end of the course.
- Return your completed Answer Sheet to NetCE by mail or fax, or complete online at www.NetCE.com. Your postmark or facsimile date will be used as your completion date.
- Receive your Certificate(s) of Completion by mail, fax, or email.

Faculty

Allan G. Hedberg, PhD, received his Master's in psychology from Northern Illinois University and his PhD in clinical psychology from Queen's University in Ontario, Canada. He has practiced clinical psychology in mental health centers, hospitals, and rehabilitation units as well as in private practice since 1969. More recently, he has maintained an active consultation service to patients and staff of nursing homes and assisted living facilities in the Central Valley of California. Over this time, Dr. Hedberg has consulted with staff, trained staff, and assisted in the establishment of appropriate programs for elderly patients with special needs, such as Alzheimer disease.

Faculty Disclosure

Contributing faculty, Allan G. Hedberg, PhD, has disclosed no relevant financial relationship with any product manufacturer or service provider mentioned.

Division Planners

Alice Yick Flanagan, PhD, MSW
James Trent, PhD

Director of Development and Academic Affairs

Sarah Campbell

Division Planners/Director Disclosure

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

Audience

This course is designed for social workers, marriage and family therapists, counselors, and other professionals involved in the care of elderly individuals.

Accreditations & Approvals

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.

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.

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.

A complete Works Cited list begins on page 23.

Mention of commercial products does not indicate endorsement.

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

Social Workers participating in this intermediate to advanced course will receive 5 Clinical continuing education clock hours.

NetCE designates this continuing education activity for 2 NBCC clock hours.

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.

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 assist therapists, counselors, and those working with the elderly in a variety of capacities to better respond, treat, and care for senior patients, particularly those who are experiencing some level of dementia.

Learning Objectives

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

1. Describe the function and structure of a normally aging human brain.
2. Identify early signs of mild cognitive impairment and dementia and differentiate between dementia and conditions that mimic dementia in the elderly patient.
3. Describe Alzheimer disease and dementia with Lewy bodies and the conditions and factors that contribute to each.
4. Describe risk factors for the development of dementia using various theoretic models.
5. Outline diagnostic tools and considerations useful in the assessment of patients with dementia.
6. Discuss key points in the management of Alzheimer disease.
7. Discuss common problems that patients with dementia experience and steps healthcare professionals can take to monitor and facilitate the safety and welfare of these patients.

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

Developmentally, the brain advances rapidly from conception onward, and the developing brain proceeds systematically and progressively. By birth, 100 billion neurons are in place but are largely unconnected. In the first decade of life, a child's brain forms trillions of connections [1]. Brain development is particularly rapid during the first year. By 1 year of age, brain scans show a brain similar to a young adult. By 3 years of age, children have twice as many connections between neurons than adults, and the visual cortex is becoming myelinated. Between 3 and 10 years of age, the brain is more active than in adulthood, accommodating new social, emotional, physical, and linguistic learning. However, between 11 and 15 years of age, the brain begins pruning unused connections. Beginning at 16 years of age, the prefrontal cortex, also referred to as the executive brain, continues to develop. The process of myelination continues, helping the brain to function more efficiently [1].

The brain is engaged in a continually active and reactive process throughout the day and night. Even when individuals are asleep or are passively resting, the brain is actively processing what it has been subjected to during the day, especially when dreaming.

The adult brain weighs about 3 pounds, or about 2% of a person's total body weight. It uses 20% of inspired oxygen and about 20% of all consumed calories [1]. The adult brain is estimated to have more than 100 billion neurons or nerve cells, the same number of stars in the Milky Way galaxy [1]. In addition, there are also trillions of supportive cells, called glia. These cells connect to form pathways, essentially forming more than 40,000 individual connections, or synapses [1].

The brain continues to mature from birth to about 25 years of age. It then stabilizes until about 50 years of age, when it starts a slow decline and begins to shrink. Research gives some indication that many people experience an improvement in cognitive functioning at around 40 years of age [97]. While this increase may be notable, it is not highly significant when cognition is measured by geometric testing. Age-related decline can be accelerated or slowed by many factors occurring before and after 50 years of age. The general health and welfare of the brain during older age is very much a function of how well it was cared for during the younger years of life. Strategies to proactively slow the brain's aging process are essential at all ages [2].

Memory dysfunction is one of the most notable symptoms of an aging brain, especially after 50 years of age. As a result of memory failure, all aspects of life are affected, including employment, independence, socialization, relationships, and general productivity.

It is important to remember that how a brain ages varies among individuals. People experience aging at different rates and patterns. However, no one is eagerly willing to accept the fact that the brain is aging and becoming less efficient. Everyone desires to remain functioning at the same level indefinitely. Unfortunately, this makes the aging person vulnerable to any new medication, supplement, or process claiming to prevent or even reverse aging.

The aging brain is a public health concern. As the U.S. population ages, society struggles with the future role and place of the elderly. Communities, government, and businesses are all tasked with identifying productive and meaningful ways to recognize and incorporate the aging person. Health care, social security, and other support programs are showing the strain associated with the costs of serving the aged and providing them a fair and reasonable place in society. In 2011, legislation was passed to enact the National Alzheimer's Project Act (NAPA), designed to ensure a national strategy for combating this disease [3;]. This Act, last updated in 2017, created an Advisory Council to make recommendations to the U.S. Department of Health and Human Services regarding priority actions to improve the health and financial security of those with Alzheimer disease (AD) [4].

The challenge before the aging person is to stave off cognitive decline by the timely use of educational and social opportunities, training in mental "gymnastics," use of herbal and dietary supplements, blood pressure and cholesterol monitoring, and utilizing medical and psychologic services. In addition, an individual's acceptance of the aging process and changes in cognitive ability can affect his or her aging trajectory [5].

In many ways, aging is an attitude, not just a biologic process [6]. While the aging brain takes its course from many influences over the years, a person's attitude serves as a primary directional force toward health or illness. One's attitude either allows for or stunts the exploration of the purpose for aging. A person's attitude also gives strength and courage to face the aging experience and softens the underlying fear of aging and dying [5; 6].

THE NORMAL AGING BRAIN

In 2018, 52.4 million (16%) of individuals in the United States were older than 65 years of age; by 2060, it is projected that this number will reach 94.7 million, a nearly 81% increase [7]. In 2019, 10.7 million Americans (20.2%) older than the usual retirement age (65 years) were in the labor force [7]. Indeed, a population shift is occurring in the United States.

Research indicates that neural mismatches begin to appear in individuals as young as 40 years of age, resulting in increased vulnerability to distraction [8]. By 65 years of age, one-fourth of the population struggles with a failing memory and a range of mild cognitive problems. Most notable is the "senior moment" of forgetting a person's name; this is known as paraphasia. As cognitive and biologic changes take place, aging persons are forced to learn compensatory skills to continue functioning as best they can for as long as possible.

Further, by 85 years of age, approximately 35% of men and women will experience symptoms of dementia or AD [9]. After 65 years of age, the number of cases doubles every five years. There are additional factors, aside from age, that increase the risk of developing AD. For example, a family history of dementia is a contributing factor to the rate and degree of decline. It also appears that individuals whose mothers had AD are more at risk for the disease than those whose fathers had AD [10]. Patients with a maternal history of AD had an altered level of amyloid and free radicals, the proteins involved with oxidative stress [10].

Normal signs of aging can be distinguished from the more advanced signs of mild cognitive impairment (MCI), dementia, and AD. Normal aging may include the following behavioral changes or losses:

- Forgetting names of people one rarely sees, such as a former neighbor
- Forgetting parts of an experience, such as parts of a vacation trip with a friend
- Occasionally misplacing an item, such as car keys or a cell phone
- Extreme mood changes related to a relevant or appropriate cause, such as recalling the death of a spouse
- Temporarily being unable to recall a specific fact while telling a story or a past event or experience
- Change and loss of interest in various age-related activities

The Registered Nurses' Association of Ontario recommends identifying and differentiating signs and symptoms of delirium, dementia, and/or depression during assessments, observations, and interactions with older persons, paying close attention to concerns about changes expressed by the person, his/her family/care partners, and the interprofessional team.

(https://rnao.ca/sites/rnao-ca/files/bpg/RNAO_Delirium_Dementia_Depression_Older_Adults_Assessment_and_Care.pdf. Last accessed March 24, 2021.)

Level of Evidence: V (Expert opinion or committee reports, and/or clinical experiences of respected authorities)

Nonetheless, the normal brain is an aging brain, and steps should be taken to maintain or improve everyday functioning. The following steps can be taken to improve the brain's functioning throughout one's life [11; 12]:

- Stay physically active.
- Stop smoking or never start.
- Avoid excess alcohol.
- Engage in cognitive training.
- Maintain social networks.
- Protect the brain from toxic exposure and closed head injury.
- Eat a nutritious and balanced diet.
- Ingest the daily required minimum of vitamins, minerals, omega fatty acids, water, fruits, and vegetables.
- Sleep six to eight hours each night.
- Engage in an array of social, intellectual, spiritual, and physical activities.
- Maintain a positive attitude about life events and circumstances.
- Engage in an active life of service to others.
- Control stress and learn to cope well with daily stressful events.
- Keep personal belongings and things well organized.
- Focus on the goals of what one desires to pursue and achieve.
- Treat any psychologic problem early, such as attention deficit hyperactivity disorder (ADHD), depression, and substance abuse.

AN OVERVIEW OF THE BRAIN

The brain is the primary driving force mediating daily behavior, learning, experiences, and choices. The entire developmental process of the brain, its significance, and its role in living a meaningful life should be appreciated. An individual's approach to life is facilitated by the brain's capabilities and limitations. The unique history of recorded experiences in the brain plays a major role in determining future experiences and interactions.

Although the brain is always changing, individuals have some control over the rate and nature of the changes taking place from childhood onward. The degree of control depends on an understanding of the brain structures and functions. Understanding the brain's changing capabilities can yield a corresponding improvement in a person's productivity, learning, and creativity. For example, researchers have found that microscopic injury-based changes in the blood vessels in the brain (referred to as microinfarcts) may lead to brain functioning problems in later life [13]. The control of blood pressure minimizes vascular microinfarcts and lowers the risk of dementia onset.

Social integration has been found to delay the decline of memory among Americans 50 years of age and older. Those adults with the highest level of social integration over a six-year period experienced a slower rate of cognitive decline than their less social peers [14].

The brain is also responsive to challenging tasks. Computer-generated games have been used to engage elderly adults in cognitive skill development in an attempt to prevent or slow the rate of decline. In one study, those who engaged in special training in memory, reasoning, or speed of processing reported greater gains in concentration and memory after five years compared to a similar group that did not receive such training [14]. Research at the University of Rochester and the University of Florida also indicated that games significantly helped to improve the visual attention skills and provided positive mental health benefits. There appears to be much promise in the use of games to delay or treat symptoms of dementia.

Apolipoprotein E is a protein necessary for the metabolism of triglycerides. Apolipoprotein E4 (ApoE4) allele is carried by approximately 10% to 15% of the population and in about 40% of all individuals with late-onset AD. The presence of this gene is not a predictor of AD, but it increases the risk of AD developing with age [15].

THE PROGRESSIVE DEMENTIA PROCESS

MILD COGNITIVE IMPAIRMENT

Through the process of aging and traumatic events, mild signs of neurologic dysfunction may begin to show. MCI is a spectrum of mild but persistent memory loss that lies between normal age-related memory loss and diagnosed dementia and 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. MCI affects 15% to 20% of the aging population [9]. The presence of MCI may be the factor that influences the course of dementia toward AD. Among those with MCI, approximately 15% develop dementia after two years and approximately 32% develop AD within five years [9]. The signs of MCI go beyond those described as normal signs of aging. This level of impairment may last for a short time or for years.

In one study of older individuals without dementia, 16% had signs of MCI. Of these, 69% had amnestic MCI and 31% had nonamnestic MCI. The prevalence of MCI increased with age and was greater in men, those who were never married, and those with an ApoE3/4 or ApoE4/4 genotype [17]. Another study found that MCI was less prevalent among those with higher educational and income levels [18]. Further, there is some evidence that brain atrophy may be slowed in those with MCI with high doses of homocysteine-lowering B vitamins [19]. The fact that women are less likely than men to have MCI suggests that they may transition from normal cognition to dementia at a later age and more abruptly.

While progressive, the first step on the pathway to dementia is not always memory loss. Impairments of other cognitive skills, such as map reading, working jigsaw puzzles, and other visuospatial skills mediated in the right hemisphere of the brain, may be early signs of cognitive impairment [14]. Researchers have found that financial decision making and arithmetic functions decline one to three years earlier than memory functions [20]. Other signs were related to executive and attentional skill decline. Such research findings are important to the process of early detection of MCI, which can lead to earlier initiation of treatment and preventative measures for more advanced cognitive impairment. Early intervention among high-risk populations is an urgent area of research and experimental studies.

DEMENTIA

Dementia is a progressive and profound disruption in brain function and intellectual capacity. The primary signs include problems with memory, language, spatial-temporal reasoning, judgment, emotionality, thought disorder, and personality. Dementia is a subtle progressive loss of cognitive functioning, with memory loss as its hallmark impairment, particularly loss of short-term memory. The ability to concentrate, make judgments, problem solve, and engage in abstract thought processes is also impaired. Personality and mood changes distinct from previous experiences are likely to develop, such as depression, apathy, elation, and anger. Impulse control becomes a major impairment with associated difficulties in social and physical relationships. Finally, grandiose and persecutory delusions are fairly common, especially in the more advanced stages of dementia [21]. It is possible for a young person to have dementia, but this is usually a result of a neurologic traumatic event or major illness with neurologic corollaries.

Dementia is a physical illness as well. It progressively shuts down the body as the brain is attacked. The first signs of dementia are generally related to reduced physical agility and strength, not just cognitive skills. Dementia can continue for years, but in the advanced stages, life expectancy is similar to that seen with advanced terminal cancer [22].

While 60% to 80% of cases of advancing dementia are categorized as the Alzheimer type, other disorders may fall within the broader classification of dementia [9]. These include but are not limited to [9; 23]:

- Vascular dementia: Rapid onset secondary to multi-infarct events
- Huntington disease with dementia: Progressive inherited breakdown of the central nervous system in early adulthood affecting movement, cognition, and emotions
- Human immunodeficiency virus (HIV) with dementia: Slow-onset dementia related to the progressive HIV infectious process affecting speed of motion, memory coordination, socialization, affect, and thought processes
- Parkinson disease with dementia: Dementia beginning about one year after the diagnosis of Parkinson disease has been affirmed
- Dementia with Lewy bodies (DLB): Characterized by visual hallucinations, an impairment of visuospatial/constructional functioning with a rapid onset and rapid decline, and often Parkinsonian motor dyscontrol and cognitive loss
- Frontotemporal lobar degeneration (FTLD): Generally related to a traumatic impact to the frontal lobe, as in a motor vehicle accident, fall, or a career in boxing or similar sports with a repetitive cranial impact
- Mixed dementia: Characterized by the hallmark abnormalities of more than one type of dementia—most commonly AD combined with vascular dementia
- Creutzfeldt-Jakob disease: Degenerative neurologic disorder associated with early development of dementia and the presence of prions, a type of infectious protein

There are also many reversible conditions that can mimic dementia [9]. For this reason, dementias must be fully assessed and diagnostically clarified [24]. Specific disorders known to cause pseudodementias include but are not limited to:

- Reactions to medications
- Metabolic disturbances
- Vision and hearing deficits
- Nutritional deficiencies
- Endocrine abnormalities
- Infections
- Subdural hematoma
- Brain tumors and hydrocephalus
- Atherosclerosis

Likewise, there are irreversible conditions known to play a significant and contributing role in dementia onset. These fall into three primary nosologic categories: systemic changes, neuropathologic changes, and underlying basic diseases. It is essential that the clinician or therapist is able to conduct a competent diagnostic evaluation to sort out these conditions and determine if dementia is diagnostically present or if dementia is a symptomatic trait of another medical or physical condition. A medical referral is encouraged in such cases. The following sample of physical conditions may or may not present with dementia:

- Closed head trauma
- Brain tumors
- Hydrocephalus
- Developmental disability
- Infections
- Chronic depression
- Deficiency diseases (e.g., vitamin B12 deficiency)
- Exposure to toxins, drugs, and metals
- Metabolic disorders
- Vascular disorders (e.g., cerebrovascular accident [CVA] and transient ischemic attacks)

- Degenerative diseases of the central nervous system
- Huntington disease
- Anoxia
- Acquired immune deficiency syndrome (AIDS)
- Multiple sclerosis
- Drug-induced psychotic state
- Congestive heart failure
- Diseases of unknown origin
- Thyroid dysfunction
- Creutzfeldt-Jakob disease
- Korsakoff syndrome

An annual screening system called the Early Detection and Screen for Dementia was developed by the National Task Group on Intellectual Disabilities and Dementia Practices for the early detection of dementia (abbreviated NTG-EDSD) [25]. The NTG-EDSD is designed to be incorporated into an annual physical examination or incorporated into wellness screening programs. The results of a screening assessment indicates if a referral for neuropsychologic assessment or further evaluation is needed. A baseline should be established at 65 or 70 years of age to ensure that a reasonably accurate profile is established and false positives minimized. The NTG-EDSD is available online at https://www.the-ntg.org/ntg-edsd [25].

ALZHEIMER DISEASE

AD is an advanced type of dementia named for German physician, Alois Alzheimer, who first identified the neuritic plaques and neurofibrillary tangles now recognized as the classic signs of AD. It is thought that these brain changes and conditions result from the destruction of neurons that produce acetylcholine in the cerebral cortex. With AD, the brain is believed to have a loss of nerve cells in certain areas and a corresponding reduction in the levels of neurotransmitters. AD is rapidly progressive, and its pattern and progression is individualistic [28].

As noted, the primary symptoms of dementia are mild-to-moderate impairments in memory, reasoning ability, and judgment, and the same symptoms are present in AD but to a greater degree. AD also often includes personality changes, bouts of agitation and combativeness, falling, wandering, and depression. The risk of self-harm from accidents and falls becomes progressively more likely. According to the Alzheimer's Association, the warning signs of AD are [29]:

- Life is disrupted by memory loss.
- Planning and problem solving are a challenge.
- Familiar tasks are difficult to complete.
- Time and place are common issues of confusion.
- Visual images and spatial relationships are problematic.
- Speaking and writing become difficult.
- Items are easily misplaced, and steps are hard to retrace.
- Judgment is poorly misguided.
- Work and social events are generally avoided.
- Mood and personality show signs of change.

However, it is important to remember that the signs and progression of the disease varies greatly among patients. Eventually, all patients with AD will require constant care with activities of daily living. Wandering and sundowning are frequent problems. It is vital that lost patients are found within 24 hours, as after this period the odds are strong that they will develop a serious illness, be injured, or die, as patients with AD are essentially unable to ask for help.

Many people with dementia will not progress to AD. However, of all those with dementia, 60% to 80% develop the pattern of AD [9]. AD is more prevalent in women than men. Of the 6.2 million people 65 years of age and older with AD in the United States, 3.8 million are women and 2.4 million are men. Among people 65 years of age and older, 12% of women have AD and other dementias, compared with 9% of men [9]. The number of

new cases of AD increases dramatically with age. In 2021, approximately 1.72 million new cases of AD are expected to occur among individuals 65 to 74 years of age. This number increases to 2.25 million among those 75 to 84 years of age, and to 2.27 among those 85 years of age and older. The prevalence of AD is expected to grow from 58 million in 2021 to 88 million in 2050 [9].

Among individuals 70 years of age, 61% of those with AD are expected to die before age 80, compared with 30% of those without the disease [9]. AD is also a condition with catastrophic impact and complex care needs. In 2020, more than 11 million Americans provided 15.3 billion hours of unpaid care to individuals with AD and other dementias, a contribution of nearly $257 billion [9]. It is anticipated that deaths due to dementia will gradually increase from about 400,000 in 2010 to 1 million worldwide in 2030 [31].

Total home care with hired caretakers or placement in a nursing home is necessary as AD progresses to higher levels of impairment. While family members may wish to be the sole caretakers, the level of care needed very often reaches a point that is beyond their level of ability, stamina, and time. If the family is unable to provide the needed care themselves, they may make arrangements for care provided in a loving and compassionate manner by a third party, such as a friend, a home health care provider, or a nursing home. Who provides the day-to-day care is less important than the quality of care provided relative to the patient's needs and level of functioning.

As the progression of AD is rapid, it is important to consider if any family member has any "unfinished business" that should be constructively addressed early in the disease process. Devoting time to being a care provider is reasonable when there is a clear sign that long overdue forgiveness, past hurts, or neurotic attachments have been resolved. If there are issues that are unaddressed, this may result in further injury in addition to historical hurts and dysfunctional relationships. While the care level may look reasonable, it may really be subtly destructive. Neurotic attachments are all too common and create a host of care problems.

DEMENTIA WITH LEWY BODIES

An estimated 1.4 million people in the United States have DLB, a total of 5% to 10% of all dementia cases [16; 26; 27]. DLB is not readily diagnosed, as it presents with symptoms closely aligned to AD and/or Parkinson disease. If inaccurately diagnosed, a proper care plan will not be formulated and the patient and his or her family will be unable to prepare for the disease's progression.

Lewy bodies, named for F.H. Lewy, who first described the condition in 1914, result from a buildup of alpha-synuclein protein in neurons in the brain [32]. This is distinct from the beta-amyloid protein fragments (plaques) and twisted strands of tau proteins (tangles) found in AD [32]. DLB is associated with dysfunction of the lower brain, brainstem, and subcortical, paralimbic, limbic, and cortical structures vital to movement and cognition. The severity of symptoms fluctuates over time, with improvements and regressions [28]. However, this dementia will eventually progress to catastrophic disability and death, as with AD.

The most common signs and symptoms of DLB are visual hallucinations, spontaneous parkinsonism, narcoleptic sensitivity, a tendency to act out vivid and frightening dreams, and fluctuations in cognition, alertness, clarity of thought, and attention [33].

Patients with DLB have more difficulty with visual perception and memory, processing speed, and attention/concentration [16]. Visual tasks are more likely to be distorted than in most patients with AD. Visual distortions tend to show up early in the dementia process, including distortions in writing, drawing, and misjudging distances. Brighter light may reduce visual hallucinations, as will removing reflective or patterned surfaces (e.g., mirrors, wallpaper with designs) and having the patient stare directly at the hallucination [33]. Hallucinations are often not acknowledged by the family; therapists must ask about them directly, especially early in the dementia process.

To assess DLB, a standardized and validated screening tool, such as the Mayo Fluctuations Composite Scale, should be used. Neuroimaging may be useful

to distinguish DLB from vascular dementia [32]. Treatment to reduce symptoms may be indicated. Acetylcholinesterase inhibitors are the medications of choice, including donepezil, rivastigmine, and galantamine. This class of medication has been shown to improve attention, sleep, ambulation, motor coordination, and visual hallucinations for patients with DLB [16]. The medication regimen should be re-evaluated every six months and altered or maintained as the relative benefits indicate [34]. Due to neuroleptic sensitivity and reduced dopamine, typical neuroleptic or antipsychotic medications, such as haloperidol, ziprasidone, and olanzapine, must be avoided as much as possible for the treatment of psychotic symptoms. If such medication is used, patients will experience increased or worsened symptoms and become more rigid.

DEMENTIA RISK FACTORS

The damage seen in AD is caused by changes in three major processes. The first process is 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, but 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 question of why some people develop MCI, dementia, or AD while others do not is the subject of much ongoing research and theoretical consideration. However, the results so far have been far from definitive. Early findings do give some insight into the developmental process of dementia and particularly AD. While not conclusive, there is some basis for predicting the possibility of dementia and AD onset, particularly familial cases. Research from the Lancet Commission and the World Health Organization indicate that addressing modifiable risk factors early in life (e.g., physical activity, smoking, education, staying socially and mentally active, blood pressure, diet) may prevent or delay up to 40% of dementia cases [9].

THE THRESHOLD MODEL

Traditionally, predicting the occurrence or onset of dementia has been thought to follow the threshold model. This model holds that individuals will exhibit dementia only when their functional cognitive reserve falls below a certain specific threshold. According to this theory, the brain has a certain density or reserve and functions well so long as the reserve is sufficient. Reserve capacity is considered largely an individual matter, and according to this theory, it may be replenished with cognitive exercises.

The threshold model draws much support from a seminal study comparing dementia rates among Catholic nuns [35]. In this study, nuns with a long history of a complex linguistic and prose writing style (high density) had a much lower lifetime rate of dementia and/or AD compared to nuns with a simple linguistic and prose writing style (low density). Research at Johns Hopkins University also found that Catholic nuns with advanced language skills in early life were less likely to suffer memory problems in their later years [35].

Additional studies have linked cognitive or linguistic skills in the early years of life to the level of cognitive functioning later in life, with stronger predictive value than environmental or lifestyle factors [36]. Low or poor linguistic ability in early life would then be indicative of the extent of AD or dementia brain pathology present at death. However, more research is necessary to support this hypothesis.

THE LIFESTYLE MODEL

Certain patient behaviors and lifestyles have also been implicated in dementia onset. These patient behaviors are generally highly modifiable and are therefore a useful part of patient teaching regarding maintenance of brain health.

Smoking and Alcohol Consumption

According to research studies published by Mount Sinai Medical Center, the combination of heavy smoking and drinking may reduce the onset age of AD by six to seven years [37]. Fortunately, behavioral habits can be prevented or terminated and the associated risk factors reduced. Heavy smoking was defined as one pack of cigarettes or more per day, and heavy drinking was defined as two or more drinks per day. Further, the researchers noted that heavy smokers and drinkers with the ApoE4 gene had a tendency to develop AD 8.5 years earlier than those without these three risk factors, translating to an onset age of 68.5 years compared to 77 years for those not in the high-risk group [37].

In another significant study, smokers were found to have a higher rate of cognitive impairment than nonsmokers or former smokers [38]. On cognitive tests, smokers performed significantly lower than nonsmokers when social and health factors were taken into account and normalized. Smoking impairs vital organs, including the brain, due to oxidative stress. The problem seems to stem from decreased blood flow to the brain, and other organs, as a result of smoking. A positive correlation between long-term smoking and vascular dementia has also been suggested [39]. The heavier the smoking, the greater likelihood of dementia. Research is ongoing on this topic, but smoking cessation is recommended based on these studies alone [39].

Chronic Stress

Chronic worry and chronic high stress are more likely to be found among individuals who develop dementia than those with calmer and unworried personality types [40; 41]. Prolonged exposure to elevated stress hormones may cause damage to critical areas of the brain, especially in certain racial/ethnic groups [40]. Patients who are chronically depressed, live overly stressed lives, and are prone to obsessive worry are at a greater risk for dementia. Such individuals should be directed into psychotherapy or other programs to address their specific risk factors.

Physical Activity

The delay of onset of dementia among exercising older adults is notable. Individuals with a positive history of physical exercise have been found to have positive skills in memory, concentration, and abstract reasoning [42]. Aerobic exercise increases blood flow to the brain, allowing brain cells to function more effectively. Further, exercise actually promotes the growth of new neurons in the hippocampus [9; 42].

Exercise may be especially helpful in preventing AD among those who carry the ApoE4 gene [43; 44]. In one study, participants with the gene who exercised showed greater brain activity in the memory-related regions of the brain than participants without the gene. Another study found that walking 5 miles every week slowed the progression of cognitive decline, even among persons already suffering from MCI [43]. Exercise training has been shown to improve hippocampal blood flow and reverse volume loss in this part of the brain, which may ameliorate or prevent dementia symptoms [9; 45].

Sleep Patterns

Dysfunctional sleep patterns, such as sleep apnea, have also been explored as contributing factors in dementia [46]. Sleep disorders can cause cognitive difficulties or deficits and reductions in gray matter, with neurodysfunction secondary to intermittent oxygen deprivation. The region of the brain that appears to be vulnerable is the same area affected by hypoxemia.

Diet and Nutrition

Diet and nutrition may influence dementia onset and symptoms, and a relationship between AD and certain nutritional deficiencies has been suggested. For example, low vitamin E intake from food sources is associated with an increased risk of AD [47]. Oxidative damage, a major component of AD progression, is greatly reduced in individuals with adequate dietary vitamin E 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 [47; 48]. Low vitamin B12 and folate levels have been suspected for increasing AD risk; however, folate deficiency is rare in the United States due to widespread use of enriched grain products [47]. Therefore, it is suggested that high folate intake combined with low B12 levels may instead be a risk factor for AD.

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 [47; 49; 50]. 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 [47]. In a sample of 3,759 subjects 65 years of age and older, those who adhered closely to a Mediterranean diet (i.e., a diet high in fruits, vegetables, whole grains, fish, and monounsaturated fats) had a slower cognitive decline than those who ate such a diet more randomly or infrequently [51]. High-cholesterol foods should be generally avoided, with a greater focus on vegetables and fruits.

Diabetes

The presence of diabetes is another factor that may affect the development or progression of AD. In a 32-year study of men older than 50 years of age, 22% of the participants developed some form of dementia or cognitive impairment [52]. Men with low insulin secretion capacity were about 1.5 times more likely to develop AD than those without insulin production problems. Insulin resistance has also been found to be significant in promoting pathologic changes consistent with AD [52].

Inflammation

Another area of investigation involves the role of inflammation of the brain. Certain genes produce an inflammation-promoting protein via the immune system. One study has shown indirect evidence that use of nonsteroidal anti-inflammatory drugs (NSAIDs) may have a protective effect against AD [53]. This study focused on the use of ibuprofen, but it is unclear if one agent would provide greater benefits than any others. Direct evidence reveals that various compounds involved in the inflammatory process can be found in the plaques of AD [54; 55].

THE NEUROBIOLOGIC MODEL

At least four genes have been implicated in the development of AD, including the amyloid precursor protein (APP) gene, ApoE4, and the presenilin 1 and 2 genes [56]. APP is a protein from which beta-amyloid, the chief component of plaques seen in the brains of patients with AD, is formed, while ApoE helps transport cholesterol in the blood [54]. Mutations of the presenilin 1, presenilin 2, and APP genes cause early-onset, autosomal dominantly inherited AD; mutations on chromosomes 1, 14, and 21 account for the majority of all of these cases [15; 58]. ApoE4 is found in about 40% of the cases of late-onset AD [15]. It is possible to test family members with no symptoms of the disease to determine whether they carry the mutated gene, thus ascertaining their risk for developing AD. As noted, if the carrier is also a smoker and/or heavy drinker, the onset age of AD is likely to be earlier [37].

Symptoms seen with AD are partially the result of damage to the hippocampus and the cerebral cortex. The size of brain, especially the size of the hippocampus, may contribute to dementia risk. Memory storage and formation is primarily centered in the hippocampus, and neurofibrillary tangles generally build up in the hippocampus before moving to other portions of the brain. In one study, those with larger brains and larger hippocampi were found to have less brain plaque and fewer tangles. Hence, they tend to be less likely to develop AD. If true, it may be that some individuals are born with larger brains and hippocampi, which require more plaque in order for memory functions to break down. Alternatively, some other factor may protect certain brains from shrinkage and/or tangle formation [59; 60; 61].

In one study of healthy, symptom-free adults 44 to 48 years of age, those who performed poorly on a simple test of cognitive ability were much more likely to have a lesion in the white matter of the brain. Magnetic resonance imaging (MRI) was utilized to detect the brain's integrity and predict those at risk for developing AD in the future [62].

Researchers at the Rush University Medical Center and the Alzheimer's Disease Center have found that MRIs of patients with AD can demonstrate structural change in the substantia innominata over time [63]. The substantia innominata sends messages to the cortical areas of the brain, and thinning of these cortical areas is consistent with AD. Cortical thinning could be a biomarker to identify those at risk for AD, and research is ongoing in this area.

Still more research suggests that toxic clumps of amyloid beta called oligomers may be the main causative factor in the brain changes associated with AD, not plaque buildup. Several medications are being studied for their ability to cease or slow the production of oligomers. The research is still unclear on this underlying biologic question, and additional studies regarding the role of oligomers are necessary before conclusions may be reached [49].

The correlation between ADHD and dementia has also been an area of interest. One study found an increased incidence of adult ADHD and AD among those who had a diagnosis of ADHD as a child, especially if the disorder was untreated. The mechanism of this correlation is unclear. Children and adolescents with ADHD are at an increased risk for traumatic brain injuries, alcoholism, depression, and other neurologic problems later in life, all of which increase the risk for AD development [28].

THE ENVIRONMENTAL MODEL

The intake of brain toxins is another possible contributing factor in the development of MCI, dementia, and AD. Aluminum, a metal associated with chronic toxicity, has been linked with AD. High concentrations of aluminum have been found in the brains of some individuals with AD, although the exact nature of the correlation is not known [64]. 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 [65; 66]. Other researchers speculate that fluoride ingestion (at exposure levels experienced by regular fluoridated drinking water consumption and toothpaste use) greatly enhances aluminum's neurodegenerative effects [67]. A higher level of silicon intake is thought to protect against aluminum toxicity. Research into the possible role of aluminum in the development of AD is ongoing [75].

In addition to aluminum, other transition metals (e.g., copper, zinc, iron) are implicated as possible causative factors for AD [65; 68]. 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 toward irreproducible research, especially regarding iron overload [68]. 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 positively linked to this form of dementia. 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.

DIAGNOSTIC CONSIDERATIONS

Dementia and especially AD can be easily confused with other psychologic conditions, such as major depression, delirium, delusional disorders, and psychotic disorders, such as paranoia. Likewise, dementia can be confused with symptoms of several physical disorders such as thyroid disorders, Parkinson disease, CVAs (i.e., stroke), transient ischemic attacks, or infection (e.g., urinary tract infection or pneumonia). Each of these conditions should be considered as part of the differential diagnosis. It is important to fully evaluate the patient before ruling out possible disorders and declaring a final diagnosis.

Early diagnostic identification and understanding of a patient's needs are vital to the initiation of treatment, a key step in slowing the progression of the dementia process. Connecting with appropriate healthcare providers, psychologists, physicians, social workers, and case managers early in the dementia process allows for lifestyle changes and long-term care planning to begin in a timely manner.

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 co-existing systemic or psychiatric illnesses.
- Define the practical and psychosocial needs of the patient, the family, and primary caregivers.
- Plan for the future (including treatment plans).

It is essential that any professional providing services to the older population be acutely aware of the signs of normal aging, MCI, dementia, and AD. When conducting a detailed medical or psychologic interview with a patient, individuals with MCI may display subtle or pronounced problems with memory or concentration. Friends, family, or co-workers are likely to notice such deficiencies. Common difficulties in MCI patients include [69]:

- 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 of the material
- Losing or misplacing a valuable object
- Decline in ability to plan or organize

Presentation of AD is widely varied in patients, with symptoms and deficits affecting every individual differently or not at all. The primary diagnostic signs of advancing dementia and AD include, but are not limited to, the following:

- Recent memory loss that affects the job, daily living, and/or interpersonal relationships
- Short-term memory loss being greater than long-term memory loss
- Difficulty performing familiar tasks
- Expressive and receptive language problems
- Becoming lost in the midst of a sentence or train of thought
- Confusion in relating complex stories or themes
- Disorientation of time, person, and/or place
- Poor or decreased judgment
- Problems of abstract reasoning
- Misplacing things, even items with a usual location
- Mood, personality, and behavior changes
- Loss of initiative, including passivity and resistance to prodding to get involved

These indicators may be considered the "soft signs" of dementia, and their identification depends mainly on close and careful observations. Formal psychologic and neurologic testing may be considered and undertaken if several signs are present and indicate significant problems in activities of daily living for the person. As part of a history taken for the diagnostic workup, it can be helpful to review these signs with various family members, friends, and acquaintances to elucidate observations.

If further screening assessment is necessary, referral to a neuropsychologist or clinical psychologist with expertise in geriatrics would be warranted. The psychologist would ordinarily conduct an initial objective screening assessment and then follow-up, if needed, with a more comprehensive psychologic and neurologic assessment.

MENTAL STATUS AND NEUROPSYCHOLOGIC EXAMINATION

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.

There are several mental status examinations that may 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 to 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 differentiating MCI from AD and predicting progression to AD [70].

The measurement of memory could also be obtained by the use of one of several informal tests of memory, such as the 10-word memory test, the 10-picture memory test, or the 10-number memory test. Additionally, memory and cognitive function may be assessed by several subjective measures, such as drawing a key or clock (with the hands at 10 minutes after 11 o'clock), asking the patient to write out a complete sentence, asking the patient to spell one or two words backward, or asking the patient to reproduce a very simple but complex design [57].

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 [71].

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 [72]. Preferably, this testing is completed by a specialist in neuropsychology.

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 an 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

MRI is able to measure with considerable accuracy the size of intracerebral structures, such as the hippocampus, that are associated with AD [73]. It has been found that patients with AD have a decreased volume of the hippocampus when compared to nonaffected individuals, and patients with some degree of atrophy are more liable to develop AD. MRI is also able to image cerebral atrophy and other abnormalities that are associated with decreased cognition or dementia. Noncontrast computed tomography can also help in the diagnosis by identifying structural changes, such as infarcts or mass lesions, that could produce cognitive changes [74].

Single photon emission tomography (SPECT) and positron emission tomography (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 [74]. 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 diagnostic measure [54; 76; 77; 78; 79; 96]. 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. AD subjects retained the tracer, while control subjects had a rapid loss of the compound. 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 [74].

A novel tracer compound, 18F-AV-45, is currently being researched as an alternative to Pittsburgh Compound B [80]. 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. In a consecutive case series of 30 patients 50 to 89 years of age being evaluated for MCI or dementia, researchers found that PET imaging with 18F-AV-45 caused a change in diagnosis in 10 patients and clarified the diagnosis in 9 patients. The procedure also prevented the initiation of incorrect or suboptimal treatment and avoided inappropriate referral to an anti-amyloid clinical trial [81].

According to the Alzheimer's Association and the Society of Nuclear Medicine and Molecular Imaging, amyloid imaging is inappropriate to determine dementia severity.

(http://s3.amazonaws.com/rdcms-snmmi/files/production/public/FileDownloads/HPRA/Appropriate%20use%20criteria%20for%20amyloid%20PET.pdf. Last accessed March 24, 2021.)

Level of Evidence: Expert Opinion/Consensus Statement

MANAGEMENT OF ALZHEIMER DISEASE

There are no treatments that can cure or reverse the effects of AD. However, AD is a condition that is amenable to moderating interventions. Patients and families can be helped with interventions designed to diminish the effects and progression of the disease. Care planning is focused on the management of the identified behaviors. Although there are many common features, each person is unique and requires distinctive approaches that

address the specific problems of each individual.

Only half of all patients with AD actually receive treatment, and more than 70% of patients with newly diagnosed AD do not receive any treatment within the first year [82]. This is partly due to patients' hesitancy to consult a physician or psychologist for diagnostic purposes. Delay in initiating a diagnostic assessment of cognitive functions may also contribute. Many family members notice the early signs of AD in a loved one. However, of those who identify possible signs of dementia, very few actually prompt their family member to submit to a screening consultation. The vast majority of families with a family member with dementia are unable to distinguish the early symptoms from late symptoms, suggesting a general lack of understanding of this area of health care [83].

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 of reducing oxidative stress and blood pressure and improving circulation, may help to prevent dementia or slow the rate of disease progression [84]. 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 [85]. 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 [85; 86]. These agents include several cholinesterase inhibitors (ChEIs) and memantine, a N-methyl-d-aspartate (NMDA) receptor antagonist [87; 88]. 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 [85]. 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 [87].

Although drugs used to manage AD can provide cognitive improvement in a small cohort, the reality is there are currently no medications promising substantial clinical benefit to the vast number of patients. As such, nonpharmacologic interventions, including social, environmental, and behavioral measures, are considered the most crucial treatment for patients with AD [89]. This generally consists of taking steps to ensure physical and emotional comfort, maintain functional levels (as much as possible), prevent complications, and ensure prolonged communication. General techniques that may be useful are:

- Consistency: Maintain a routine and consistent environment.
- Task breakdown: Identify the steps of each activity of daily living the individual is and is not able to perform, and provide assistance as necessary.
- Cueing: Give hints or clues, but do not take over.
- Distraction: Use distractions to keep the individual's mind away from distressing thoughts.
- Support: Provide consistent and loving support at all times, but particularly during times of increased stress

To continue performing activities of daily living in spite of having MCI, dementia, or AD, a patient must be supported and guided. 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.

It is important to 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 be allowed and encouraged to do this.

Do not expect patients to perform an activity of daily living when they are fatigued or agitated. Let it go for the time being, and attempt it later when they are rested or calmed down. Simplify tasks whenever possible. For example, it is easier to fasten shoes with a Velcro closure than it is to lace and tie.

Tasks should be broken into their separate components. 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. A combination of cues may be utilized for any activity.

COMMON PROBLEMS FOR PATIENTS WITH DEMENTIA

ELDER ABUSE

Elder abuse is a real threat for patients with dementia [90]. They are at risk for financial, physical, emotional, and sexual abuse, particularly from caretakers, family members, and even healthcare providers. Any suspicion of abuse should be reported to the adult social services department of the state and county in which the patient is living. Abuse can be intended (e.g., physical abuse) or unintended (e.g., neglect). Perpetrators of elder abuse may be motivated by many different factors, from overwhelm and burnout to sadism [90]. Some perpetrators are financially dependent upon the victim, leading to an imbalance in the relationship and dangerous expectations. Financial abuse is common, for example, by a child or grandchild who has been dependent on the elder for years and is now seeing their "support funds" being terminated and bank accounts closed. Health and mental health providers should be vigilant for any signs of abuse or neglect.

Signs of financial abuse or neglect should be closely monitored. This can be done by monitoring the interaction of family members/carers with patients, particularly behaviors involving finances and/or signing documents such as wills, trusts, or bank accounts. If necessary, an ombudsman or the patient's attorney should be consulted. If the patient is in a care facility, the facility's attorney may be a resource.

SUICIDE

Older Americans are at an increased risk for suicide. Individuals older than 65 years of age comprise 16.5% of the population but represent 19.3% of all suicide deaths. The rate of suicides for the elderly for 2019 was 17 per 100,000, with one elderly suicide every 57.3 minutes [91]. Persons older than 85 years of age, especially white men, have the highest rate. Although the elderly attempt suicide

less frequently than other age groups, they have a higher completion rate [91]. Common risk factors for suicide in the elderly include [91]:

- Recent loss of a loved one
- Physical illness, uncontrollable pain, or fear of prolonged illness
- Perceived poor health
- Social isolation and loneliness
- Major changes in social roles (e.g., retirement)

According to the U.S. Preventive Services Task Force, population-specific risk factors, such as social isolation, spousal bereavement, neurosis, affective disorders, physical illness, and functional impairment, increase the risk for suicide in older adults.

(https://www.uspreventiveservicestaskforce.org/uspstf/recommendation/suicide-risk-in-adolescents-adults-and-older-adults-screening. Last accessed March 24, 2021.)

Level of Evidence: Expert Opinion/Consensus Statement

A dementia diagnosis encompasses several of these risk factors, and these patients should be monitored closely and directed to appropriate professional help. The loss of health, purpose, or meaning must be addressed at all stages of aging, but even more so in the later years of life.

Suicide among elderly patients with dementia may be subtle or camouflaged, manifesting as refusal to eat and/or drink water and fluids, rejection of prescribed medication, or intentional isolation from any social contact. These more passive suicide attempts are especially common among older persons in nursing homes or other care settings who have no other means.

ALCOHOL ABUSE

Alcohol abuse/dependence in the elderly is generally a hidden problem. Many elderly individuals do not disclose alcohol abuse because they are ashamed. This is compounded by healthcare professionals' reluctance to ask older adults about alcohol abuse, mostly due to the prevalent images of young people misusing substances [92]. Older adults are more likely to hide their alcohol use and less likely to seek professional help, and their families, particularly adult children, are often in denial or are ashamed of the parent's problem [93]. Additionally, the symptoms of alcohol abuse can mimic or resemble conditions associated with aging, including dementia, thereby masking an underlying drinking or substance disorder [92; 93]. 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.

According to the National Council on Alcoholism and Drug Dependence, older adults exhibiting symptoms of alcoholism comprised 6% to 11% hospital admissions, 20% of admissions to psychiatric services, and 14% of emergency room admissions [94]. The prevalence of alcoholism in the older population is estimated to be 10% to 18%. It is the second most frequent reason for admitting elders to inpatient psychiatric facilities [95]. Less than 2% of all admissions for alcohol treatment are people older than 55 years of age [94]. Among nursing home residents, it is estimated that as many as one-half have problems related to alcohol [94; 95].

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 physical symptoms, such as difficulty sleeping or chronic pain. Mourning a loved one, loss of social supports, and loneliness can also instigate alcoholism later in life [93].

One study found that the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (DSM-5) criteria for alcohol use disorder might be difficult to apply to older adults [98]. For example, age-related physiologic changes may change an individual's response to alcohol, increasing his or her sensitivity and lowering their levels of tolerance. These persons would not meet the DSM-5 criteria for alcohol use disorder, as they would require smaller

amounts of alcohol to become intoxicated. In addition, the DSM-5 criterion of giving up activities or responsibilities as a result of substance use may not be appropriate for older adults because they may engage in fewer regular activities due to diminished vocational or social responsibilities [100].

After a diagnostic assessment, treatment of alcohol abuse in the elderly may include close monitoring, attendance at 12-step programs, group therapy, increased socialization, and/or medication. For patients with dementia, the urge to drink will likely be lost eventually, but it is important to prevent overconsumption, as it may exacerbate symptoms.

FALLS

Falls are common among the elderly and can cause serious injury and even death. Decreased mobility, medication side effects, and confusion/disorientation can all predispose the elderly patient with dementia to falls. Patients and their families should be counseled regarding the importance of fall prevention strategies. Elderly persons' medication profiles must be reviewed relative to their potential contribution to falling. The home environment should also be modified to decrease the risk of falls, keeping pathways cleared and well lit, removing unstable furniture, and eliminating throw rugs and extension cords. Referral to physical therapy for balance training and strengthening may be considered. In addition, occupational therapy is appropriate if modifications in the home are necessary.

INTIMACY

It is important for older people to feel loved and cared for. Romance, connection, physical touch, and sex remain important to people as they age and should be considered part of an individual's overall health and well-being. Individuals may be encouraged to explore new ways of spending time with other people and showing affection, including hand-holding, hugging, massage, and dancing. Some may benefit from education on positive aspects of interpersonal relationships. In some patients, hypersexuality may develop. This can be a manifestation of dementia (e.g., fronteotemporal dementia) or the effect of medications.

WANDERING

Wandering behavior is relatively common among persons with dementia, especially at sundown [103]. It can be unintentionally dangerous, and it is important for all persons with dementia to carry some for of identification (e.g., medical bracelet) at all times. It can also be helpful to alert neighbors and local law enforcement of the possibility of wandering. Door should be kept locked whenever possible, with an alarm and/or a two-step lock including a deadbolt recommended.

AGGRESSION

Individuals with dementia may become confused, frustrated, and easily agitated as they become unable to perform formerly routine tasks. When agitation is frequent or excessive, pharmacotherapy may be necessary. It is also important to take steps to protect the individual from harming him/herself and others. This may consist of creating a calm environment (e.g., quiet, reduced clutter) and providing continuing care, support, and reassurance.

PARANOIA

Paranoia is a form of delusion in which an individual is fearful, jealous and/or suspicious of others. When a person with dementia displays paranoia, it is best not to directly react. Instead, the individual should be reassured that s/he is safe and protected. It can be helpful to redirect the individual to a different task or activity to interrupt paranoid thinking patterns.

SPIRITUALITY

All individuals, including those with dementia, have spiritual needs, and spiritual health is part of holistic care. As much as possible, individuals should remain part of their faith community. Spirituality and religion should be incorporated into discussions and daily activities as much as is desired. In some cases, spiritual music may be comforting. Members from the individual's faith community may be encouraged to remain connected.

DRIVING

The risk of driving-related accidents is increased among the older population, and impaired mental status due to cognitive impairment and/or the effects of certain medications can increase risk further. Restricting an individual's driving causes a considerable loss of independence and can be a highly sensitive issue, and the decision should be collaborative, if possible. A dementia diagnosis alone is not considered grounds to revoke driving privileges. Other factors must be present, including cognitive decline and comorbidities [101]. Many states require physicians to report impaired drivers, especially if there is a history of a closed head injury. However, laws vary regarding reporting by other service providers. Professionals are encouraged to study their own state's laws. There are driving schools and classes in many communities specifically designed to assist the elderly in maintaining their driving skills and license, which may be an option for some individuals.

It is also important to assess if alcohol or drugs are playing a role in an elderly driver's abilities. Efforts to intercede to stop drinking/substance abuse or to keep an impaired patient from driving may be necessary.

INFORMED CONSENT

Informed consent requires awareness of relevant information and the demonstrated competency to understand the nature of an issue under consideration and its implications and consequences. Agreement from patients who lack the capacity to give consent actually results in no consent at all. In such cases, the patient requires a healthcare surrogate to be designated through the process of a conservatorship, a will and an advance directive for health care, and/or the appointment of a power of attorney. These surrogates are sometimes referred to as the responsible party (RP). Failing a provision for consent to be granted by some preauthorized RP, healthcare and/or financial decisions require court intervention.

If a patient has a preapproved healthcare surrogate, as outlined by law or an advance directive, all treating professionals and facilities should have a copy of the document on file. This is an area of frequent abuse and boundary violations, even by well-meaning family members. The provider of service must be careful to assure that informed consent or permission of the RP has been granted before proceeding, even when the intended service seems necessary and/or obviously desired. Consent to proceed with any treatment or financial dealing must be with the consent of the RP, and all communication regarding the patient is with and through the RP.

PRESCRIBED MEDICATIONS

Medication management and polypharmacy are major concerns for older adults. An estimated 30% of individuals older than 65 years of age take five or more prescription medications [102]. This number does not take into account over-the-counter medications, vitamins, minerals, and dietary supplements. Taking multiple medications and supplements significantly increases the risk of interaction with foods, other medications, and alcohol.

Common medication problems include incorrect dosage, erratic drug use, misuse of over-the-counter medications, drug interactions, mixing medications and alcohol, use of drugs at the wrong time of the day, using medications prescribed for another person, using two or more medications with synergistic effects, and using several medications with profound side effects or that might be contraindicated due to comorbid conditions.

Aging itself can contribute to unforeseen medication problems. Older individuals tend to absorb, metabolize, and excrete medications at a slower rate. Many older people also have major complicating medical problems, such as Parkinson disease, cardiovascular difficulties, neurologic disorders, infections, and vertigo, that may be impacted by various medications. In general, older persons are at a greater risk for side effects. If present, cognitive deficits may lead to greater confusion regarding timed doses and medication use.

SKILLED CARE FACILITIES AND ASSISTED LIVING

The move to a higher level of care is not an easy decision for any impaired person, family members, or healthcare providers. Each patient has different circumstances that must be taken into account. The decision usually involves consideration of a variety of psychologic, medical, financial, practical, and family issues. Often, it is based on the inability of the family to fully provide the needed level of care. If the family has been the sole care provider, burnout and exhaustion may be factors. It may even depend on the ability to adapt the home to accommodate the new needs of the patient. When selecting a facility, the focus should be on location and the competency and personability of the staff.

Generally, a patient will need to be hospitalized for three days to qualify for referral to a skilled nursing facility under the Medicare guidelines. Admission to an assisted living program, on the other hand, is not covered by Medicare or most health insurance plans. Long-term care insurance may be a financial help to offset medical costs and the costs of alternative nursing care, including home care.

Selecting a skilled nursing or assisted living facility is difficult for many families. The following may be offered to families to assist in making the best possible decision:

- Is the facility within a reasonable distance to supportive family members?
- Is the facility able to provide the appropriate level of care and needed services anticipated?
- Is the facility stable, with a low staff turnover rate? Has the facility changed ownership several times?
- Is the facility nonprofit for for-profit?
- Does the facility have a positive record with the state (e.g., facility infractions, wrongful staff actions)?
- Is the food reasonably prepared and served in a manner consistent with the patient's culture and eating history?

LONGEVITY CONCERNS

The number of individuals 85 years of age and older is growing steadily in the United States. In 2020, there were 6.7 million individuals in this age-group; this number is expected to grow to 19 million by 2060 [99]. Many people who live past 85 years of age fear they will outlive their resources. Providing education about healthcare savings programs throughout life may be helpful, even into the aging years. Preparation for long-term assisted living is essential, such as having long-term healthcare insurance, having a healthcare reserve fund, and being compliant with healthcare treatment plans (if possible). Regular exercise, rest, social support, and a good attitude are among the essential factors needed for healthy longevity [6].

CONCLUSION

The aging process can become a very challenging time in a person's life. It is often difficult for the aging person to understand and accept the changes that are taking place, to maintain a positive level of functioning for as long as possible, and to compensate for ongoing losses.

It has increasingly become the responsibility of psychologists, social workers, and counselors to be early responders for patients with dementia and their family members, as senior patients are seeking the counsel of therapists in greater numbers than ever before. This change is partly due to the increasing population of aged individuals and to their willingness to seek assistance outside their traditional source of help: their family physician. With the healthcare industry changing, therapists may find themselves in the position of being the primary source of consultation for senior patients as the concept of the family or personal physician is rapidly fading.

Works Cited

1. Ackerman S. *Discovering the Brain*. Washington, DC: National Academies Press; 1992.
2. Science Daily. MR Technique Shows Brains of Alzheimer's Patients Similar to Immature Brains in Children. Available at https://www.sciencedaily.com/releases/2003/05/030507080247.htm. Last accessed March 15, 2021.
3. Alzheimer's Association. Public Policy Victories. Available at https://www.alz.org/get-involved-now/advocate/victories. Last accessed March 15, 2021.
4. U.S. Department of Health and Human Services. National Plan to Address Alzheimer's Disease: 2017 Update. Available at https://aspe.hhs.gov/report/national-plan-address-alzheimers-disease-2017-update. Last accessed March 15, 2021.
5. O'Brien M. *Successful Aging*. Concord, CA: Biomed General; 2005.
6. Murphey C. *Aging is an Attitude: Positive Ways to Look at Getting Older*. Chattanooga, TN: Living Ink Publishers; 2005.
7. Administration on Aging. 2019 Profile of Older Americans. Available at https://acl.gov/sites/default/files/Aging%20and%20Disability%20in%20America/2019ProfileOlderAmericans508.pdf. Last accessed March 15, 2021.
8. Fernandes MA, Pacurar A, Moscovitch M, Grady C. Neural correlates of auditory recognition under full and divided attention in younger and older adults. *Neuropsychologia*. 2006;44(12):2452-2464.
9. Alzheimer's Association. 2021 Alzheimer's Disease Facts and Figures. Available at https://www.alz.org/media/documents/alzheimers-facts-and-figures.pdf. Last accessed March 15, 2021.
10. Mosconi LG, Glodzik L, Mistur R, et al. Oxidative stress and amyloid-beta pathology in normal and individuals with a maternal history of Alzheimer's. *Biol Psychiatry*. 2010;68(10):913-921.
11. Bergland C. What Is the Best Way to Improve Your Brain Power For Life? Available at https://www.psychologytoday.com/us/blog/the-athletes-way/201401/what-is-the-best-way-improve-your-brain-power-life. Last accessed March 15, 2021.
12. Alzheimer's Association. Brain Health. Available at https://www.alz.org/help-support/brain_health. Last accessed March 15, 2021.
13. Brundel M, de Bresser J, van Dillen JJ, Kappelle LJ, Biessels GJ. Cerebral microinfarcts: a systematic review of neuropathological studies. *J Cereb Blood Flow Metab*. 2012;32(3):425-436.
14. Willis SL, Tennstedt SL, Marsiske M et al. Long-term effects of cognitive training on everyday functional outcomes in older adults. *JAMA*. 2006;296(23):2805-2814.
15. 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 March 15, 2018.
16. Lewy Body Dementia Association. Healthcare Professionals: Treatment. Available at https://www.lbda.org/treatment. Last accessed March 18, 2021.
17. Petersen RC, Roberts RO, Knopman DS, et al. Prevalence of mild cognitive impairment is higher in men: the Mayo Clinic study on aging. *Neurology*. 2010;75(10):889-897.
18. Stagnitti MN. Person Characteristics of the Elderly Reporting One or More Cognitive Disorders, 2007. Available at https://meps.ahrq.gov/data_files/publications/st310/stat310.shtml. Last accessed March 16, 2021.
19. Smith JC, Nielson KA, Woodard JL, et al. Interactive effects of physical activity and APOE-ε4 on BOLD semantic memory activation in healthy elders. *Neuroimage*. 2011;54(1):635-644.
20. Martin RC, Annis SM, Darling LZ, Wadley V, Harrell L, Marson DC. Loss of calculation abilities in patients with mild and moderate Alzheimer disease. *Arch Neurol*. 2003;60(11):1585-1589.
21. Mayo Clinic. Dementia. Available at https://www.mayoclinic.org/diseases-conditions/dementia/symptoms-causes/syc-20352013. Last accessed March 16, 2021.
22. Mitchell SL, Teno JM, Kiely DK, et al. The clinical course of advanced dementia. *N Engl J Med*. 2009;361(16):1529-1538.
23. Alzheimer's Association. Types of Dementia. Available at https://www.alz.org/alzheimers-dementia/what-is-dementia/types-of-dementia. Last accessed March 16, 2021.
24. Green R. *Diagnosis and Management of Alzheimer's Disease and Other Dementias*. 2nd ed. West Islip, NY: Professional Communications; 2005.
25. National Task Group on Intellectual Disabilities and Dementia Practices. NTG-Early Detection and Screen for Dementia (NTG-EDSD). Available at https://www.the-ntg.org/ntg-edsd. Last accessed March 16, 2021.
26. Lewy Body Dementia Association. 10 Things You Should Know About LBD. Available at https://www.lbda.org/10-things-you-should-know-about-lbd. Last accessed March 16, 2021.
27. Alzheimer's Association. Lewy Body Dementia. Available at https://www.alz.org/alzheimers-dementia/what-is-dementia/types-of-dementia/lewy-body-dementia. Last accessed March 16, 2021.
28. Shankle W, Amen D. *Preventing Alzheimer's: Ways to Help Prevent, Delay, Detect, and Even Halt Alzheimer's Disease and Other Forms of Memory Loss*. New York, NY: Penguin Group; 2004.
29. Alzheimer's Association. 10 Early Signs and Symptoms of Alzheimer's. Available at https://www.alz.org/alzheimers-dementia/10_signs. Last accessed March 16, 2021.

30. National Institute on Aging. One in Seven Americans Age 71 and Older Has Some Type of Dementia, NIH-Funded Study Estimates. Available at https://www.nih.gov/news-events/news-releases/one-seven-americans-age-71-older-has-some-type-dementia-nih-funded-study-estimates. Last accessed March 21, 2021.
31. Fodale V, Ritchie K, Rasmussen LS, Mandal PK. Anesthetics and Alzheimer's disease: research and background. *J Alzheimers Dis*. 2010;22(S3):1-3.
32. Crystal HA. Dementia with Lewy Bodies. Available at https://emedicine.medscape.com/article/1135041-overview. Last accessed March 16, 2021.
33. Hamilton J. Considering alternative causes of dementia: is it Alzheimer's disease or dementia with Lewy bodies? *California Psychol*. 2010;43(6):12-14.
34. Suda S, Sugihara G, Suyama R, Mori N, Takei N. Donepezil and concurrent sertraline treatment is associated with increased hippocampal volume in a patient with depression. *J Clin Psychiatry*. 2010;71(6):806-808.
35. Snowdon DA. Aging and Alzheimer's disease: lessons from the Nun Study. *Gerontologist*. 1997;37(2):150-156.
36. Tyas SL, Snowdon DA, Desrosiers MF, Riley KP, Markesbery MR. Early-life linguistic ability, late-life pathology and asymptomatic Alzheimer's disease: findings from the Nun Study. *Alzheimers Dement*. 2005;5(4 Suppl):P103-P104.
37. Wendling P. Drinking, smoking may raise early AD risk. *Clinical Psychiatry News*. 2008;(5).
38. Sabia S, Marmot M, Dufouil C, Singh-Manoux A. Smoking history and cognitive function in middle age from the Whitehall II study. *Arch Intern Med*. 2008;168(11):1165-1173.
39. Wallin, C., Sholts, S.B., Österlund, N. et al. Alzheimer's disease and cigarette smoke components: effects of nicotine, PAHs, and Cd(II), Cr(III), Pb(II), Pb(IV) ions on amyloid-β peptide aggregation. *Sci Rep*. 2017;7:14423.
40. Yaffe K, Vittinghoff E, Lindquist K, et al. Posttraumatic stress disorder and risk of dementia among U.S. veterans. *Arch Gen Psychiatry*. 2010;67(6):608-613.
41. Andel R, Crowe M, Hahn EA, et al. Work-related stress may increase the risk of vascular dementia. *J Am Geriatr Soc*. 2012;60(1):60-67.
42. Erickson KI, Kramer AF. Aerobic exercise effects on cognitive and neural plasticity in older adults. *Br J Sports Med*. 2009;43:22-24.
43. Lowry F. Walking Slows the Progression of Alzheimer's Disease. Available at https://www.medscape.com/viewarticle/733242. Last accessed March 18, 2021.
44. Knöchel C, Oertel-Knöchel V, O'Dwyer L, et al. Cognitive and behavioural effects of physical exercise in psychiatric patients. *Prog Neurobiol*. 2012;96(1):46-68.
45. Erickson KI, Voss MW, Prakash RS, et al. Exercise training increases size of hippocampus and improves memory. *Proc Natl Acad Sci USA*. 2011;108(7):3017-3022.
46. Postuma RB, Gagnon JF, Vendette M, Fantini ML, Massicotte-Marquez J, Montplaisir J. Quantifying the risk of neurodegenerative disease in idiopathic REM sleep behavior disorder. *Neurology*. 2009;72(15):1296-1300.
47. Williams JW, Plassman BL, Burke J, Holsinger T, Benjamin S. *Preventing Alzheimer's Disease and Cognitive Decline*. Evidence Report/Technology Assessment No. 193. Rockville, MD: Agency for Healthcare Research and Quality; 2010.
48. Neugroschl J. Diet, depression and diabetes could modify dementia risk. *Focus Healthy Aging*. 2010;13(11):7.
49. Kerwin DR, Gaussoin SA, Chlebowski RT, et al. Interaction between body mass index and central adiposity and risk of incident cognitive impairment and dementia: results from the Women's Health Initiative Memory Study. *J Am Geriat Soc*. 2011;59(1):107-112.
50. Humpel C, Ullrich C, Pirchl M. Chronic high cholesterol diet produces brain damage. *Mol Cell Neurosci*. 2010;45(4):408-417.
51. Tangney CC, Kwasny MJ, Li H, Wilson RS, Evans DA, Morris MC. Adherence to a Mediterranean-type dietary pattern and cognitive decline in a community population. *Am J Clin Nutr*. 2011;93(3):601-607.
52. Peila R, Rodriguez BL, Launer LJ. Type 2 diabetes, APOE gene, and the risk for dementia and related pathologies: the Honolulu-Asia Aging Study. *Diabetes*. 2002;51(4):1256-1262.
53. Vlad SC, Miller DR, Kowall NW, Felson DT. Protective effects of NSAIDs on the development of Alzheimer disease. *Neurology*. 2007;70:1672-1677.
54. 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.
55. National Institute on Aging. *2009 Progress Report on Alzheimer's Disease: Translating New Knowledge*. Washington, DC: National Institute on Aging; 2010.
56. Williams J. Recent breakthroughs in understanding the genetics of Alzheimer's disease. *Int J Neuropsychopharmacol*. 2000;3(suppl 1):559.
57. Hedberg AG. *Forms for the Therapist*. New York, NY: Elsevier; 2010.
58. 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.

59. Eckerström C. Hippocampal Volumetry in Mild Cognitive Impairment. Available at https://gupea.ub.gu.se/bitstream/2077/22902/2/gupea_2077_22902_2.pdf. Last accessed March 20, 2021.
60. Hertze J, Minthon L, Zetterberg H, Vanmechelen E, Blennow K, Hansson O. Evaluation of CSF biomarkers as predictors of Alzheimer's disease: a clinical follow-up study of 4.7 years. *J Alzheimers Dis*. 2010;21(4):1119-1128.
61. Quinn JF, Raman R, Thomas R, et al. Docosahexaenoic acid supplementation and cognitive decline in Alzheimer's disease: a randomized trial. *JAMA*. 2010;304(17):1903-1911.
62. Bunce D, Anstey KJ, Cherbuin N, et al. Cognitive deficits are associated with frontal and temporal lobe white matter lesions in middle-aged adults living in the community. *PLoS One*. 2010;5(10):e13567.
63. George S, Mufson EJ, Leurgans S, Shah RC, Ferrari C, deToledo-Morrell L. MRI-based volumetric measurement of the substantia innominata in amnestic MCI and mild AD. *Neurobiol Aging*. 2011;32(10):1756-1764.
64. Alzheimer's Society. Dementia Risk Factors and Prevention. Available at https://www.alzheimers.org.uk/site/scripts/documents_info.php?documentID=102. Last accessed March 20, 2021.
65. 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.
66. 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.
67. 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.
68. 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.
69. Alzheimer's Association. Stages of Alzheimer's Disease. Available at https://www.alz.org/national/documents/topicsheet_stages.pdf. Last accessed March 20, 2021.
70. 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.
71. Ready RE, Paulsen JS. Neuropsychological studies in geriatric psychiatry. *Curr Opin Psychiatry*. 2003;16(6):643-648.
72. Agency for Health Care Policy and Research. *Recognition and Initial Assessment of Alzheimer's Disease and Related Dementias*. Pub. No. 97-R123. Rockville, MD: U.S. Department of Health and Human Services; 1996.
73. 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.
74. 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.
75. Mold M, Linhart C, Gómez-Ramírez J, et al. Aluminum and amyloid-β in familial Alzheimer's disease. *J Alz Dis*. 2020;73(4):1627-1635.
76. 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.
77. 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.
78. 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.
79. Waldemar G, Dubois B, Emre M, et al. Recommendations for the diagnosis and management of Alzheimer's disease and other disorders associated with dementia: EFNS guideline. *Eur J Neurol*. 2007;14(1):e1-e26.
80. 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.
81. Mitsis EM, Bender HA, Kostakoglu L, et al. A consecutive case series experience with [18F] florbetapir PET imaging in an urban dementia center: impact on quality of life, decision making, and disposition. *Mol Neurodegener*. 2014;9:10.
82. DeMarco B. Seventy Percent of Newly Diagnosed Alzheimer's Patients Do Not Receive Treatment within a Year of Diagnosis. Available at https://decisionresourcesgroup.com/news/122605-seventy-percent-of-newly-diagnosed-alzheimers-disease-patients-do-not-receive-treatment-within-a-year-of-diagnosis. Last accessed March 20, 2021.
83. Cruz VT, Pais J, Teixeira A, Nunes B. The initial symptoms of Alzheimer's disease: caregiver perception. *Acta Med Port*. 2004;17(6):435-444.
84. Solfrizzi V, Frisardi V, Seripa D, et al. Mediterranean diet in predementia and dementia syndromes. *Curr Alzheimer Res*. 2011;8(5):520-542.
85. Winslow BT, Onysko MK, Stob CM, Hazlewood KA. Treatment of Alzheimer disease. *Am Fam Physician*. 2011;83(12):1403-1412.

86. 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.

87. National Institute on Aging. How is Alzheimer's Disease Treated? Available at https://www.nia.nih.gov/health/how-alzheimers-disease-treated. Last accessed March 20, 2021.

88. Alzheimer's Association. Medications for Memory. Available at https://www.alz.org/alzheimers-dementia/treatments/medications-for-memory. Last accessed March 20, 2021.

89. Beier MT. Treatment strategies for the behavioral symptoms of Alzheimer's disease: focus on early pharmacologic intervention. *Pharmacotherapy*. 2007;27(3):399-411.

90. Ramsey-Klawsnik H. Elder-abuse offenders. *Generations*. 2000;24(2):17-22.

91. American Association of Suicidology. USA Suicide: 2019 Final Data. Available at https://suicidology.org/wp-content/uploads/2021/01/2019datapgsv2b.pdf. Last accessed March 20, 2021.

92. Deblinger L. Alcohol problems in the elderly. *Patient Care*. 2000;3(10):68.

93. National Council on Alcoholism and Drug Dependence, Inc. Seniors and Alcohol. Available https://www.ncadd.org/about-addiction/seniors. Last accessed March 20, 2021.

94. National Council on Alcoholism and Drug Dependence, Inc. An Invisible Epidemic: Alcoholism and Drug Dependence Among Older Adults. Available at https://ncadd.org/images/stories/PDF/factsheet-alcoholismanddrugdependenceamongolderadults.pdf. Last accessed March 20, 2021.

95. Aging.com. Alcohol Abuse Amongst the Elderly: A Complete Guide. Available at https://aging.com/alcohol-abuse-amongst-the-elderly-a-complete-guide. Last accessed March 18, 2021.

96. National Institutes of Health. News Release: NIH Award Expands Landmark Alzheimer's Biomarker Study, ADNI Adds Novel Methods for Recruitment, Testing Disease Risk. Available at https://www.nih.gov/news-events/news-releases/nih-award-expands-landmark-alzheimers-biomarker-study. Last accessed March 20, 2021.

97. Phillips ML. The Mind at Midlife. Available at http://www.apa.org/monitor/2011/04/mind-midlife.aspx. Last accessed March 15, 2021.

98. Mejldal A, Andersen K, Bilberg R, et al. The Alcohol Dependence Scale and DSM-5 alcohol use disorder: severity ratings correspond insufficiently in older patients. *Int J Methods Psychiatr Res*. 2020;29:e1811.

99. Population Reference Bureau. The U.S. Population Is Growing Older, and the Gender Gap in Life Expectancy Is Narrowing. Available at https://www.prb.org/the-u-s-population-is-growing-older-and-the-gender-gap-in-life-expectancy-is-narrowing. Last accessed March 20, 2021.

100. National Institute on Alcohol Abuse and Alcoholism. Understanding Alcohol Use Disorder. Available at https://www.niaaa.nih.gov/publications/brochures-and-fact-sheets/understanding-alcohol-use-disorder. Last accessed March 20, 2021.

101. Alzheimer's Association. Driving and Dementia. Available at https://www.alz.org/national/documents/statements_driving.pdf. Last accessed March 20, 2021.

102. Quinn KJ, Shah NH. A dataset quantifying polypharmacy in the United States. *Sci Data*. 2017;4:170167.

103. National Institute on Aging. Caring for a Person with Alzheimer's Disease. Available at https://order.nia.nih.gov/sites/default/files/2019-03/Caring_for_a_person_with_AD_508_0.pdf. Last accessed October 14, 2021.

Evidence-Based Practice Recommendations Citations

Registered Nurses' Association of Ontario. *Delirium, Dementia, and Depression in Older Adults: Assessment and Care*. Toronto: Registered Nurses' Association of Ontario; 2016. Available at https://rnao.ca/sites/rnao-ca/files/bpg/RNAO_Delirium_Dementia_Depression_Older_Adults_Assessment_and_Care.pdf. Last accessed March 24, 2021.

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 http://s3.amazonaws.com/rdcms-snmmi/files/production/public/FileDownloads/HPRA/Appropriate%20use%20criteria%20for%20amyloid%20PET.pdf. Last accessed March 24, 2021.

U.S. Preventive Services Task Force. Screening for suicide risk in adolescents, adults, and older adults in primary care: U.S. Preventive Services Task Force recommendation statement. *Ann Intern Med*. 2014;160(10):719-726. Available at https://www.uspreventiveservicestaskforce.org/uspstf/recommendation/suicide-risk-in-adolescents-adults-and-older-adults-screening. Last accessed March 24, 2021.