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**Impact of a Web-Based Instructional Module of Alzheimer's Disease within
Seven Content Knowledge Domains**

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A Dissertation Submitted to the Graduate School of the University of Missouri - St. Louis
in Partial Fulfillment of Requirements for the Doctor of Philosophy Degree in Education

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Abstract

Alzheimer's Disease (AD) has been classified as the most common form of dementia. Primary health care providers are usually the first clinicians to whom individuals present with symptoms of dementia. By 2050, it is expected that as many as 13.8 million Americans will be living with AD, and millions more will be placed in the challenging role of providing care for these individuals. However, studies continue to show that dementia is often underdiagnosed and under detected. The purpose of the study was to systematically inquire about the impact of AD education on level of knowledge about AD among primary health care providers. Knowledge was tested on a standardized Alzheimer's Disease Knowledge Scale (ADKS) that included seven content knowledge domains. A Web-based learner-focused instructional module about AD was created to assure comprehensive content coverage and content relevance while upgrading conceptual knowledge about AD. In this study, a quasi-experimental 2 x 2 factorial design with repeated measures was implemented. The study participants (N=57) consisted of volunteer primary health care provider trainees who were randomly assigned to the treatment group (N=30) or the control group (N= 27). AD education about Alzheimer's disease was the independent variable and level of knowledge overall and within the seven content knowledge domains on the ADKS was the dependent variable. The results indicated there were no differences between groups. It is possible that a ceiling effect on the ADKS measure existed as scores clustered toward the upper limits of the ADKS scale, even on the pretest and for both groups. In conclusion, AD education delivered in this format showed no differential benefit. The questions on the ADKS might not have been difficult enough to measure true knowledge of the learners. This study should be repeated with a different measure of AD knowledge.

Key Words: *Alzheimer's Disease, Alzheimer's Disease content knowledge domains, Alzheimer's Disease Knowledge Scale (ADKS), dementia, ceiling effect*

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This dissertation is dedicated to the author's husband, Dr. Edward C. Haynie. His interest and strong belief in higher education has been an inspiration to me and our children; Edward Caesar Haynie, Jr., Patrick Robert Haynie, and Ethan Alexander Haynie. Without my family's tolerance, steadfast faith, and good humored support, my goals would not have been achieved.

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Chapter I

Introduction

Numerous physical and mental health conditions are known to cause cognitive impairment in older adults, particularly those who are 65 years of age or older. Alzheimer's disease (AD), a degenerative brain disorder, is the most common cause of cognitive impairment in this vulnerable population (Struble & Sullivan, 2011). Currently, reports indicate there has been no definitive treatment found to cure AD. Researchers have suggested that an intricate series of neurodegenerative abnormalities take place in the brain over extended periods of time which constitute development of the disorder. It is thought that these changes begin to take place over twenty years before individuals experience noticeable symptoms. These events eventually lead to irreversible impairment in cognition with loss of memory and thinking that progressively alters normal personality, learning, language, and behavior over time and becomes severe enough to interfere with social interactions and independent functioning. AD commonly presents itself during late adult life. In many instances, individuals plagued by memory loss associated with AD, commonly referred to as dementia of the Alzheimer's type (DAT) or AD dementia, are likely to be affected by various physical and psychosocial co-morbidities (Alzheimer's Association, 2019).

Like AD, other health conditions can potentially cause changes in cognition or dementia-like symptoms similar to those symptoms manifested in AD. Common among these conditions are: abnormalities of the metabolic and endocrine systems; toxic effects of medications; infections; nutritional and vitamin deficiencies subdural hematomas; brain tumors; cerebral vascular accident or stroke; hypoxia; poisoning; sleep disorders; head trauma; depression; various psychiatric illnesses; and chronic lung and heart

conditions (Albert et al., 2011). However, unlike many of these conditions which are reversible with appropriate treatment, dementia due to AD is irreversible, progressively worsens over time, lacks effective treatment and it is incurable. Several researchers have recommended one common strategy to detect reversible causes of dementia. That strategy is to include routine diagnostic evaluations in their clinical practice (Albert et al., 2011b; Mentis, 1995; Shapira, Roper, & Schulzinger, 1993).

AD is known as the sixth leading cause of death in the United States. Its prevalence is alarming and as the aging population grows, it is expected to grow in epic proportions. is also a leading cause of disability and poor health. Before a person with AD dies, he or she may live through years of morbidity as the disease progresses. Approximately 5.8 million people of all ages live with dementia due to AD in the United States. The Alzheimer's Disease Facts and Figures (2019) reports AD and dementia triples healthcare costs for the age group of 65 and older.

Likewise, the individual costs of this disease have continued to grow at rapid rates. The financial impact of AD on families in the United States, including annual costs for direct care of people with dementia has grown enormously. According to government studies in 2019, total payments in 2019 for all individuals with AD or other dementias are estimated at \$290 billion. Medicare and Medicaid are expected to cover \$195 billion, or 67%, of the total health care and long-term care payments for people with AD or other dementias. Despite these and other sources of financial assistance, individuals with AD or other dementias still incur high out-of-pocket costs. These costs are for Medicare and other health insurance premiums and for deductibles, copayments and services not covered by Medicare, Medicaid or additional sources of support (Alzheimer's

Association, 2019). As the baby boomer generation continues to age, this unfortunate reality will affect far too many individuals, potentially bankrupting families, communities and the healthcare system. In addition, patients with AD dementia have been shown to have greater mortality rates than elderly patients with conditions other than dementia (Alzheimer's Association, 2016a).

Early detection and management of DAT in primary health care has become a daunting public health menace for decades in the U. S. and in other countries (Nielsen, Andersen, Kastrup, Phung, & Waldemar, 2011; Nielsen, Vogel, Phung, Gade, & Waldemar, 2011). According to an evidenced-based review by the Quality Standards Subcommittee of the American Academy of Neurology, the Agency for Health Care Policy and Research set the tone in 1996 for reform measures in detection of memory loss when it recommended screening for cognitive impairment among elderly patients seen in primary care settings (Knopman et al., 2001). Subsequently, the Alzheimer's Disease and Related Disorders Association (ADRDA) and the National Institute of Neurological Disorders and Stroke (NINDS) endorsed the claim that early recognition of cognitive impairment due to dementia is advantageous. First, a diagnosis provides some comfort to the patient and family by explaining the changes in the patient's behavior and allows the health care provider to counsel the patient and family about the prognosis. Second, an accurate diagnosis of cognitive impairment and assessment of its functional and social effects may facilitate access to rehabilitative, social, and financial services while informing decisions about competency and guardianship. Third, early recognition of dementia may perhaps allow an opportunity to alter the course of cognitive impairment. Without effective preventive measures, millions of baby boomers can

potentially surrender to this public health predicament (Jack et al., 2011).

Physicians and advanced practice nurses practicing in primary health care settings are in a unique position to contribute to detection, diagnosis, treatment and management of AD. Primary health care providers are often overwhelmed by time constraints, limited knowledge about AD, and lack the confidence to make a dementia diagnosis. Therefore, assessment of dementia due to AD is less likely incorporated into clinical routines of busy primary care clinical practice settings (Cordell et al., 2013).

The growing number of older adults plagued by Alzheimer's dementia implies that primary health care providers have inherited an increasingly important role in early detection, diagnosis, and management of AD. Primary health care providers, who have updated knowledge and understanding of AD, are instrumental in maintaining a reasonable quality of life for those affected by AD. Physicians and nurses are usually the first health care providers to witness the signs and symptoms of dementia caused by AD. Because of this disclosure, it is within reason to postulate that physicians and nurse practitioners would have more knowledge about AD than any other health care professionals (e.g. pharmacists, therapists, social workers, etc.). Hence, a critical need has become evident for primary health care professionals to understand, recognize, detect, diagnose, and manage this pervasive disease. Perhaps, an accessible web-based AD education program focused on primary care health care providers will increase knowledge and enhance awareness of AD, which can play an important role in accurate diagnoses and appropriate treatment.

The following questions guided this study: "Is an instructional intervention on knowledge of AD feasible and acceptable for health care trainees? In addition, "Is there a

relationship between AD education and level of knowledge about AD among health care providers”? “Does level of knowledge about AD among health care providers have an influence on early detection of AD”? It is proposed that a web-based AD education program will increase knowledge of AD among primary health care providers and increase awareness of the importance of early recognition of dementia caused by the disease. It is the aim of this study to provide evidence regarding the impact of enhanced knowledge and awareness of AD and support strategies on.

Purpose of the Study

The primary purpose of this study is to investigate the effectiveness of a Web-based instructional program for primary health care providers on the overall score and seven AD content knowledge domains scores based on the standardized ADKS (Carpenter, Balsis, Otilingam, Hanson, & Gatz, 2009). The expectation was that increased knowledge of AD among primary health care provider trainees would influence early detection of AD. In this study, the investigator designed and implemented an instructional program entitled, “AD Education: A Unit of Instruction”, that focused on AD. For the purpose of this study, the program was presented as a Web-based, learner-focused instructional strategy, which targeted primary health care provider trainees with the aim of ensuring relevant and comprehensive content coverage.

Hypothesis

This research study tested the following hypothesis: primary health care provider trainees will exhibit a significant increase in mean post-test total scores when compared to their mean pretest scores and will exhibit an increased level of knowledge about AD in each of the seven content knowledge domains based on Carpenter's ADKS model.

Definition of Terms

Alzheimer disease (AD). A progressive degenerative brain disease that insidiously corrodes brain cells which regulate intellectual function and causes a gradual and progressive loss of memory, language dysfunction, disturbance in ability to reason, learn, and concentrate; the disease is steady, causes irreversible decline in cognition, and behavior which eventually leads to demise (Cummings & Cole, 2002). One conformist described his view of AD as the following:

Alzheimer's disease refers to the neurodegenerative brain disorder, regardless of the individual's clinical status represented by a continuous process of synaptic and neuronal deterioration. AD has two major stages: Preclinical (presymptomatic or asymptomatic) and symptomatic (clinical). Symptomatic AD is defined as intraindividual cognitive decline that can progress from subtle to severe and interfere with daily function. Symptomatic AD can be sub classified based on symptom severity which is often referred to as incipient (prodromal or mild cognitive impairment) dementia (Morris, 2012, p. 707).

AD is the most common cause of severe cognitive impairment in older age groups 65 or older which typically effects an individual's previous level of social and occupational function and causes the affected person to lose the ability to care for one's self. As AD progresses, aging individuals may also experience changes in their personality and behavior that manifests itself by disorientation, confusion, restlessness, difficulty in following directions, and performing routine tasks. In addition, these individuals may exhibit mood swings, express distrust in others, show increased stubbornness, and withdraw socially.

Dementia. Dementia is characterized as a syndrome comprised of a broad spectrum of disorders associated with neurodegenerative changes in the brain characterized by significant loss of cognitive functions affecting daily intellectual and social abilities, quality of life and mortality. AD is the most common type of dementia. Other forms of dementia have been identified to include vascular dementia (VD), Lewy Body disease, mixed types (e.g., AD and Lewy Body), fronto-temporal dementia and dementia resulting from head trauma or anoxia (Raskind, 2004).

Primary Health Care Provider/Primary Health Care Provider Trainee. Primary Health Care Provider is the term used in this study that refers to professional health care providers and primary health care provider trainees who are medical students and nursing students in training to become physicians and professional nurses, and nurse practitioners or advanced practice nurses (APN). They provide health care services to older adults in primary health care settings whose focus is on family or general practice, geriatrics, internal medicine, neurology and psychiatry.

AD Education. Web based learner-focused instructional module about AD. The definition used in this study describes the investigator-designed unit of instruction. The education program focused on AD with emphasis on and seven content knowledge domains with the intent to target primary healthcare providers. The module of instruction presented a web-based instructional model designed to assist primary healthcare providers in an effort to increase their knowledge of AD. Augmented by a PowerPoint presentation, the module covered an easily accessible and efficient general overview of AD to include treatment and management strategies in the care of older adults with memory loss and cognitive impairment due to dementia caused by AD. Busy primary

care providers need quick access to educational resources while caring for patients, especially during routine clinical office visits, which increase the probability of early detection of AD. This educational intervention covered specific course content about AD, which included demographics, pathophysiology, diagnosis, treatment, community resources, and differential diagnosis. The investigator also incorporated a few of the features provided in the manuscript by Armstrong and Parsa-Parsi (2005).

Ceiling Effect. The ceiling effect is observed when the independent variable no longer has an effect on the dependent variable, or the level above which variance in an independent is no longer measurable. It occurs when a majority of values cluster at the upper limit of a measurement scale. Hence, test scores have little variance.

Significance of the Study

Because AD is classified as the most common cause of dementia, education of health care provider trainees on the topic of AD is the focus of this study. Primary health care providers are usually the first clinicians to whom individuals present with symptoms of dementia. Timeliness and accuracy of a dementia diagnosis are increasingly relevant in respect to the growth of the aging U.S. population. The growing number of older adults plagued by AD implies that primary health care providers have inherited an increasingly important role in detection, diagnosis, and management of these patients and families.

This study attempts to increase content knowledge of AD among primary health care providers in an effort to enhance early recognition of characteristic features of Alzheimer's dementia. The development of dementia due of Alzheimer disease should not be viewed as a normal part of aging. It is therefore critical that AD dementia is detected early. Early detection gives the provider, the individual, and family an

opportunity to identify resources and initiate appropriate management options (Albert et al., 2011c; Jack et al., 2011; Sperling et al., 2011; Valcour, Masaki, Curb, & Blanchette, 2000). Researchers have suggested that this strategy allows the individual with AD to look forward to a better quality of life as the illness progresses (Chodosh et al., 2006a). People expect health care providers practicing in the primary health care setting today to have a high level of knowledge and skill to recognize various presentations of dementia during clinical assessment of the older adult. Evidenced-based reviews have reported that early indicators of cognitive decline due to dementia AD are commonly undetected, misdiagnosed, or attributed to normal aging (Cordell et al., 2013).

Chapter II

Review of the Literature

A literature search was performed to address level of knowledge of health care providers in the primary health care setting and the relationship between early detection and diagnosis of dementia due to AD. Numerous studies were generated after searching key terms such as AD education, dementia, Alzheimer's Disease Knowledge Scale, primary health care providers, knowledge of AD, early detection, and primary health care. Findings revealed that many physicians, researchers and educators have identified diverse factors, which contribute to missed or delayed diagnosis of dementia in the primary care setting. Research studies have been investigating vaccines, genetic interventions, and hundreds of medications to conquer AD. Subsequently, there has been an explosion of knowledge among scientific researchers related to the biology of AD, biomarkers, genetics, care giving, health disparities, risk factors, testing therapies, translation of new knowledge, detection and prevention (Cook et al., 2008; Mueller, McConahey, Orvidas, Jenkins, & Kasten, 2010; Vaughn & Baker, 2001).

Second only to cancer, AD has predominated as one of the most feared illnesses in the United States and around the world. According to the Alzheimer's Disease 2012-2013 Progress Report, the U. S. Department of Health and Human Services (HHS) unveiled the National Plan to Address Alzheimer's Disease. This initiative was a coordinated national effort designed to address major challenges presented by AD. Its activities included identification of trends, exploration of opportunities in Alzheimer's research, assessment of the impact of AD, and it provided a mechanism to report advances and challenges in Alzheimer's research. Physicians and scientists have

navigated new pathways never discovered before from their laboratories and medical practices to expand their existing scope of AD.

Implementation of early detection strategies and management of dementia caused by AD in primary care settings have offered clinical challenges for health care providers. User-friendly practical guidelines for detection of dementia have been developed for busy primary health care providers (Galvin & Sadowsky, 2012; Mueller, 2009; 2015; Vaughn & Baker, 2001).

Theoretical Framework

Researchers have found that the web-based educational environment is increasingly utilized by adult learners and should be adapted based on changing learning needs (Cercone, 2008). Two conceptual educational theories were applied to build the theoretical framework for this study: Self-Directed Learning (SDL) and the theory of andragogy. SDL is described as an adult education concept where learning is self-planned. Personal and informal learning concepts are incorporated which are commonly influenced by individual learning needs during various life transitions (Roberson & Merriam, 2005).

The theory of andragogy was primarily derived from adult learning with emphasis on creation of self-directed learners who will be confident and accountable for their choices. Malcolm Knowles, the theorist commonly associated with theory of andragogy, articulated his theory for adult learning in the book, *The Modern Practice of Adult Education* (Darden, 2014). Knowles (1980) defined andragogy as “the art of science of helping adults learn” (Knowles, 1980, pg. 43). The underlying basis of andragogy principles prioritize the process of learning as opposed to the content of the subject matter

being taught in adult education. Andragogy addresses principles of instructional design such as an adult's readiness to learn, the role of the learner's experiences, the instructor as a facilitator of learning, an adult's orientation to learning, and the learner's self-concept. The andragogy model for adult learning formulates a set of major assumptions about how adults learn as quoted by Derrick Darden (2014):

The andragogy model is based on a set of four assumptions related to the concepts that adult distance learners must possess the ability, the need and the desire to control, and be responsible for their learning: The Adult learners' self-prospective moves from dependency to independency of self-directedness.

Furthermore, the instructor must advocate a more practical, relevant, self-directed and self-motivated instructional style (Darden, 2014, p. 810).

This postulate was applied in this study because adult learning theory places the instructor in the role of facilitator who creates an atmosphere for self-directed learners (Roberson and Merriam, 2005).

By integrating the theoretical concepts of andragogy and self-directed learning into the structure of a web-based unit of instruction, the expectation is that it would render the opportunity to effectively address AD educational needs of primary health care providers. It would also acknowledge their needs as self-directed learners and validate the role of the instructor as a facilitator who would direct the delivery of instructional content. The web-based unit of instruction presented in this study employed these essential features utilizing web-based technology to facilitate SDL.

Geriatric Education in the Health Professions

As early as 1994, leaders in medicine and medical education have strongly

advocated a curriculum for medical students which essentially focused on clinical geriatric training taught in long term care and acute care settings. Researchers have reported that a high level of knowledge and confidence is necessary to recognize dementia caused by AD. Evidence has shown that health science academic institutions have incorporated geriatric education into the health professions curriculum for more than three decades, but still struggle to meet the enormous needs of an aging society. There is reason to wonder just how much formal education physicians and advanced practice nurses receive as part of their formal education (Barry, 1994). Several research reports included in this section were somewhat dated, but they served as necessary references due to the paucity of more up to date resources.

Warshaw & Bragg (2003) conducted a longitudinal study of training and practice related to geriatric medicine and fellowship programs in the United States through 2002. Their study indicated that support for development of geriatric medicine programs came from the National Institute on Aging, the Institute of Medicine, and Veterans Health Administration initiatives. In addition, leadership and investments by the public sector and private foundations contributed enormous support. Remarkable progress was made in respect to geriatric medicine training as well as certification of internists and family physicians in geriatric medicine. However, this growth did not match the number of certified geriatricians in the workforce needed to meet the growing population of older adults.

Bragg and Warsaw (2005) reported that experts in the various medical specialties who served on residency review committees (RRCs) of the Accreditation Council for Graduate Medical Education (ACGME) developed training standards to prepare residents

and fellows to practice medicine. Program requirements were reviewed to identify specific curriculum criteria related to geriatrics medicine training (Bragg & Warshaw, 2005). To determine whether changes had occurred since an earlier 2002 study, Warsaw and colleagues comparatively conducted a similar national geriatrics workforce survey in 2005, initiated by the Association of Directors of Geriatric Academic Programs (ADGAP). This status report suggested no significant changes. Geriatric training was established as a three-year training program, most often offered in block format. Clinical instruction was primarily structured around principles of geriatric care and training was largely dependent on nursing home facilities, ambulatory care settings, and geriatric assessment centers. Internal medicine residency programs focused training on preparation of physicians to care for the baby boomers (Warshaw, Bragg, Thomas, Ho, & Brewer, 2006).

Bardach and Rowles (2012) conducted a case study and examined semi-structured interviews of curriculum personnel in an effort to determine the progress of geriatric education in several health professions. Findings revealed that geriatric training varied among the health professions. Participants recognized the unique needs of older adults and respected the inclusion of geriatric training. Several barriers to improving training opportunities were identified, specifically, lack of geriatric-trained educators, absence of financial incentives, and time restraints. Low student demand was also identified as a barrier to training which was consequent to limited exposure to older adults and gerontological stereotyping. Overall, geriatric medical education has been improving in the last thirty years. It was suggested that new resources and new strategies are needed to meet future challenges (Saunders, Yeh, Hou, & Katz, 2005; Bardach & Rowles, 2012).

Unlike specialists in neurology, geriatrics and psychiatry, physicians and APNs who specialize in family practice, providers in general practice and internal medicine often lacked comprehensive education and experience related to dementia care (Parmar et al., 2014; Vickrey et al., 2006; Callahan et al., 2006; Bryant-Lukosius, Dicenso, Browne, & Pinelli, 2004; Newhouse et al., 2011; Baloch, Moss, Nair, & Tingle, 2010).

Various authors have investigated student perspectives related to prognostic tests for AD and knowledge about this disease among students studying medicine and psychology. A group of researchers in 1997 reported that students lacked adequate knowledge, and perceived little opportunity to gain a good understanding about AD from prognostic tests. Students argued the importance of such complex testing and doubted its benefits. Few students preferred to have predictive tests themselves, especially when there was no effective treatment for AD and the emotional burden of knowing. Disclosure of an AD diagnosis allowed the opportunity to make plans for the future (Welkenhuysen, Evers-Kiebooms, & Van den Berghe, 1997).

Jefferson (2012) and colleagues examined the effect of the Partners in Alzheimer's Instruction Research Study Program (PAIRS) on enhancement of medical education in service related learning. On analysis of the reflective essays of medical students, the investigators found that when medical students were given the opportunity to be personally engaged in the daily lives of patients with AD dementia, they gained humanistic insights, enriched understanding, and positive attitudes towards dementia. Such experiences help medical students to embrace the concept the importance of treating the person as well as the disease (Jefferson, et al., 2012).

In a research study of knowledge and abilities of nursing students, investigators

used Palmore's (1988) Facts on Aging Quiz and the Alzheimer Disease Knowledge Test (ADKT) developed by Dieckmann, Zarit, Zarit, and Gatz (1988). Older students, seniors, and those who reported knowing more about AD scored higher on the instruments than those students who had previous personal or educational experiences with AD. Having knowledge of aging did not prove to be a factor in relationship to having knowledge of AD (Edwards, Plant, Novak, Beall, & Baumhover, 1992).

A team of researchers used the ADKT in a study to assess knowledge of practicing nurses about AD by comparing groups of nurses in the United States to nurses in Hong Kong. This team of researchers found that nurses who were experienced with AD patients, had specific training on AD, and reported greater knowledge about AD were, indeed, more knowledgeable. Overall, their findings advocated more training for nurses in the United States and in Hong Kong (Anderson, Day, Beard, Reed, & Wu, 2009; Nagy, Beal, Kwan, & Baumhover, 1994).

Accuracy of Primary Care Providers in Recognizing Alzheimer's Disease

Early diagnosis of dementia of the Alzheimer's type benefit both patients and caregivers. Various researchers have pointed out that general practitioners often incorrectly recognize dementia. Similarly, some researchers have also made the observation that physicians on a whole may not be adequately trained in geriatrics and dementia care (Bradford, Kunik, Schulz, Williams, & Singh, 2009; Morley, Paniagua, Flaherty, Gammack, & Tumosa, 2008; Savva & Arthur, 2015; Sayegh & Knight, 2013).

Educational intervention models have been successful in increasing the number of AD diagnoses and improving perceptions, knowledge, and collaboration among health care providers in primary care (Perry et al., 2008). Evidence from several case-

management studies reported evidence that teaching sessions, decision-support software, and modification of service pathways improved documentation of dementia diagnosis, stakeholder satisfaction, provider care, and autonomy (Fortinsky et al., 2014).

Educational outcomes were more positive when practice protocols were utilized (Koch & Iliffe, 2011).

Continuing Education Considerations

According to some intervention studies, geriatrics has not been consistently infused in health science programs, and health care professionals lacked adequate education in the area of geriatrics (Bardach & Rowles, 2012; Barry, 1994; Saunders et al., 2005). The results of other studies indicated above average knowledge among health care professionals and an interest in learning more about geriatrics. Preference for training materials included videotapes and CD-ROM courses, and the preferred location for educational activities was community-based. An interdisciplinary approach to geriatric care was the preferred method of care management (Goins, Gainor, Pollard, & Spencer, 2003).

A study conducted by Chodosh and colleagues of primary care providers explored the effect of a comprehensive care management program on knowledge, attitudes, and perceptions of quality of dementia care in clinics. Analysis of the evidence showed few differences in provider knowledge or attitudes in regards to dementia care. The conclusion also suggested that this care model's effect on quality was primarily mediated through other components of the care management program (Chodosh et al., 2006b).

Researchers in another study came to the consensus that primary care providers customarily assessed older adults in primary care clinics, and subsequently these

providers had the advantage to discover early indicators for AD. When confronted with diagnostic or management challenges, referral to a specialist became the preferred alternative by primary care providers in urban locations. This was rarely the norm for primary care providers in rural locations because specialists may not have been easily accessible (Galvin, Meuser, & Morris, 2012).

The Clinician Partners Program (CPP) represented an educational intervention to afford rural health care providers an opportunity to access AD education as reported by researchers. The primary impetus behind this innovative approach was to increase knowledge and confidence of primary health care providers in the diagnosis and care of patients with Alzheimer's dementia. The program also served as a means to implement a strategy to enhance recruitment of participants from rural communities in dementia research. Participants, physicians, advanced practice nurses, social workers, and psychiatrists who participated in the CPP engaged in a course of instruction which included didactic, observational, and skill-based teaching strategies. Evaluation results indicated that the CCP was an effective educational intervention and program goals were accomplished as expected (Galvin et al., 2012).

Another study used a correlation research design to measure the influence of ageism attitudes related to memory, aging and knowledge of AD among college students and mental health professionals. Participants in the study completed the *Knowledge of Memory Aging Questionnaire*, the *ADKT* and the *Fraboni Scale of Ageism* before and after a lecture on normal and pathological memory issues in adulthood. The final analysis revealed that mental health professionals had more positive attitudes about ageism than college students (Jackson, Cherry, Smitherman, & Hawley, 2008).

Pucci and associates recruited a sample of Italian general practitioners (GPs) and administered an Italian version of the University of Alabama at Birmingham's *Alzheimer's Knowledge Test for Health Professionals* to verify the test's ability to differentiate AD specialists and non-specialists. The evidence suggested that continuing medical education (CME) programs for GPs should largely focus on dementia (Pucci et al., 2004a).

Barriers to Early Detection

Correcting biased perceptions about old age and dementia has been a daunting challenge for many researchers. These attitudes have impeded the capacity of health care providers to provide the best care for aging clients due to implicit bias. Many researchers have cited various impediments to detection of dementia namely: extraordinary proportions of misdiagnosis, incorrect usage of medications, lack of social service referrals, and time restrictions. Other researchers discovered that a large number of primary care physicians harbor defeatist perceptions about dementia. They perceive memory loss as a normal indication of aging rather than viewing it as a medical condition related to cognitive impairment. Health care professionals who use routine history and physical examination seldom diagnose dementia during clinic visits as a common practice. These findings supported the theory that individuals who presented with mild to moderate memory and thinking changes have been rarely given a dementia diagnosis by their primary care physician (Boise, Morgan, Kaye, & Camicioli, 1999a; Meuser, Boise, & Morris, 2004). Boise (1999b) and Meuser (2004) quoted additional barriers to timely diagnosis and treatment of dementia: "(1) Failure to recognize key symptoms and respond accordingly, (2) perceived lack of need to diagnose, (3) limited time available for

such assessment, and (4) negative attitudes about the importance of assessment and differential diagnosis ” (Boise et al., 1999; Meuser et al., 2004). Their research suggested that AD education for health care providers combined with use of screening tests in the primary health care setting may be the key to identification of persons at risk for vascular dementia and undiagnosed AD (Boise et al., 1999; Meuser et al., 2004).

Researchers have found that general practitioners (GPs) share similar views in respect to clinical practice barriers that influence delays and misdiagnosis of dementia of the Alzheimer's type in clinical practice settings. Results of several studies reported several reasons for deferment of early diagnosis: disclosure and communication of a dementia diagnosis, diagnostic ambiguity during the early stages, inconsistent consultation patterns, and lack of time. The majority of GPs preferred to identify signs and symptoms of dementia at an early stage as opposed to diagnosis at more progressed stages to provide individuals the opportunity to stay at home for a longer period of time (Bamford, Eccles, Steen, & Robinson, 2007; van Hout, Vernooij-Dassen, Bakker, Blom, & Grol, 2000).

Innovations in research have made a tremendous impact on enhancement of knowledge related to the etiology of AD, early detection and diagnosis, treatment and management. The health care arena for dementia care has changed for the better. Physicians and nurse practitioners who provide primary care or specialty services to older adults have advanced in their position as the preferred point of contact when individuals and their families report observed changes in memory and thinking. Primary health care providers have been inherently placed in a position to diagnose and treat dementia more

often due to increased volumes of individuals with dementia and inadequate access to memory care specialists (Callahan, Boustani, Weiner, et al., 2011).

From a public health perspective, researchers have reported that delayed recognition of dementia in primary care has been reported in not only the United States, but also detection of dementia syndromes has been problematic in the United Kingdom (UK), especially at the early stages. Iliffe et al. (2012) endorsed increasing prevalence of dementia in industrialized societies and recognized it as a substantial contributor to disability. Similarly, as in United States, the combined cost of care for people with AD in the UK was reported greater than the annual expenditure on heart disease, stroke and cancer. A group of researchers in the UK found delayed diagnosis of dementia was common in community settings, but the causes were poorly understood. Specialists identified lack of diagnostic skills among primary care physicians as the main cause and remedied these limitations with training and the use of brief instruments for assessment of cognition. This strategy had little impact. Subsequently, integration of psychological, social, and economic issues were considered in respect to the needs of individual patients and their care givers and community resources were utilized (Iliffe et al., 2012).

It has been reported that AD has caused suffering among millions of people who have been compelled to cope with their loved one's steady and irreversible decline in cognition, functioning, and behavior. Primary care physicians may fail to recognize the first signs of AD or misdiagnose the disorder, which perpetuates myths and fallacies about the disease. Particularly, one misleading notion is that when the early signs of AD dementia present themselves, this was considered "just old age" or "just senility" (Small et al., 1997).

Many dementia patients have benefited from progress that has been made in understanding the diagnosis and treatment of AD and related disorders. Timely and accurate diagnosis can help to avoid the use of expensive medical resources and allow patients and family members time to prepare for future medical, financial, and legal tribulations. While there has been no current therapy found that can reverse the progressive cognitive decline associated with the disease, current drug treatments for dementia of the Alzheimer's type may temporarily improve symptoms of dementia. Fortunately, several pharmacologic agents and psychosocial measures have been shown to provide relief for depression, psychosis, and agitation often linked to dementia. Drug treatment may help modestly with relative clinical stability for many patients if initiated upon early diagnosis (Rodda & Carter, 2012).

Education and Training Needs of Primary Care Providers

A group of researchers conveyed that the matter of early detection was marginally addressed in 1994 when the practice parameter, *Diagnosis and Evaluation of Dementia*, was published. In 1997, the American Association for Geriatric Psychiatry, the Alzheimer's Association and the American Geriatrics Society convened a Consensus Conference on the Diagnosis and Treatment of Alzheimer Disease and Related Disorders. As a result, the consensus panel which was comprised of experts from psychiatry, neurology, geriatrics, primary care, psychology, nursing, social work, occupational therapy, epidemiology, and public health advocated inclusion of documents on detection, diagnosis, evaluation, and treatment of AD and dementia directed at primary care providers (Daviglius et al., 2010; Lathren, Sloane, Hoyle, Zimmerman, & Kaufer, 2013; Petersen et al., 2001).

A workgroup was established in 2011 to update the criteria for diagnosing AD. This workgroup was responsible for making the criteria appropriate for adaptation and ease of application for health care professionals (McKhann et al., 2011). They explored queries related to how providers distinguished changes in an individual's normal memory and thinking processes in comparison to other potential causes of cognitive decline. It was the expectation that revised criteria would direct future research and advance detection efforts for early changes that take place in the brain that could lead to the development of AD.

According to their findings, experts suggested that the revised guidelines lacked specific directives that would change the current methods used by health care providers to diagnose AD. Their investigation motivated health care providers to consider additional indicators that could mark the onset of dementia, such as progressive change in judgment and problem solving abilities. As a result, awareness was raised among health care providers about mild cognitive impairment (MCI). It was discovered that MCI may progress to AD and that memory impairment was not always recognized as the first symptom of AD. As a result, the workgroup made recommendations to implement strategies that could be used to evaluate potential causes of memory loss and progressive cognitive decline (Albert et al., 2011d; McKhann et al., 2011b; Robinson, Tang, & Taylor, 2015).

Cordell (2013) and colleagues presented an assumption that if better screening procedures were established and if diagnostic guidelines were widely disseminated, clinicians would increasingly recognize MCI and closely monitor those persons at risk for cognitive impairment and AD during the Annual Wellness Visit (AWV). The AWV

algorithm was utilized in Cordell's study, which was expected to provide primary care providers with guidance on use of structured cognitive assessment tools to be used by both providers and informants during the Annual Wellness visit. In addition, the goal of the AWV was to influence those individuals who reported early signs of memory loss that often progressed to AD. As a strategy to detect cognitive impairment, there was a component of the AWV guidelines that allowed health care providers the opportunity to be compensated. The results of this study recommended that the AWV be accompanied by counseling related to available community resources, long-range planning options, and education interventions (Cordell et al., 2013).

In review, the literature review identified numerous evidence-based sources authored by groups of researchers and educators who have identified diverse factors that contributed to missed or delayed diagnosis of AD in the primary care setting (Perry, Draskovic, Lucassen et al., 2011). Use of practice guidelines were advocated as a primary resource used by primary care providers as they sought innovative approaches to detect, diagnose, and treat AD. Ongoing research efforts offer hope to countless dementia patients and their families. Since research has advanced more quickly on the diagnostic methods than on the therapeutic strategies, early biomarker diagnosis have been known to offer the greatest advantage to researchers. The value of early detection and diagnosis of AD in clinical settings can be optimized when AD knowledge is enhanced and more practical, and possibly even preventative treatments become available.

There were clear implications for increased knowledge about AD among primary health care providers in order to enhance early recognition of DAT. Web-based

curriculum for health professionals often resulted in improved outcomes, and stronger physician interest in CME (Crenshaw et al., 2010).

Chapter III

Methodology

The primary purpose of the study was to systematically inquire about the impact of AD education on level of knowledge about AD among primary health care providers based on the standardized ADKS and its seven content knowledge domains. The investigator examined a Web-Based learner-focused instructional method to determine whether the ADKS model had an influence on knowledge level about AD. The investigator identified two factors: AD education about Alzheimer's disease (independent variable) and level of knowledge based on the seven AD content knowledge domains (dependent variable). A Web-based learner-focused instructional module about AD was designed by the investigator as a means to assure comprehensive content coverage and content relevance while upgrading conceptual knowledge of AD among primary health care providers. The criteria used in the design of the AD instructional module was based on Carpenter's Alzheimer's Disease Knowledge Scale (ADKS). The research hypothesis was stated as follows: primary health care provider trainees receiving education would exhibit a significant increase in mean post-test total scores when compared to their mean pretest scores and would exhibit an increased level of knowledge about AD overall and within each of the seven content knowledge domains based on Carpenter's ADKS model compared to a control group.

Theoretical Framework

Researchers have found that the web-based educational environment has been increasingly utilized by adult learners and should be adapted based on changing learning needs (Cercone, 2008). The theoretical framework described as Self-Directed Learning

(SDL) was applied in this study. SDL is described as an adult education concept where learning is self-planned.

Integrating the theory of andragogy into the structure of a web-based unit of instruction made it possible not only to address the needs of primary health care providers, but also acknowledged their requirements as self-directed learners and validated the role of the instructor as facilitator in delivery of instructional content. Participant selection, reliability and validity properties of the knowledge assessment instrument, instruments used to gather data, and data collection procedures were covered in the following section.

Participant Selection

In this study, the investigator collaborated with program directors and faculty members from two academic and clinical settings – a medical school and a college of nursing in a metropolitan area of Missouri to select a convenience sample of 65 health care provider trainees. After collecting data from the demographics survey, the original number of registered participants (N=65) agreed to participate in the study. Three (3) of the participants were eliminated because they partially completed the pre-test or post-test criteria. Seven (7) participants did not complete the demographics survey, and they were also eliminated. Consequently, two (2) of these seven (7) participants were the same participants who were already eliminated because they only partially completed the pre-test or post-test criteria. Upon completion of the elimination process, fifty-seven trainees (N=57) completed the study. The study participants consisted of volunteer primary health care provider trainees who were randomly assigned to the treatment group (N=30) or the control group (N= 27). These health care provider trainees were identified as

nursing students, medical students, residents, and fellows. Participants were expected to have varying levels of existing knowledge and personal experience with AD. Some participants may have had experience with AD because relatives or friends were diagnosed with AD while others may have had no close relatives or friends who had experienced AD. It was expected that health care providers in training, whose curriculum included dementia care, would have some prior knowledge about AD.

Participants were limited to health care provider trainees who provided care to adults in the age range of sixty-five years or older. As suggested, the rationale for targeting primary care physician trainees and nurse trainees was based on the premise that as students and graduate professionals, they would be more likely to be the first health care providers to encounter individuals who demonstrated signs and symptoms of dementia related to AD. These trainees would likely endure the challenge of managing dementia care throughout the progression of an individual's dementia illness (Salloway & Correia, 2009).

Total time of involvement in the study was approximately 60 minutes with consideration for previous knowledge and experience with AD. For time and effort, program directors were given the option to offer a gift card or the addition of grade points to encourage participation. No anticipated risks were associated with this research study. Participation was strictly voluntary, and the researcher used caution to maintain confidentiality. The delivery of instruction designed by the researcher was made available to the participants by web-based learning. This method has been shown to be an increasingly growing choice for primary health care professionals with demanding schedules who seek easily accessible options for continuing education.

Instruments

The following is a sequential description of what participants would expect once an interest was expressed in study participation and access was gained into the study web site.

Demographic survey. As seen in Appendix B, the demographic survey included items related to individual demographics, such as: education; age range; race/ethnicity; gender; professional field of practice; length of practice; and percentage of practice focused on dementia care. Other items included percentage of patients diagnosed with AD; a neuropsychiatric disorder or other dementing illness; percentage of patients who resided in a long-term care facility; knowledge level about AD; confidence level; prior experiences with AD, and most useful training materials. Except for questions 1, 4, 5, 6, 7, 14, 15, and 16 (see Appendix F), all items were measured on a Five-Point Likert Scale where participants were given various options to respond based on the structure of the questions within the survey. Google forms was used to create the demographics survey.

Alzheimer's Disease Knowledge Scale (ADKS) pre/post-test survey. The ADKS was employed in this study as the pre-test/post-test survey as it appears in Appendix F. The Scale consists of 30 true-false items, resulting in a maximum score of 30. It was utilized to assess the knowledge of primary health care provider trainees about AD *before* completion of the AD instructional module. Although the researcher recognized that the ADKS was not an exhaustive assessment tool, it was also utilized because of its demonstrated ease of use, measures of reliability and validity, and applicability to test knowledge of AD among different groups; namely, health care professionals, students, caregivers, and lay people. The rationale for utilizing the ADKS

as the post-test evaluation was to assess change in knowledge level of health care providers about AD *after* completing the AD unit of instruction both generally and within seven content knowledge domains (Carpenter et al., 2009).

Reliability and validity of the ADKS. The ADKS has been shown to be an appropriate assessment and it has demonstrated good psychometric properties. An analysis of the scale's psychometric properties suggested it had adequate test-retest reliability, $r = .81$, $p < .00$, and has internal consistency, $\alpha = .71$, as well as adequate validity (content, predictive, concurrent, and convergent) (Carpenter et al., 2009).

ADKS model. The researcher developed a model to visually display the seven content knowledge domains as shown in Figure 1 Each of the 30-items on the test were classified into one of the seven content knowledge domains. The domains have been identified as the following: *life impact* (items 1, 11 and 28); *risk factors* (items 2, 13, 18, 25, 26 and 27); *symptoms* (items 19, 22, 23, 30); and *treatment and management* (items 9, 12, 24 and 29). In addition, the remaining domains included *assessment and diagnosis* (items 4, 10, 20 and 21); *care giving* (items 5, 6, 7, 15 and 16); and *course of the disease* (items 3, 8, 14 and 17). Examination of change in the seven content knowledge domain scores allowed assessment of the unit of instruction for each of the domains.

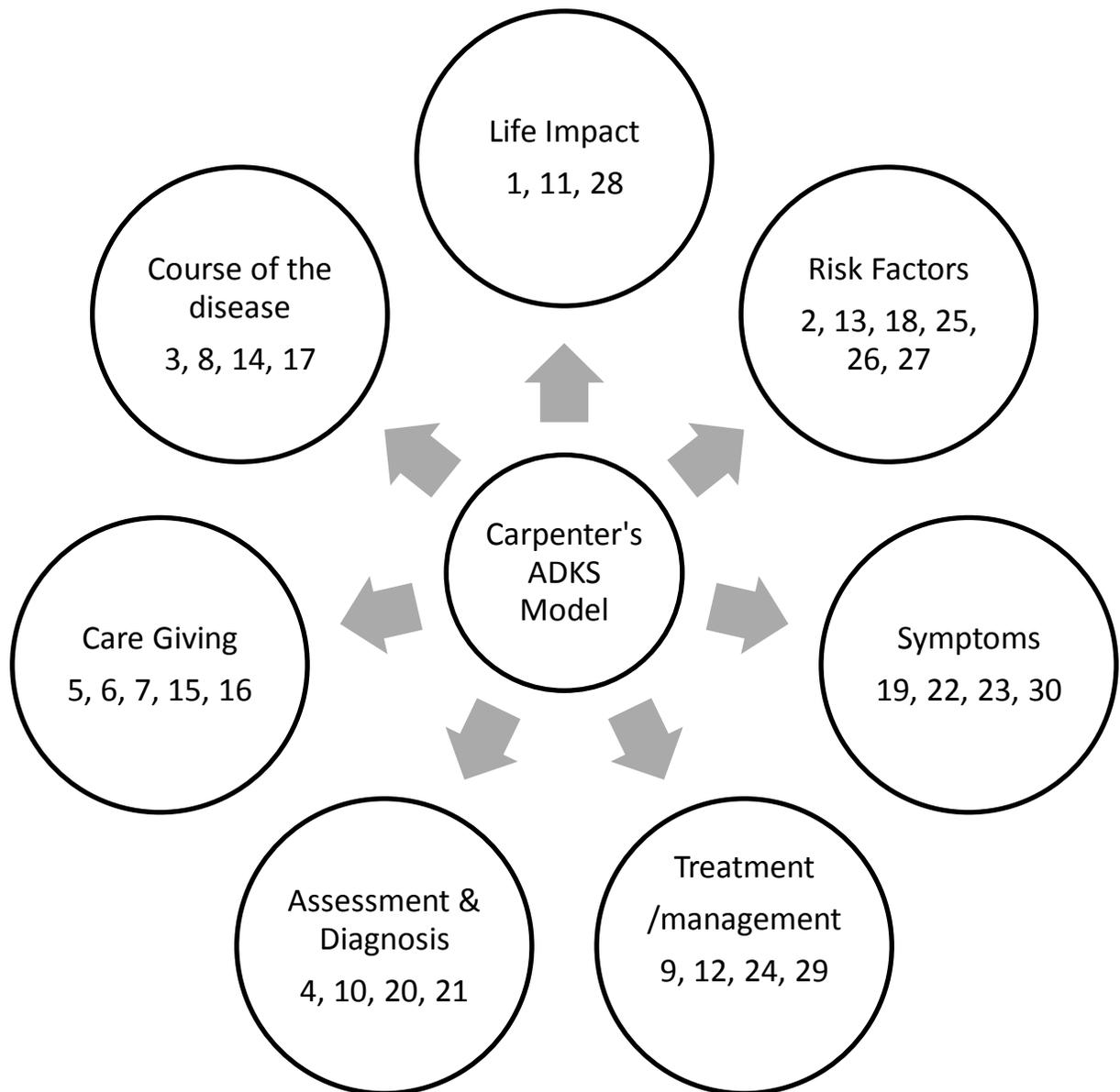


Figure 1. Carpenter's ADKS model of content knowledge domains. The knowledge content domains are shown with the scale's item numbers associated with that domain.

Web-based learner-focused instructional module. Following completion of the pre-test, participants were directed to complete the Web-Based Learner-Focused Instructional module (See Appendix D). This instructional module about AD was developed by the investigator to serve as an accessible educational resource for health care providers to increase knowledge about AD, and subsequently, to augment efforts in early detection of cognitive impairment in the primary care setting. The content presented in a Power-Point Presentation enabled easy access to an efficient and comprehensive overview of AD.

Specific content of the Web-based learner-focused instructional module about AD was included to enrich the knowledge of health care providers about AD. Participants were able to complete several learning objectives: 1) Outline the characteristics and effect of AD; 2) Summarize the pathophysiological changes in the brain related to dementia and Alzheimer's disease; 3) Review clinical manifestations of AD in various stages; 4) Identify the goals and components of the diagnostic workup; 5) Describe the appropriate pharmacological and non-pharmacological management of AD, 6) Discuss components of care in working with patients with AD, including planning issues facing the family after the diagnosis is made, rehabilitation, and management of coexisting illnesses; 7) Describe interventions for impaired communication; 8) Describe several behavioral management skills and examples of successful interventions for specific behaviors common to AD patients; 9) Describe the care required by those with end-stage Alzheimer's disease; and 10) Describe interventions for providing support to the family (Carpenter et al., 2009).

Procedure

An application was submitted to the University of Missouri Saint Louis Institutional Review Board to request exempt review, after which approval to conduct the study was granted.

Informed consent. Informed consent was obtained from all participants by directing them to access the investigator's web site to invite their participation in the study prior to initial participation in the research study as shown in Appendix A. For the purpose of advertisement and as a strategy to contact potential candidates, an informational flyer was provided to interested participants. The purpose of the flyer was threefold: to develop a means by which to advertise the research study; to offer a detailed overview of study components to those who expressed an interest in participating in the study; and to give directions related to how to obtain on-line consent. If interested, each potential subject was given the option to "Agree" or "Disagree" to participate in the study. All participants who selected "Agree" were prompted to establish a computer-generated username and password in order to proceed with completion of study components as a research subject. At all times, the investigator remained anonymous to the identity of the study participants. Only after electronically accessing the on-line research link "AD Education" were potential participants able to review the terms of the informed consent for participation as described in the informational flyer. All information collected for this study was coded so that no individual data was linked to a particular participant. This coded data and the data collected from the assessment instruments was analyzed using a XL Miner Analysis Toolpak add-on for Google Sheets. Information linking individual participants to demographic and content scores was destroyed once the

data files were constructed and successful analysis was completed.

Confidentiality. Confidentiality and anonymity were preserved by application of a number-coding system regarding identification links between individual names of participants to demographic data and test scores. All data collected from participants in this study was coded so that no scores would be linked with respect to any individual participant. Coded data and data files were assembled from the assessment instruments. Data has been stored and secured in Google Sheets files after data analysis was successfully analyzed and finalized using XL Miner Analysis Toolpak add-on for Google Sheets software.

After the informed consent was obtained participants were given the demographic survey. After completion of the demographic survey, the participants (N=57) were randomized into two (2) groups, the Treatment Group (X) (N=30) and the Control Group (Y) (N=27). Knowledge of AD in both groups then was assessed with the ADKS. Treatment Group participants were tested on the ADKS before and after participating in the web-based, learner-focused instructional module. Study components were accessed by participants from a Web site established by the researcher. The Control Group participants repeated the ADKS after approximately 60 minutes.

Design

The primary purpose of the study was to systematically inquire about the impact of AD education on level of knowledge of AD among primary health care providers based on Carpenter's (2009) standardized ADKS. The secondary purpose of this investigation was to determine the level of knowledge about AD among primary health care providers based on the AD seven content knowledge domains as assessed by the ADKS. It was

the two levels of treatment (X_1) while X_2 represented the two time of testing levels, the pretest and the posttest. As demonstrated in Figure 2:

- Let X_1 represent two groups, the treatment and control groups and let X_2 represent the two tests, the pretest and the posttest.
- Participants ($N=57$) were assigned at random to each of four possible combinations of experimental treatments.
- Group A was exposed to the pretest and Group B is exposed to the posttest. Group C was exposed to the pretest and Group D is exposed to the posttest.
- After a period of 60 min, the achievement scores of each participant was measured and the mean score of each of the groups was recorded in their appropriate cells.
- Mean scores were also computed for the pair of groups exposed to the pretest and the posttest. These combined mean scores were placed in their respective row or column.

The two-way Analysis of variance (ANOVA) is an extension of the one-way ANOVA that examines the influence of two different categorical independent variables on one continuous dependent variable. This statistical technique compares the mean difference between groups that have been split into two levels of the independent variable or factor. As a statistical technique to test the null hypothesis, the ANOVA with repeated measures on the second factor was utilized. The primary purpose of a two-way ANOVA with repeated measures was to determine whether there was an interaction between the independent variables and the dependent variable. The two-way ANOVA aimed not only to assess the main variable effect of each level of the independent variables, but also to

determine whether or not there was any interaction between them. The interaction effect occurs when the effect of one variable depends on the value of another variable (Isaac & Michael, 1995).

A mixed design Analysis of Variance was utilized to test for mean differences between two independent groups while subjecting participants to repeated measures. Thus, in this mixed design ANOVA model, one factor acted as a between-participants variable and the other acted as a within-participants variable (Isaac & Michael, 1995b).

In this study, one mean represented the experimental group (treatment group) which received the Web-based learner-focused unit of study about AD as the treatment condition and the second mean represented the control group which was not exposed to the treatment condition. This study examined the effects of one AD instructional method and utilized repeated measures (pretest-posttest) to assess level of AD knowledge based on analysis of mean test scores.

While ANOVA is the first step in the analysis of the 2 x 2 factorial design, it is only a preliminary and exploratory tool. The analysis of variance statistical technique should answer the question: Is the variability between groups large enough in comparison with the variability of within groups variability to justify the inference that the means of the population from which the different groups were sampled are not all the same? More specifically, if the variability between group means was large enough, one could conclude that it probably came from a different population and that there would be a statistically significant difference present in the data.

The particular statistical test utilized to yield the answer was the F-ratio. If an F-ratio was obtained, the researcher would know that somewhere in the data something

other than chance was probably operating (Isaac & Michael, 1995). The F-ratio was represented by the following equation:

$$F = \frac{\text{Between Group Variance}}{\text{Within Group Variance}}$$

Chapter IV

Results

This study operationalized the 2 x 2, group by time of testing, Factorial Quasi-experimental design with repeated measures on time of testing using the Analysis of Variance (ANOVA) statistical technique to test the hypothesis. The Two-Way Analysis of Variance examined the influence of two levels of the independent variables on one continuous dependent variable. The two-way ANOVA compared the mean difference between groups that have been split into two levels of the independent variable or factor (Isaac & Michael, 1995). The primary purpose of a two-way ANOVA was to understand if there was an interaction between the two groups on the dependent variable. The Two-Way ANOVA aimed not only to assess the main variable effect of each independent variable, but it also determined if there was any interaction between them.

Design

The primary purpose of the study was to systematically inquire about the impact of AD education on level of knowledge of AD among primary health care providers as measured by Carpenter's (2009) ADKS. The secondary purpose of this investigation was to determine the level of knowledge about AD among primary health care providers based on the AD seven content knowledge domains. It was hypothesized that primary health care provider trainees receiving education will exhibit a significant increase in overall mean post-test total scores when compared to their mean pretest scores and will exhibit an increased level of knowledge about AD in each of the seven content knowledge domains based on Carpenter's ADKS model, compared to a control group. Two variables were identified: AD education (independent variable) and level of

knowledge about AD in total or in seven content knowledge domains (dependent variable).

The Quasi-experimental design used in this study was the 2 x 2 Factorial Design which is commonly described when two or more factors in an experiment are involved. Such designs are classified by number of levels of each factor and the number of factors. Known as the simplest of the factorial designs, the 2 x 2 Factorial Design permitted the study of the effects of the two treatments in this study, each of which was varied in two ways. This study examined the effects of an AD instructional method and utilized repeated measures of knowledge of AD based on analysis of mean test scores (Isaac & Michael, 1995).

The hypothesis stated in this study was: primary health care provider trainees given education will exhibit a significant increase in mean post-test total scores when compared to their mean pretest scores and will exhibit an increased level of knowledge about AD in each of the seven content knowledge domains based on Carpenter's ADKS model compared to a control group.

A directional research hypothesis was made by the researcher to predict a positive or negative difference, change, relationship, or difference between the two variables of a population. In this study, it was utilized to predict a positive or negative difference between the treatment group and the control group. Based on accepted theory, a one-tailed statistical test is also known as a directional test in which the critical area of a distribution is one-sided, so that it is either greater than or less than a certain value, but not both. The normal distribution for the treatment group and the control group are displayed in Figures 3. and 4.

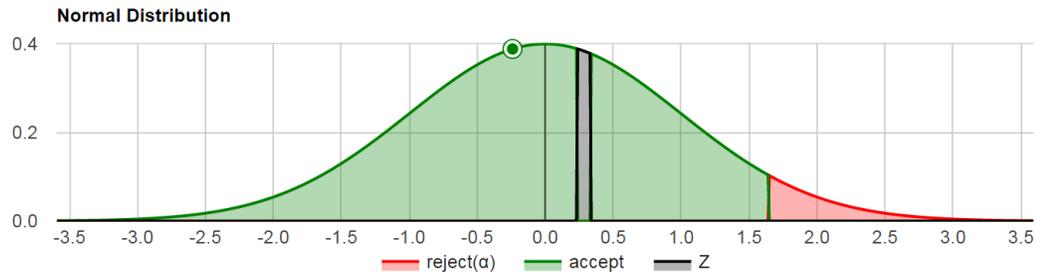


Figure 3. ADKS Scores of treatment group

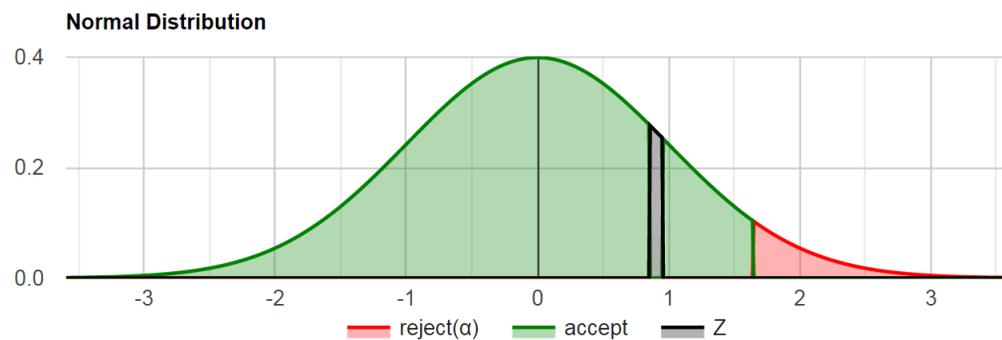


Figure 4. ADKS Scores of control group.

There were three pairs of null hypotheses and alternative hypotheses for the two-way ANOVA:

H0: The means of the groups are equal

H1: The means of the groups are different

H0: The means of the control group are equal

H1: The means of the control group are different

H0: There is no interaction between the treatment and control groups

H1: There is an interaction between the treatment and control groups

The null hypotheses tested by this design for each measure were:

1. There is a significant difference among the means of the two treatment groups and

the means of the two control groups for the dependent measures of the ADKS scores.

2. There is a significant difference among the means of the two treatment groups on the dependent measures of the ADKS.
3. There is a significant interaction between the means of the two treatment groups and the means of the two control groups for the dependent measures of the ADKS scores.

Analysis of Variance Assumptions for Repeated Measures. A Single-Factor Repeated-Measures ANOVA has five required assumptions and they have been listed as the following:

1. Sample data are continuous.
2. The independent variable is categorical
3. Extreme outliers have been removed
4. Sample groups are normally distributed
5. Sphericity exists across all groups

Assuming that the first four required assumptions for repeated-measures ANOVA have been met, sphericity should now be evaluated. Sphericity exists when the variances of the differences between data pairs from the same participants are the same across all possible combinations of sample groups. Remember that all sample groups for a Repeated-Measures ANOVA test consist of measurements taken from the same set of participants at different time intervals or in different conditions. Violation of sphericity makes a Repeated-Measures ANOVA test more likely to produce a false positive or a Type 1 error.

When there is uncertainty that sphericity exists, a correction should be applied to both degrees of freedom which will increase the final *p*-value of the Repeated-

Measures ANOVA test. Increasing the p -value reduces the power of the test (makes it less likely that the test will detect a difference) in order to compensate for the test's increased tendency to produce a false positive result due to the data's violation of sphericity error.

Epsilon estimation corrections. If the sphericity requirement has been violated, then the degree to which sphericity is violated needs to be calculated. The statistic that describes how much sphericity is violated is called an Epsilon Estimation. Epsilon is a number between 1 and 0. The further from 1 that Epsilon is, the greater the violation of Sphericity.

Sphericity can only be estimated because the available data are sample data and not population data. There are two methods commonly used to estimate Epsilon: the Geisser-Greenhouse procedure and the Huynh-Feldt procedure. The estimate of Sphericity (Epsilon) that is calculated for each of these procedures is used to correct the degrees of freedom between and the degrees of freedom error in a way that makes the test less powerful by increasing the final p -value.

The data in this study for the ADKS scores and the seven content knowledge domains, showed that the Geisser-Greenhouse and the Huynh-Feldt epsilon estimations were both 1, and therefore, no correction was needed because sphericity was not violated.

In this study, the selected significance level was $\alpha = .05$ which represents the probability of rejection of the null hypothesis when it would be true. If the p -value was smaller than the $\alpha = .05$, the investigator would reject the null hypothesis. If the F-value was greater than the f-critical, the null hypothesis would be rejected. If the F-value was

less than the f-critical, then the null hypothesis would be accepted.

Statistical Analysis Results

The characteristics of participants within six subgroups of primary health providers were presented in Table 1.

Table 1

Characteristics of the Subgroups (M and SD; n and %)

Characteristics	Participants	1st Yr. Nursing Students	2nd Yr. Nursing Students	3rd Yr. Nursing Students	4th Yr. Nursing Students	Resident	Fellow
	N=57	n=20	n=2	n=8	n=14	n=12	n=1
Age(Years)							
30-50	56	20	2	8	14	11	1
>50	1	0	0	0	0	1	0
Gender							
Male N (%)	14 (25)	4 (20)	0 (0)	1 (13)	2 (14)	7 (58)	0 (0)
Female N (%)	43 (75)	16 (80)	2 (100)	7 (87)	12 (86)	5 (42)	1 (100)
Race							
Caucasian N (%)	45 (79)	16 (80)	2 (100)	6 (75)	14 (100)	6 (50)	1 (100)
African American N (%)	5 (9)	1 (5)	0 (0)	1 (12.5)	0 (0)	3 (25)	0 (0)
Hispanic N,%	3 (5)	2 (10)	0 (0)	1 (12.5)	0 (0)	0 (0)	0 (0)
Asian N,%	3 (5)	0 (0)	0 (0)	0 (0)	0 (0)	3 (25)	0 (0)
Other N,%	1 (2)	1 (5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Education							
BS/BA	38	17	2	7	12	0	0
MS/MA	5	3	0	1	1	0	0
MD/Ph.D.	14	0	0	0	1	12	1

*Note. * indicates out of range.*

Scores on the ADKS revealed a difference across the subgroups of participants who likely showed a different level of knowledge about AD (see Table 2). Residents

scored better on the ADKS than any other subgroup followed respectively by the 2nd year nursing students, the 4th year nursing students, and the 3rd year nursing students.

Internal Consistency

Cronbach's Alpha was used to identify the internal consistency of the demographic survey instrument. The average inter-item correlation for all participants was $\alpha = .79$. The internal consistency of the survey used in this study was acceptable $r = .50, p < .001$. In this study, the correlation for the treatment group showed $r = .85$ and the correlation for the control group showed $r = .62$. See Appendix I for graphs related to the ADKS scores of the subgroups.

ADKS scores. The mean pre- and posttest total scores on the ADKS are shown in Table 2. The first factor consisted of two levels of ADKS scores, the treatment group and the control group. The second factor consisted of two levels for time of testing, the pretest and the posttest. One mean represented the treatment group which received the instructional module of study about AD as the treatment condition and the second mean represented the control group which was not exposed to the treatment condition. Participants were assigned at random to each of two possible combinations of the treatment groups. The treatment group was exposed to the pretest and the posttest. The control group was exposed to the pretest and to the posttest.

The treatment group had higher scores on both the pretest and posttest and both groups scored higher on the posttest. There was an increase in scores between pretest and posttest scores for the treatment group.

Table 2

Two by Two Factor: ADKS Scores

ADKS Scores	Pretest	Post test	M	Difference
Treatment	23.90	25.37	24.64	1.47
Control	22.47	23.47	22.97	1.00
M	23.19	24.42		
Difference	-1.43	-1.90		

Figure 5. shows a graph of the data in Table 2 which showed the interaction of group and time of testing. There was no significant interaction between the means of the treatment group (24.64) and the control group (22.97). Hence, there was no differential benefit from the instructional module realized by the treatment group.

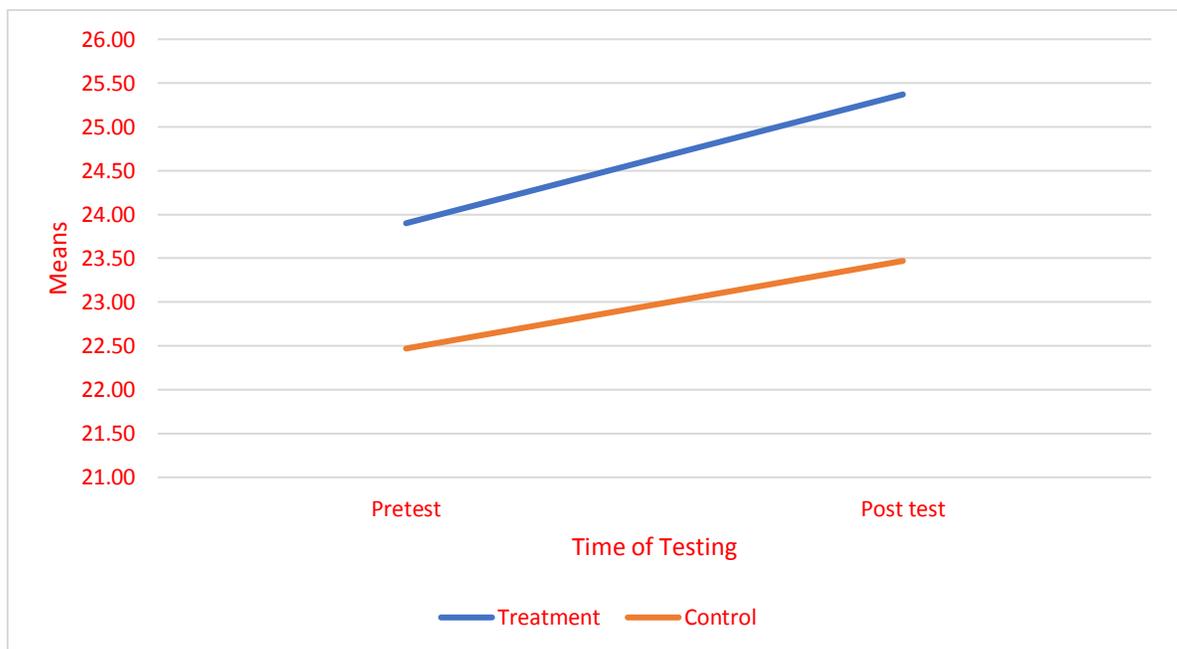


Figure 5. Interaction of group and time of testing

Results of the two-way ANOVA, shown in Table 3, indicated the treatment group had higher scores than the control group, $F(1, 58) = 4.72, p < .03$. The posttest scores were significantly higher than the pretest scores, $p < .00$. The interaction of group by time of testing was not significant, $p > .53$. The research hypothesis was rejected since the education received by the treatment group did not improve the mean post test scores over and beyond improvement of the control group on the post test.

Table 3

ANOVA: ADKS Scores

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	<i>F crit</i>
Between Subjects	1107.20	59.00				
- Groups	83.33	1.00	83.33	4.72	0.03	4.01
- Error	1023.87	58.00	17.65			
Within Subjects	290.00	60.00				
- Testing	45.63	1.00	45.63	10.90	0.00	4.01
- Interaction	1.63	1.00	1.63	0.39	0.53	4.01
- Error	242.73	58.00	4.19			
Total	1397.20	119.00	11.74			

Descriptive results of ADKS Scores for underclassmen, 4th year nursing students, and residents. On examination of the mean pre and posttest scores for knowledge of the ADKS for underclassmen (1st, 2nd, and 3rd Year nursing students combined), 4th Year nursing students, and residents (the fellow was combined with the residents) as shown in Table 4, there was a difference between the group means for the ADKS scores. The data demonstrated a difference in knowledge levels as evidenced by ADKS scores from the pretest to the posttest. The comparison between the mean scores and standard deviations for the underclassmen (24.08, 1.06), 4th year nursing students (26.04, 1.26), and residents (25.21, 0.11) indicated that the 4th year nursing students

showed the highest mean scores. The 4th year nursing students (25.14) and the residents (25.13) showed similar pretest scores and the 4th year nursing students gained (1.79) more knowledge than the residents (0.16). The underclassmen had the lowest pretest scores (23.33), however, they showed an increased gain in AD knowledge (1.50).

Table 4

Means of ADKS Scores for Underclassmen, 4th Year Nursing Students and Residents

Subgroups N= 57	<i>Pretest</i>	<i>Post test</i>	<i>M</i>	<i>SD</i>	<i>Difference</i>
Underclassmen* N=30	23.33	24.83	24.08	1.06	1.50
4 th year Nursing Students N=14	25.14	26.93	26.04	1.26	1.79
Residents* N=13	25.13	25.29	25.21	0.11	0.16

**Note: 1st, 2nd, and 3rd year nursing students combined.*

**Residents and fellow combined.*

The one-way ANOVA in Table 5 which shows the results of the ADKS scores for underclassmen, 4th year nursing students, and residents indicated that there was no statistical difference in knowledge level between the groups, $F(2, 3) = 2.11, p > 0.27$.

Table 5

ANOVA: ADKS Scores for Underclassmen, 4th Year Nursing Students, and Residents

Source of Variation	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	<i>F crit</i>
Between Groups	3.84	2	1.92	2.11	0.27	9.55
Within Groups	2.73	3	0.91			
Total	6.57	5				

Table 6 shows the seven ADKS content knowledge domains and the percentage of correct scores among the healthcare provider trainees. Four domains stood out as having the lowest scores; Symptoms (percent correct) = 79%, Risk Factors (percent correct) = 80%, Care Giving (percent correct) = 84%, and Life Impact (percent correct) = 87%.

Table 6

Scores by Subgroup and Content Knowledge Domain

Professional Health Care Provider Trainees									
Domain	# Items	Participants		1st Yr. Nursing Students	2nd Yr. nursing Students	3rd Yr. Nursing Students	4th Yr. Nursing Students	Residents	Fellow
		M/SD	% Correct	M/SD	M/SD	M/SD	M/SD	M/SD	M/SD
Life Impact	3	2.60	87%	2.45	3.00	2.38	2.79	2.67	3.00
Question		(0.24)		(0.38)	(0.00)	(0.22)	(0.37)	(0.38)	(0.00)
Risk Factors	6	4.82	80%	4.95	5.00	4.38	4.86	4.83	5.00
		(0.76)		(1.09)	(1.55)	(1.00)	(0.84)	(0.61)	(2.45)
Symptoms	4	3.14	79%	2.90	3.50	3.00	3.43	3.33	2.00
		(0.52)		(0.81)	(1.00)	(0.71)	(0.52)	(0.54)	(2.31)
Treatment/	4	3.65	91%	3.75	4.00	3.25	3.64	3.75	3.00
Management		(0.26)		(0.19)	(0.00)	(0.50)	(0.43)	(0.32)	(2.00)
Assessment	4	3.61	90%	3.65	3.50	2.63	3.93	3.83	4.00
& Diagnosis		(0.25)		(0.19)	(1.00)	(1.03)	(0.14)	(0.19)	(0.00)
Care Giving	5	4.18	84%	4.15	4.50	3.75	4.36	4.33	3.00
		(0.49)		(0.58)	(1.12)	(0.99)	(0.47)	(0.56)	(2.74)
Course of the	4	3.70	93%	3.60	4.00	3.25	3.93	3.83	4.00
Disease		(0.11)		(0.16)	(0.00)	(0.29)	(0.14)	(0.19)	(0.00)

Analysis of Variance Results for the Domain Scores.

It would be valuable to know whether the instructional module improved knowledge in any or all of the seven content knowledge domains. Therefore, seven additional ANOVAs were conducted with each domain score as the dependent variable. The research hypothesis was analyzed for the independent variable of treatment and the dependent variable of ADKS total scores and seven content knowledge domain scores. The summary of the two-way factorial design of the ADKS mean scores for the seven content knowledge domains were reported in Tables 7, 9, 11, 13, 15, 17, and 19. The summary of the two-way ANOVA that shows the knowledge levels between the group scores, the difference in the pre-posttest scores, and timing of interaction effect are displayed in Tables 8, 10, 12, 14, 16, 18, and 20.

Life impact domain. The treatment group scored higher than the control group and both groups scored higher on the posttest (see Table 7).

Table 7

Two by Two Factor: Life Impact Domain

Life Impact	<i>Pretest</i>	<i>Post Test</i>	<i>M</i>	<i>Difference</i>
Treatment	24.67	25.00	24.83	0.33
Control	23.33	24.33	23.83	1.00
M	24.00	24.67	24.33	
Difference	-1.33	-0.67		

The ANOVA for the Life Impact Domain indicated that there was no significant difference in knowledge levels between the groups, $F(1, 4) = 0.49$, $p > .52$ (see Table 8). There was no significant difference in pre- and posttest scores, $p > .56$ and no significant

group by time of testing interaction effect, $p > .77$. Hence, the null hypothesis was accepted for the Life Impact Domain.

Table 8

ANOVA: Life Impact Domain

Source of Variation	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	<i>F crit</i>
Between Subjects	27.67	5.00				
- Groups	3.00	1.00	3.00	0.49	0.52	7.71
- Error	24.67	4.00	6.17			
Within Subjects	15.00	6.00				
- Testing	1.33	1.00	1.33	0.40	0.56	7.71
- Interaction	0.33	1.00	0.33	0.10	0.77	7.71
- Error	13.33	4.00	3.33			
Total	42.67	11.00	3.88			

Risk factor domain. The treatment group scored higher than the control group at both testing times in the Risk Factor Domain (see Table 9). Both groups scored higher at the posttest.

Table 9

Two by Two Factor: Risk Factors Domain

Risk Factors	<i>Pretest</i>	<i>Post test</i>	<i>M</i>	<i>Difference</i>
Treatment	22.33	23.83	23.08	1.50
Control	21.50	22.00	21.75	0.50
M	21.92	22.92		
Difference	-0.83	-1.83		

The ANOVA shows that there was no significant difference in knowledge levels between the groups in the Risk Factor Domain, $F(1, 10) = 0.53$, $p > .48$ (see Table 10).

There was no significant difference in pre- and posttest scores, $p > .41$ and no significant

group scores by the time of testing interaction effect, $p > .68$. The null hypothesis was accepted for the Risk Factor Domain.

Table 10

ANOVA: Risk Factors Domain

Source of Variation	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	<i>F crit</i>
Between Subjects	210.83	11.00				
- Groups	10.67	1.00	10.67	0.53	0.48	4.96
- Error	200.17	10.00	20.02			
Within Subjects	89.00	12.00				
- Testing	6.00	1.00	6.00	0.74	0.41	4.96
- Interaction	1.50	1.00	1.50	0.18	0.68	4.96
- Error	81.50	10.00	8.15			
Total	299.83	23.00	13.04			

Symptoms domain. The treatment group scored higher than the control group at both times of testing in the Symptoms Domain (see Table 11). The treatment group scored marginally higher on the posttest, but the control group's mean decreased on the posttest.

Table 11

Two by Two Factor: Symptoms Domain

Symptoms	<i>Pretest</i>	<i>Post Test</i>	<i>M</i>	<i>Difference</i>
Treatment	23.5	24	23.75	0.5
Control	21.75	20.75	21.25	-1
M	22.625	22.375	22.5	
Difference	-1.75	-3.25		

The ANOVA indicates there was no significant difference in knowledge between the groups in the Symptoms Domain, $F(1,6) = 1.15$, $p > .33$ (see Table 12). There was no significant difference in pre- and posttest scores, $p > .79$ and no significant group by time of testing interaction effect, $p > .44$. The null hypothesis was accepted for the Symptoms Domain.

Table 12

ANOVA: Symptoms Domain

Source of Variation	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	<i>F crit</i>
Between Subjects	156.00	7.00				
- Groups	25.00	1.00	25.00	1.15	0.33	5.99
- Error	131.00	6.00	21.83			
Within Subjects	22.00	8.00				
- Testing	0.25	1.00	0.25	0.08	0.79	5.99
- Interaction	2.25	1.00	2.25	0.69	0.44	5.99
- Error	19.50	6.00	3.25			
Total	178.00	15.00	11.87			

Treatment/management domain. The treatment group scored higher than the control at both times of testing (see Table 13). Both groups scored higher at the posttest, the treatment group by a wider margin.

Table 13

Two by Two Factor: Treatment/Management Domain

Treatment/Management	<i>Pretest</i>	<i>Post Test</i>	<i>M</i>	<i>Difference</i>
Treatment	25.00	27.00	26.00	2.00
Control	24.75	25.00	24.88	0.25
M	24.88	26.00	25.44	
Difference	-0.25	-2.00		

The ANOVA yielded no significant differences in knowledge levels between the group in the Treatment/Management Domain, $F(1,6) = 0.44$, $p > .53$ (see Table 14).

There was no significant difference in pre-and posttest scores, $p > .21$ and no significant group by time of testing interaction effect, $p > .32$. The null hypothesis was accepted for Treatment/Management.

Table 14

*ANOVA: Treatment/management
Domain*

Source of Variation	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	<i>F crit</i>
Between Subjects	74.44	7.00				
- Groups	5.06	1.00	5.06	0.44	0.53	5.99
- Error	69.38	6.00	11.56			
Within Subjects	23.50	8.00				
- Testing	5.06	1.00	5.06	1.98	0.21	5.99
- Interaction	3.06	1.00	3.06	1.20	0.32	5.99
- Error	15.38	6.00	2.56			
Total	97.94	15.00	6.53			

Assessment and diagnosis domain. The treatment group scored higher than the control group at both testing times (see Table 15). Both groups scored higher on the posttest.

Table 15

Two by Two Factor: Assessment & Diagnosis Domain

Assessment & Diagnosis	<i>Pretest</i>	<i>Post Test</i>	<i>M</i>	<i>Difference</i>
Treatment	26.50	28.25	27.38	1.75
Control	22.25	23.25	22.75	1.00
M	24.38	25.75	25.06	
Difference	-4.25	-5.00		

The ANOVA indicates that there was a significant difference between the groups, $F(1, 6) = 11.70, p < .01$ (see Table 16). There was no significant difference in pre- and posttest scores, $F(1, 6) = 4.84, p > .07$, and no significant group by time of testing interaction, $F(1, 6) = 0.36, p > .57$. While there was an increase in scores between the groups, this difference was pronounced even on the pretest, and the instructional module

widened the difference between the groups only marginally. Hence, the null hypothesis was accepted.

Table 16

*ANOVA: Assessment & Diagnosis
Domain*

Source of Variation	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	<i>F crit</i>
Between Subjects	129.44	7.00				
- Groups	85.56	1.00	85.56	11.70	0.01	5.99
- Error	43.88	6.00	7.31			
Within Subjects	17.50	8.00				
- Testing	7.56	1.00	7.56	4.84	0.07	5.99
- Interaction	0.56	1.00	0.56	0.36	0.57	5.99
- Error	9.38	6.00	1.56			
Total	146.94	15.00	9.80			

Care giving domain. The control group scored somewhat higher than the treatment group at both testing times (see Table 17). Both groups scored higher on the posttest by a modest amount.

Table 17

Two by Two Factor: Care Giving Domain

Care Giving	<i>Pretest</i>	<i>Post Test</i>	<i>M</i>	<i>Difference</i>
Treatment	22.20	23.00	22.60	0.80
Control	23.40	24.60	24.00	1.20
M	22.80	23.80	23.30	
Difference	1.20	1.60		

The ANOVA shows there was no significant difference in knowledge levels between the groups in the Care Giving Domain, $F(1, 8) = 0.39$, $p > .55$ (see Table 18). There was no significant difference in pre- and posttest scores, $p > .09$ and no significant

group by time of testing interaction effect, $p > .71$. The null hypothesis was accepted for the care giving domain.

Table 18

ANOVA: Care Giving Domain

Source of Variation	SS	df	MS	F	p	F crit
Between Subjects	210.20	9.00				
- Groups	9.80	1.00	9.80	0.39	0.55	5.32
- Error	200.40	8.00	25.05			
Within Subjects	16.00	10.00				
- Testing	5.00	1.00	5.00	3.70	0.09	5.32
- Interaction	0.20	1.00	0.20	0.15	0.71	5.32
- Error	10.80	8.00	1.35			
Total	226.20	19.00	11.91			

Course of the disease domain. The treatment group score higher than the control group at both times of testing (see Table 19). Both groups scored better at the posttest.

Table 19

Two by Two Factor: Course of the Disease Domain

Course of the Disease	Pretest	Post Test	M	Difference
Treatment	24.50	27.75	26.13	3.25
Control	22.50	25.00	23.75	2.50
M	23.50	26.38	24.94	
Difference	-2.00	-2.75		

The ANOVA shows that there was no significant difference between the groups, $F(1, 6) = 3.23$, $p > .12$ (see Table 20). There was no significant difference in time of testing, $p > .09$, and there was no significance in group by time of testing or interaction, $p > .80$. The null hypothesis was accepted.

Table 20

ANOVA: Course of the Disease Domain

Source of Variation	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	<i>F crit</i>
Between Subjects	64.44	7.00				
- Groups	22.56	1.00	22.56	3.23	0.12	5.99
- Error	41.88	6.00	6.98			
Within Subjects	82.50	8.00				
- Testing	33.06	1.00	33.06	4.06	0.09	5.99
- Interaction	0.56	1.00	0.56	0.07	0.80	5.99
- Error	48.88	6.00	8.15			
Total	146.94	15.00	9.80			

Summary of Results

It was hypothesized that primary health care provider trainees receiving education would exhibit a significant increase in mean post-test total scores when compared to their mean pretest scores and would exhibit an increased level of knowledge about AD in each of the seven content knowledge domains based on Carpenter's ADKS model compared to a control group. In fact, the statistical analysis showed that education did not benefit the treatment group over the control group.

There was an increase in scores between pretest and posttest scores for the treatment group and the control group. The results of the ANOVA demonstrated that the treatment group scored higher than the control group and the posttest scores were higher than the pretest scores. There was no interaction found for the within group by timing of testing. Therefore, the research hypothesis was rejected.

The comparison between the mean scores for the underclassmen, 4th year nursing students, and residents showed an increase in mean scores with education, but the difference was not significant ($p > .05$).

On analysis of all seven content knowledge domains, the group comparisons of the F-values were less than the F-critical values, except for the Assessment and Diagnosis domain. Analysis of the data for the Assessment and Diagnosis domain demonstrated that the F-value was much larger than the F-critical value. The treatment group scored significantly higher than the control group. There was no evidence that this difference was related to the instructional module. Hence, the null hypothesis was accepted.

In the testing and interaction comparisons, it was found that an F-value was less than the F-critical value in all seven content knowledge domains. There was no increase in pre-post test scores. An interaction between group and timing of tests was not found.

On analysis of the seven ADKS content knowledge domains and the percentage of scores among the healthcare provider trainees (see Table 6), the percentage of correct scores ranged from 79 to 93%. In the symptoms domain, participants scored the lowest percent of correct scores while participants scored the highest percentage of scores in the Course of Disease Domain. The domains were ranked as follows beginning with the domain which displayed the lowest to the highest percentage of correct scores: Symptoms (79%); Risk Factors (80%); Care Giving (84%) Life Impact (87%), Assessment and Diagnosis (90%); Treatment/Management (91%); and Course of Disease (93%).

Chapter V

Discussion and Conclusions

Chapter five consists of discussions related to summary of purpose, hypothesis, and design; findings and limitations; implications of the study; and recommendations for future research.

Summary of Purpose, Hypothesis and Design

AD has been classified as the most common form of dementia. In the initial stages of AD, many primary health care providers are exposed to the symptoms of AD dementia from patients who seek treatment for other health conditions. These clinicians have been known to generally lack sufficient knowledge about AD dementia. AD education has been identified as a means of improving the level of knowledge among health care providers. It is important to note that knowledge alone does not necessarily translate into change of care. Having knowledge of risk factors and the course of disease about AD have been commonly recognized as the most supportive qualities owned by health care providers involved in dementia care (Smyth et. al, 2013).

The purpose of this study was to explore the level of knowledge about AD among primary health care provider trainees after exposure to an AD instructional module as assessed by comparison of ADKS scores and scores within each of the seven content knowledge domains. The effectiveness of the AD instructional approach employed in this research study was assessed by utilization of pre-posttest examination that included questions related to content knowledge. This research tested the hypothesis that primary health care provider trainees receiving education would exhibit a significant increase in mean post-test total scores when compared to their mean pretest scores and would exhibit

an increased level of knowledge about AD overall and within each of the seven content knowledge domains based on Carpenter's ADKS model compared to a control group.

This research utilized a Two-factor ANOVA research design. The first factor, Groups, had two levels: the Treatment Group and the Control Group. The second factor, a repeated measure, was testing which had two levels of testing: Pretest and Posttest.

Findings and Limitations

The AD instructional module used in this study was designed to focus on specific and measurable data regarding the knowledge of AD among primary health care provider trainees. The intention of this instructional module was to provide content about AD and conceptual measures that would impact effective learning outcomes about AD.

After exposure to the AD instructional module delivered in a Web-based format, analysis of the data showed that the treatment group did not score differentially higher on the posttest compared to the control group. The instructional module did not help the treatment group achieve relatively higher scores than the control group.

It was expected that primary health care providers in training, whose curriculum included dementia care, would have some prior knowledge about Alzheimer's disease. In fact, the participants in this study scored fairly high on the ADKS. The mean score of participants on the ADKS was 25.7 with a standard deviation of 3.83. The maximum achievable score on the ADKS was 30. This potential ceiling effect might have been a factor in the outcome and is explored later in this chapter.

Participants were expected to have varying levels of existing knowledge and personal experience with AD. Some participants had experience with AD because relatives or friends were diagnosed with AD while others may have had no close relatives

or friends who had experienced AD. By targeting those health care provider trainees who would likely interact with older adults with AD dementia, the educational intervention presented in this study, like Schoen et al. (2009), was expected to be highly useful. In fact, the subgroups in this study scored fairly high on the ADKS and there was no statistically significant difference among the groups, although the means tended to follow a trend of groups with more education having higher scores.

Further, it was valuable to examine whether the instructional module improved knowledge in any or all of the seven content knowledge domains. The results of this study indicated there was no significant difference between the treatment group and the control group scores within the seven content knowledge domains. The research hypothesis that the treatment group would benefit from the instructional module within the seven content knowledge domains was rejected. Four domains stood out as having the lowest percent of correct scores; Symptoms (percent correct) = 79%, Risk Factors (percent correct) = 80%, Care Giving (percent correct) = 84%, and Life Impact (percent correct) = 87%, respectively (see Table 6). These four domains contained the most medically oriented questions, such as those questions about what factors predisposed individuals to develop AD and how long the course of disease would typically last. These four domains, in which participants exhibited the lowest percentage of correct scores, the results closely resembled the results of Smyth's (2013) research study. Their study identified two domains, risk factors (65%) and course of the disease (75%), for having the lowest percent of correct scores (Smyth et. al., 2013).

Measures of AD Knowledge. Given the nonsignificant findings in this study and the high scores on the ADKS, an exploration of the measurement of AD knowledge is

warranted. Few measures of dementia knowledge exist that demonstrate evidence to be reliable and valid. According to Annear and colleagues (2016), instruments and tools utilized to measure dementia knowledge have been judged by their ability to accurately assess baseline understanding and recognition of changes in knowledge. Such measures have been particularly useful to test AD knowledge level among health care providers who care for individuals with AD dementia after exposure to an education intervention. This group of researchers introduced the 27-item Dementia Knowledge Assessment Scale (DKAS) in their study to compare the performance of the DKAS with that of the ADKS when administered to large international groups of participants. The study participants completed both instruments before and after participating in a course related to AD dementia, the Massive Open Online Course. Their findings, relative to dementia specific interscale correlation, indicated there was a moderate to strong positive relationship between the DKAS and the ADKS. The DKAS was found to be a psychometrically and conceptually sound alternative to the ADKS as a tool for measuring baseline understanding and knowledge change about AD dementia. The DKAS, according to Annear et al. (2016), was found to have greater consistency, a wider response distribution with fewer pre-education ceiling effects, and greater margins of distinction between pre and post education scores than the ADKS. In comparison, the ADKS scores before and after dementia education in this study were relatively unchanged. Hence, the conclusion suggested that the DKAS was a reliable and valid measure of dementia knowledge and outperformed the ADKS when administered to diverse international groups. Concerns were raised by Annear et al. (2016) about the appropriateness of utilizing the ADKS as a measure of dementia knowledge, especially given its inadequate internal consistency,

inability to distinguish between certain occupational cohorts, and the probability of causing pre-education ceiling effects. Indeed, in this study the ADKS had moderate internal consistency. Annear et al. suggested utilization of the DKAS as a viable alternative to the ADKS to measure dementia knowledge.

The simplistic true/false format of the ADKS may have limited identification of the subtle aspects of knowledge of AD that could be of much importance in the practice of nursing and medicine. Some researchers believe that the ceiling effects of the ADKS may be attributed to its true-false response format. It was likely that the high level of sensitivity of the DKAS was related to its Likert-type scale. Such scales have been known to prompt more distinctive answers than the multiple choice or true/false response formats (Annear et al., 2016). The Annear et al. (2016) study discovered that the DKAS overcame limitations that were identified in existing instruments unlike the ADKS.

Spector and colleagues (2012) conducted a systematic review and recommended the development of a contemporary measure that incorporated items that addressed biopsychosocial and person-centered models of care while also suggesting that the ADKS required additional validation. Although other studies have utilized the ADKS in the evaluation of dementia knowledge in discrete populations, including Norwegian psychologists (Nordhus et al., 2012) and British public service employees (Hudson, Pollux, & Mistry, 2012), large-scale evaluation of the performance of this measure in diverse samples had not been conducted during the beginning timeframe in which this study was conducted.

Another limitation of the ADKS included its use of a simplistic response format, namely the true-false format, low internal consistency, and its ability to differentiate

certain occupational cohorts (Annear et al., 2016; Carpenter et al., 2009).

Ceiling Effect. Given the high mean scores produced by the treatment group on the ADKS, it was possible that a ceiling effect occurred which caused the inability of the measure to detect increased knowledge about AD gathered from the instructional module. A ceiling effect can be observed when the independent variable no longer has an effect on the dependent variable, or the level above which the variance in an independent variable can no longer be measurable. A ceiling effect can occur anytime a measure involves a set range in which a normal distribution predicts multiple scores at or above the maximum value for the dependent variable. The treatment group had higher scores on both the pretest and posttest, and likewise, the control group also demonstrated higher scores on the posttest. Some individuals scored 30, the maximum score, while other individuals scored near 30 on the pretest, leaving little room for them to demonstrate an improved score on the post test.

One of the findings of Annear et al. (2016) suggested that use of the ADKS could possibly lead to pre-education ceiling effects among participants who consisted of health care providers. The high scores achieved by health care provider trainees on the ADKS strongly suggested the likelihood that the participants had a high preexisting level of knowledge about AD dementia prior to participation in this study. It should also be recognized that dementia education is significant at Washington University School of Medicine due to the large footprint of the Knight Alzheimer's Disease Research Center (ADRC) at Washington University School of Medicine. These efforts in many schools (WU School of Medicine, residency programs, and Goldfarb College of Nursing) likely permeates the educational milieu and added to higher mean scores on the ADKS. It is

possible had this study been done in other educational settings, an intervention effect would have been found. Finally, a brand new questionnaire that tapped into novel areas that the trainees had not previously known, could have brought down the overall pre-test mean scores and allowed for a measurable effect with the intervention.

Had this study been planned earlier, the DKAS might have been chosen over the ADKS.

Participants. This study was also limited by the low number of participants (N=57) who also represented a self-selected group. Participants were asked to volunteer to participate in the study. It may be possible that those who responded were those who already had a high level of knowledge about AD, but they were interested in learning more about AD, as reflected by high mean scores on the ADKS. It may be that some of the participants believed they had sufficient knowledge of AD. As a consequence, when they engaged in the Web-based instructional module they lacked motivation to learn something new which adversely influenced intentions to learn. With increased participation, it is possible that a significant increase in level of AD knowledge after engaging in the instructional module would be shown.

Lack of variability in participant groups was another limitation of this study. In the beginning of the recruitment phase, the investigator collaborated with the local Alzheimer's Association, two local university nursing schools, a medical association, and a professional nursing association with the expectation of gaining recruitment support and variability in participant groups. These initial recruitment efforts were challenged mainly by time restraints as perceived by busy health care professionals in clinical practice and academic settings. Some program directors and instructors were disinclined

to incorporate a research study because of competing demands on class time. Perhaps, ceiling effects would have been less likely to occur if the participant groups had included those who were seldom exposed to the ADKS in their training.

It is also possible that in the years since Carpenter et al. (2009) developed the ADKS there has been more attention to AD dementia in popular press and advertisements, as well as cultural events such as movies and television shows. Hence, many in the general population, including professional health care providers and trainees, have become more knowledgeable about AD dementia, and currently believe fewer myths about AD now than 10 or more years ago.

Knowledge of AD. Various studies were identified that widely recognized deficiencies of knowledge about AD in comparison with the results of this study. Like this study, other authors suggested that healthcare professionals lacked adequate education in the area of AD. Some of them were differentiated in purpose and content.

Cahill (2008) and Perry (2008) suggested that AD educational programs should be developed. Like Cahill and Perry, this researcher advocated development of a web-based, learner-focused instructional program about AD similar to the one presented in this study where emphasis was placed on the seven content knowledge domains.

Unlike this study, Bailey (2000) utilized the *Test on Alzheimer's Disease*, a 10-item test to assess student knowledge in a course related to aging. The items covered assessment, epidemiology, symptoms, course, and prevalence.

In another study, investigators used Palmore's (1988) *Facts on Aging Quiz* and the *Alzheimer Disease Knowledge Test* (ADKT) developed by Dieckmann, Zarit, Zarit, and

Gatz (1988) to study knowledge and abilities of nursing students. Similar to this study, their findings showed that older students, seniors, and those who reported knowing more about AD scored higher on the instruments than those students who had previous personal or educational experiences with AD. Having knowledge of aging did not prove to be a factor in relationship to having knowledge of AD (Edwards, Plant, Novak, Beall, & Baumhover, 1992).

Eshbaugh's (2014) research offered an empirical basis for AD education programs and emphasized the importance of exposing AD education to young adults. Those students pursuing careers in human services, health care, social work, gerontology, and health promotion will more likely come in contact with people who have AD or be asked to provide care and support for someone affected by Alzheimer's and related dementias. This researcher recommended that the first step in providing dementia education should be to develop time-efficient programs that target gaps in knowledge among college students (Eshbaugh, 2014).

Barrett and colleagues (1997) designed the *University of Alabama Alzheimer's Disease Knowledge Test for Health Professionals*, for those who had some medical knowledge. The 12-item test emphasized etiology, symptoms, diagnosis, epidemiology, caregiving, and treatment (Barrett, Haley, Harrell, and Powers, 1997).

Pucci and colleagues (2004) assessed knowledge about AD in a sample of Italian general practitioners (GPs) and administered an Italian version of the eUniversity of Alabama Alzheimer's Knowledge Test for Health Professionals to verify the test's ability to differentiate AD specialists and non-specialists. Among the 95 GPs who performed the AD Knowledge Test (68.3% response rate), 21% had a total score ≥ 9 . Among the 95

GPs, the evidence suggested that continuing medical education (CME) programs for GPs should largely focus on AD dementia (Pucci et al., 2004).

The *Knowledge of Alzheimer's Disease Quiz*, designed by Hicks and Miller (1994), and assessed knowledge in a research context. The 30-item quiz combined some of the 17-item *Alzheimer's Disease Awareness Test* (Steckenrider, 1993) and Dieckmann and colleagues' (1998) 20-item *Alzheimer's Disease Knowledge Test*. The quiz covered etiology, assessment, diagnosis, differential, symptoms, course, treatment, caregiving strategies, and community resources. Their study clearly explored the level of overall public knowledge about Alzheimer's disease measured through survey research based on a nationally representative sample of 1498 persons age 45 and over.

In a study of public knowledge about AD by Steckenrider (1993), the Alzheimer's Disease Awareness Test (ADAT) was utilized with 17 items dealing with disease etiology, symptoms, and misconceptions. While almost everyone (91 percent) had heard of AD, there were wide gaps in disease knowledge among a significant portion of the public. Two tiers of knowledge were found to exist indicating the different types of information known. Most people scored moderately high on the Easy/General Index while few did well on the Hard/Specific Index. Findings that correlated with a high level of knowledge on both tiers were education, age, knowing someone with AD as well as the closeness and relationship of the effected person, and having parents who were living.

In 2012, Galvin et al. at the Washington University Alzheimer's Disease Research Center designed the *Clinical Partners Program Evaluation Survey* to assess knowledge in health care professionals. The 48-item survey addressed etiology, diagnosis, treatment, course, treatment, course, symptoms, caregiving, prevalence, research, and life impact.

Of the newly available screening tools for use by primary care providers, Galvin recommended the Mini-Cog and the AD8 as complementary, brief, easy to administer, and effective diagnostic assessments that could be utilized in everyday clinical practice. Alongside cognitive and daily functioning assessments, he suggested a thorough evaluation of behavioral symptoms and caregiver status be required to ensure that both the patient and the patient's family receive optimal care (Galvin et al., 2012).

Implications of the Study

With the increasing age of the U. S. population, there is much more that needs to be done to enable primary health care providers to detect early indicators of AD dementia. When health care providers fail to discover and confidently diagnose early-stage dementia due to AD, the result may lead to possibly unnecessary and harmful treatment (Doody et al., 2001). Although this study did not find that an instructional module significantly improved knowledge of AD, the measurement tool and nature of the participants might have influenced this finding, such that the need for increased and improved instruction about AD for primary health care providers remains.

Throughout the course of analyzing the research hypothesis specific to this study, the findings revealed additional areas that could augment or further this research on AD education. Inclusion of more specific AD education utilizing the ADKS in the regular curriculum and professional development activities without revisions, could possibly mask the need for learners to gain more knowledge about AD. Because there are widely recognized deficiencies of knowledge about AD among health care providers, curriculum developers for nursing and medical school programs are encouraged to facilitate teaching

and learning strategies relative to systematic AD specific education and training from the perspective of seven content knowledge domains.

This study identified the weakest areas of AD knowledge among the participants, particularly in the content knowledge domains related to symptoms, risk factors, care giving, and life impact. It would be helpful to nursing schools and medical schools to influence increased AD education in these areas and to support development of continuing education activities for health care providers. The importance of increasing efforts to develop and improve other tools to measure knowledge of AD has been indicated by this study. Measures of AD knowledge that can better identify gaps in knowledge could prove useful.

Recommendations for Future Research

In consideration of the findings of this study, the following recommendations were offered:

- This study could be replicated with a larger sample size of participants. Based on the evidence of this study and in an effort to improve study outcomes, it was suggested that selection of participants in such a study should consist of a large number of diverse practice cohorts with various levels of education. Since the Alzheimer's Association maintains a huge data base of primary health care providers and a plethora of educational resources, researchers in this area of study are encouraged to combine efforts to conduct future research about AD education with local Alzheimer's Associations to improve subject recruitment strategies and data collection methods.

- The specialized AD unit of instruction that incorporates content specific to each of the seven content knowledge domains could be revised and perhaps include more detailed knowledge of AD, especially about the four content knowledge domains with the lowest scores as determined in this study (Symptoms, Risk Factors, Care Giving, and Life Impact).
- As an alternative to utilization of the ADKS which employs a true-false response format, an instrument like the DKAS should be used in future research with similar populations of participants. In this study, the data showed that the treatment group and the control group both demonstrated similar high scores on the pretest and posttest. This was largely attributable to the ceiling effect of the ADKS. The ADKS is not an exhaustive tool, rather, it contains representative items on the scale that more likely reflect general knowledge about AD. Using this scale with health professional trainees might have masked increased knowledge.

References

- Albert, M. S., DeKosky, S. T., Dickson, D., Dubois, B., Feldman, H. H., Fox, N. C., . . . Phelps, C. H. (2011). The diagnosis of mild cognitive impairment due to Alzheimer's disease: Recommendations from the National Institute on Aging-Alzheimer's Association workgroups on diagnostic guidelines for Alzheimer's disease. *Alzheimers Dementiaia*, 7(3),
- Alzheimer's Association (2019). 2019 Alzheimer's disease facts and figures. *Alzheimers Dementiaia*, 15(3), 321-387.
- Alzheimer's Association (2016). 2016 Alzheimer's disease facts and figures. *Alzheimer's & Dementia: The Journal of the Alzheimer's Association*, 12(4), 459-509.
- Anderson, L. A., Day, K. L., Beard, R. L., Reed, P. S., & Wu, B. (2009). The public's perceptions about cognitive health and Alzheimer's disease among the U.S. population: a national review. *Gerontologist*, 49 Supplement 1, S3-11.
- Annear, M. J., Eccleston, C. E., McInerney, F. J., Elliott, K. J., Toye, C. M., Tranter, B. K., & Robinson, A.L. (2016). New standard in dementia knowledge measurement: comparative validation of the dementia knowledge assessment scale and the Alzheimer's disease knowledge scale. *Journal of American Geriatric Society*, 64(6), 1329-1334.
- Armstrong, E., & Parsa-Parsi, R. (2005). How can physicians' learning styles drive educational planning? *Academic Medicine*, 80(7), 680-684.
- Baloch, S., Moss, S. B., Nair, R., & Tingle, L. (2010). Practice patterns in the evaluation and management of dementia by primary care residents, primary care physicians,

and geriatricians. *Archives of Proceedings (Baylor University Medical Center)*, 23(2), 121-125.

Bamford, C., Eccles, M., Steen, N., & Robinson, L. (2007). Can primary care record review facilitate earlier diagnosis of dementia? *Family Practice*, 24(2), 108-116.

Bardach, S. H., & Rowles, G. D. (2012). Geriatric education in the health professions: are we making progress? *Gerontologist*, 52(5), 607-618.

Barrett, J. J., Haley, W. E., Harrell, L. E., & Powers, R. E. (1997). Knowledge about Alzheimer disease among primary care physicians, psychologists, nurses, and social workers. *Alzheimer Disease Associated Disorders*, 11(2), 99-106.

Barry, P. P. (1994). Geriatric clinical training in medical schools. *American Journal of Medicine*, 97(4a), 8s-9s.

Baumgart, M., Snyder, H. M., Carrillo, M. C., Fazio, S., Kim, H., & Johns, H. (2015). Summary of the evidence on modifiable risk factors for cognitive decline and dementia: A population-based perspective. *Alzheimer's & Dementia*, 11(6), 718-726.

Boise, L., Morgan, D. L., Kaye, J., & Camicioli, R. (1999). Delays in the diagnosis of dementia: perspectives of family caregivers. *American Journal of Alzheimer's Disease and Other Dementias*, 14(1), 20-26.

Bradford, A., Kunik, M. E., Schulz, P., Williams, S. P., & Singh, H. (2009). Missed and delayed diagnosis of dementia in primary care: Prevalence and contributing factors. *Alzheimer Disease and Associated Disorders*, 23(4), 306-314.

- Bragg, E. J., & Warshaw, G. A. (2005). ACGME requirements for geriatrics medicine curricula in medical specialties: Progress made and progress needed. *Academy of Medicine, 80*(3), 279-285.
- Bryant-Lukosius, D., Dicenso, A., Browne, G., & Pinelli, J. (2004). Advanced practice nursing roles: development, implementation and evaluation. *Journal of Advanced Nursing, 48*(5), 519-529.
- Cahill, S., Clark, M., OConnell, H., Lawlor, B., Coen, R., & Walsh, C. (2008). The attitudes and practices of general practitioners regarding dementia diagnosis in Ireland. *International Journal of Geriatric Psychiatry, 23*(7), 663.
- Callahan, C. M., Boustani, M. A., Unverzagt, F. W., Austrom, M. G., Damush, T. M., Perkins, A. J., . . . Hendrie, H. C. (2006). Effectiveness of collaborative care for older adults with Alzheimer disease in primary care: a randomized controlled trial. *Journal of American Medical Association, 295*(18), 2148-2157.
- Callahan, C. M., Boustani, M. A., Weiner, M., Beck, R. A., Livin, L. R., Kellams, J. J., . . . Hendrie, H. C. (2011). Implementing dementia care models in primary care settings: the aging brain care medical home. *Aging & Mental Health, 15*(1), 5-12.
- Carpenter, B. D., Balsis, S., Otilingam, P. G., Hanson, P. K., & Gatz, M. (2009). The Alzheimer's disease knowledge scale: development and psychometric properties. *The Gerontologist, 49*(2), 236-247.
- Carpenter, B. D., Zoller, S. M., Balsis, S., Otilingam, P. G., & Gatz, M. (2011). Demographic and contextual factors related to knowledge about Alzheimer's disease. *American Journal Alzheimer's Disease and Other Dementias, 26*(2), 121-126.

- Cercone, K. (2008). Characteristics of Adult Learners With Implications for Online Learning Design. *American Association of Clinical Endocrinologists Journal*, *16*(2), 137-159.
- Chodosh, J., Berry, E., Lee, M., Connor, K., DeMonte, R., Ganiats, T., . . . Vickrey, B. (2006a). Effect of a dementia care management intervention on primary care provider knowledge, attitudes, and perceptions of quality of care. *Journal of American Geriatric Society*, *54*(2), 311-317.
- Cook, D. A., Levinson, A. J., Garside, S., Dupras, D. M., Erwin, P. J., & Montori, V. M. (2008). Internet-based learning in the health professions: A meta-analysis. *Journal of American Medical Association*, *300*(10), 1181-1196.
- Cordell, C. B., Borson, S., Boustani, M., Chodosh, J., Reuben, D., Verghese, J., . . . Fried, L. B. (2013). Alzheimer's Association recommendations for operationalizing the detection of cognitive impairment during the Medicare Annual Wellness Visit in a primary care setting. *Alzheimers Dementiaia*, *9*(2), 141-150.
- Crenshaw, K., Curry, W., Salanitro, A. H., Safford, M. M., Houston, T. K., Allison, J. J., & Estrada, C. A. (2010). Is physician epngagement with web-based CME associated with patients' baseline hemoglobin A1c levels? The Rural Diabetes Online Care Study. *Academy of Medicine*, *85*(9), 1511-1517.
- Cummings, J. L., & Cole, G. (2002). ALzheimer disease. *Journal of American Medical Association* , *287*(18), 2335-2338.
- Darden, D. C. (2014) Relevance of the Knowles theory in distance education. *Creative Education*, *5*, 808-812.

- Daviglus, M. L., Bell, C. C., Berrettini, W., Bowen, P. E., Connolly, E. S., Jr., Cox, N. J., . . . Trevisan, M. (2010). National Institute of Health state-of-the-science conference statement: Preventing Alzheimer's disease and cognitive decline. *NIH Consensus Statement Science Statements*, 27(4), 1-30.
- Dieckmann, L., Zarit, S. H., Zarit, J. M., & Gatz, M. (1988a). The Alzheimer's Disease Knowledge Test. *The Gerontologist*, 28(3), 402-408.
- Doody, R. S., Stevens, J. C., Beck, C., Dubinsky, R. M., Kaye, J. A., Gwyther, L., . . . Cummings, J. L. (2001). Practice parameter: management of dementia (an evidence-based review). Report of the Quality Standards Subcommittee of the American Academy of Neurology. *Neurology*, 56(9), 1154-1166.
- Edwards, R.M.; Plant, M. A.; Novak, D. S.; Beall, C.; Baumhover, L.A. (1992). Knowledge about aging and Alzheimer's Disease among baccalaureate nursing students. *Journal of Nursing Education*, 31(3):127-135.
- Eshbaugh, E. M (2014). Gaps in Alzheimer's knowledge among college students. *Educational Gerontology*, 40(9): 655-665.
- Folstein, M. F., Folstein, S. E., & McHugh, P. R. (1975). "Mini-mental state". A practical method for grading the cognitive state of patients for the clinician. *Journal of Psychiatric Residence*, 12(3), 189-198.
- Fortinsky, R. H., Delaney, C., Harel, O., Pasquale, K., Schjavland, E., Lynch, J., . . . Crumb, S. (2014). Results and lessons learned from a nurse practitioner-guided dementia care intervention for primary care patients and their family caregivers. *Research in Gerontology Nursing*, 7(3), 126-137.

- Galvin, J. E., Meuser, T. M., & Morris, J. C. (2012). Improving physician awareness of Alzheimer disease and enhancing recruitment: the Clinician Partners Program. *Alzheimer Disease and Associated Disorders*, 26(1), 61-67.
- Galvin, J. E., Roe, C. M., Powlishta, K. K., Coats, M. A., Muich, S. J., Grant, E., . . . Morris, J. C. (2005). The AD8: a brief informant interview to detect dementia. *Neurology*, 65(4), 559-564.
- Galvin, J. E., & Sadowsky, C. H. (2012). Practical guidelines for the recognition and diagnosis of dementia. *Journal of American Board of Family Medicine*, 25(3), 367-382.
- Goins, R., Gainor, S., Pollard, C., & Spencer, S. (2003). Geriatric Knowledge and Educational Needs among Rural Health Care Professionals. *Educational Gerontology*, 29(3), 261-272.
- Hudson, J., Pollux, P., Mistry, B. et al (2012). Beliefs about Alzheimer's disease in Britain. *Aging Mental Health*;16:828–835.
- Isaac, S. & Michael, W. (1995). *Handbook in research evaluation*. 2nd edition, 177 -179.
- Ilfie, S., Koch, T., Jain, P., Lefford, F., Wong, G., Warner, A., & Wilcock, J. (2012). Developing an educational intervention on dementia diagnosis and management in primary care for the EVIDEM-ED trial. *Trials*, 13, 142-142.
- Jack, C. R., Jr., Albert, M. S., Knopman, D. S., McKhann, G. M., Sperling, R. A., Carrillo, M. C., . . . Phelps, C. H. (2011). Introduction to the recommendations from the National Institute on Aging-Alzheimer's Association workgroups on diagnostic guidelines for Alzheimer's Disease. *Alzheimers Dementiaia*, 7(3), 257-262.

- Jackson, E. M., Cherry, K. E., Smitherman, E. A., & Hawley, K. S. (2008). Knowledge of memory aging and Alzheimer's disease in college students and mental health professionals. *Aging & Mental Health, 12*(2), 258-266.
- Jefferson, A. L., Cantwell, N. G., Byerly, L. K., & Morhardt, D. (2012). Medical student education program in Alzheimer's disease: the PAIRS Program. *BioMed Central Medical Education, 12*(1), 80. DOI:10.1186/1472-6920-12-80.
- Knopman, D. S., DeKosky, S. T., Cummings, J. L., Chui, H., Corey-Bloom, J., Relkin, N., . . . Stevens, J. C. (2001). Practice parameter: diagnosis of dementia (an evidence-based review). Report of the Quality Standards Subcommittee of the American Academy of Neurology. *Neurology, 56*(9), 1143-1153.
- Knowles, M. (1980). *The Modern Practice of Adult Education: From Andragogy to Pedagogy*. Chicago: Associated.
- Koch, T., & Iliffe, S. (2011). Dementia diagnosis and management: a narrative review of changing practice. *British Journal of General Practice, 61*(589), e513-525.
- Lathren, C. R., Sloane, P. D., Hoyle, J. D., Zimmerman, S., & Kaufer, D. I. (2013). Improving dementia diagnosis and management in primary care: a cohort study of the impact of a training and support program on physician competency, practice patterns, and community linkages. *BioMed Central Geriatrics, 13*, 134.
- McKhann, G. M., Knopman, D. S., Chertkow, H., Hyman, B. T., Jack, C. R., Jr., Kawas, C. H., . . . Phelps, C. H. (2011). 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 Dementia, 7*(3), 263-269.

- Mentes, J. C. (1995). A nursing protocol to assess causes of delirium. Identifying delirium in nursing home residents. *Jernal of Gerontological Nursing, 21*(2), 26-30.
- Meuser, T. M., Boise, L., & Morris, J. C. (2004). Clinician beliefs and practices in dementia care: Implications for health educators. *Educational Gerontology, 30*(6), 491-516.
- Millard, F. B., Kennedy, R. L., & Baune, B. T. (2011). Dementia: opportunities for risk reduction and early detection in general practice. *Australia Journal of Primary Health, 17*(1), 89-94.
- Morley, J. E., Paniagua, M. A., Flaherty, J. H., Gammack, J. K., & Tumosa, N. (2008). Chapter 3 The Challenges to the Continued Health of Geriatrics in the United States. *Annual Review of Gerontology and Geriatrics, 28*(1), 27-44.
- Morris, J. C. (1997a). Clinical Dementia Rating: A Reliable and Valid Diagnostic and Staging Measure for Dementia of the Alzheimer Type. *International Psychogeriatrics, 9*(S1), 173-176.
- Morris, J. C. (1997b). Clinical dementia rating: a reliable and valid diagnostic and staging measure for dementia of the Alzheimer type. *International Psychogeriatrics, 9 Supplement 1*, 173-176; discussion 177-178.
- Morris, J. C. (2012). Revised criteria for mild cognitive impairment may compromise the diagnosis of Alzheimer disease dementia. *Archives of Neurology, 69*(6), 700-708.
- Mueller, P. S. (2009). Incorporating Professionalism into Medical Education: The Mayo Clinic Experience. *The Keio Journal of Medicine, 58*(3), 133-143.

- Mueller, P. S. (2015). Teaching and assessing professionalism in medical learners and practicing physicians. *Rambam Maimonides Medical Journal*, 6(2), e0011.
- Mueller, P. S., McConahey, L. L., Orvidas, L. J., Jenkins, S. M., & Kasten, M. J. (2010). The Visiting Medical Student Clerkship Program at Mayo Clinic. *Mayo Clinic Proceedings*, 85(8), 723-727.
- Nagy, M. C., Beal, S. C., Kwan, A. Y., & Baumhover, L. A. (1994). Are health care professionals ready for Alzheimer's disease: a comparison of U.S. and Hong Kong nurses. *International Journal of Aging and Human Development*, 39(4), 337-351.
- Newhouse, R. P., Stanik-Hutt, J., White, K. M., Johantgen, M., Bass, E. B., Zangaro, G., . . . Weiner, J. P. (2011). Advanced practice nurse outcomes 1990-2008: a systematic review. *Nursing Economics*, 29(5), 230-250; quiz 251.
- Nielsen, T. R., Andersen, B. B., Kastrup, M., Phung, T. K., & Waldemar, G. (2011). Quality of dementia diagnostic evaluation for ethnic minority patients: a nationwide study. *Dementia and Geriatric Cognitive Disorders*, 31(5), 388-396.
- Nielsen, T. R., Vogel, A., Phung, T. K., Gade, A., & Waldemar, G. (2011). Over- and under-diagnosis of dementia in ethnic minorities: a nationwide register-based study. *International Journal of Geriatric Psychiatry*, 26(11), 1128-1135.
- Nordhus I, Sivertsen B, Pallesen S. (2012). Knowledge about Alzheimer's disease among Norwegian psychologists: the Alzheimer's disease knowledge scale. *Aging and Mental Health*;16:521–528.
- Norusis, M. J. (2008). *Guide to data analysis, SPSS 16.0: version 17.0*. Chicago: SPSS Inc.

- Olafsdottir, M., Foldevi, M., & Marcusson, J. (2001). Dementia in primary care: why the low detection rate? *Scandinavian Journal of Primary Health Care*, *19*(3), 194-198.
- Palmore, E. (1981). More on Palmore's Facts on Aging Quiz. *The Gerontologist*, *Volume 21*(2), 115-116
- Parmar, J., Dobbs, B., McKay, R., Kirwan, C., Cooper, T., Marin, A., & Gupta, N. (2014). Diagnosis and management of dementia in primary care: exploratory study. *Canadian Family Physician*, *60*(5), 457-465.
- Perry, M., Draskovic, I., Lucassen, P., Vernooij-Dassen, M., van Achterberg, T., & Rikkert, M. O. (2011). Effects of educational interventions on primary dementia care: A systematic review. *Internal Journal of Geriatric Psychiatry*, *26*(1), 1-11.
- Perry, M., Drašković, I., van Achterberg, T., Borm, G., van Eijken, M., Lucassen, P., . . . Olde Rikkert, M. (2008). Can an EASYCare based dementia training programme improve diagnostic assessment and management of dementia by general practitioners and primary care nurses? The design of a randomised controlled trial. *BioMed Central Health Services Research*, *8*(1), 71.
- Petersen, R. C., Stevens, J. C., Ganguli, M., Tangalos, E. G., Cummings, J. L., & DeKosky, S. T. (2001). Practice parameter: early detection of dementia: mild cognitive impairment (an evidence-based review). Report of the Quality Standards Subcommittee of the American Academy of Neurology. *Neurology*, *56*(9), 1133-1142.

- Peterson, D., Berg-Weger, M. S., McGillick, J., & Schwartz, L. (2002). Basic care I: the effect of dementia-specific training on certified nursing assistants and other staff. *American Journal of Alzheimers Disease and Other Dementias*, *17*(3), 154-164.
- Proctor, R., Martin, C., & Hewison, J. (2002). When a little knowledge is a dangerous thing...: a study of carers' knowledge about dementia, preferred coping style and psychological distress. *Internal Journal of Geriatric Psychiatry*, *17*(12), 1133-1139. doi:10.1002/gps.762
- Pucci, E., Angeleri, F., Borsetti, G., Brizioli, E., Cartechini, E., Giuliani, G., & Solari, A. (2004). General practitioners facing dementia: Are they fully prepared? *Neurological Sciences*, *24*(6), 384-389.
- Raskind, M.A. (2004). Cognitive Disorders. In E. W. Busse & D. G. Blazer (Eds.), *Textbook of Geriatric Psychiatry* (3rd ed., pp. 207-229). Washington, DC: American Psychiatric Press.
- Roberson, D. N. & Merriam, S. B. (2005). The self-directed learning process of older, rural adults. *Adult Education Quarterly*, *55*(4), 269-287.
- Robinson, L., Tang, E., & Taylor, J.-P. (2015). Dementia: Timely diagnosis and early intervention. *British Medical Journal*, *350*.
- Rodda, R. & Carter, J. (2012) Cholinesterase inhibitors and memantine for symptomatic treatment of dementia. *British Medical Journal* (344): e2986.
- Salloway, S., & Correia, S. (2009). Alzheimer disease: time to improve its diagnosis and treatment. *Cleveland Clinical Journal of Medicine*, *76*(1), 49-58.
- Saris, W., Gallhofer, I. (2007). *Design, evaluation, and analysis of questionnaires for survey research*. Hoboken, NJ: Wiley & Sons.

- Saunders, M. J., Yeh, C.-K., Hou, L.-T., & Katz, M. S. (2005). Geriatric Medical Education and Training in the United States. *Journal of the Chinese Medical Association, 68*(12), 547-556.
- Savva, G. M., & Arthur, A. (2015). Who has undiagnosed dementia? A cross-sectional analysis of participants of the Aging, Demographics and Memory Study. *Age Ageing, 44*(4), 642-647.
- Sayegh, P., & Knight, B. G. (2013). Cross-cultural differences in dementia: The Sociocultural Health Belief Model. *International Psychogeriatrics, 25*(4), 517-530.
- Schoen, M. J., Tipton, E. F., Houston, T. K., Funkhouser, E., Levine, D. A., Estrada, C. A., . . . Kiefe, C. I. (2009). Characteristics that predict physician participation in a Web-based CME activity: The MI-Plus study. *Journal of Continuing Education in the Health Professions, 29*(4), 246-253.
- Sindi, D. J. (2012). Preventing Alzheimer's disease. *Science, 337*(6101), 1488-1492.
- Shapira, J., Roper, J., & Schulzinger, J. (1993). Managing delirious patients. *Nursing, 23*(5), 78-83.
- Sindi, S., Mangialasche, F., & Kivipelto, M. (2015). Advances in the prevention of Alzheimer's disease. *F1000prime reports, 7*.
- Small, G. W., Rabins, P. V., Barry, P. P., Buckholtz, N. S., DeKosky, S. T., Ferris, S. H., . . . Tune, L. E. (1997). Diagnosis and treatment of Alzheimer disease and related disorders. Consensus statement of the American Association for Geriatric Psychiatry, the Alzheimer's Association, and the American Geriatrics Society. *Journal of the American Medical Association, 278*(16), 1363-1371.

- Spector, A., Orrell, M., Schepers, A., & Shanahan, N. (2012). A systematic review of 'knowledge of dementia' outcome measures. *Ageing Research Reviews, 11*(1), 67-77.
- Sperling, R. A., Aisen, P. S., Beckett, L. A., Bennett, D. A., Craft, S., Fagan, A. M., . . . Phelps, C. H. (2011). Toward defining the preclinical stages of Alzheimer's disease: recommendations from the National Institute on Aging-Alzheimer's Association workgroups on diagnostic guidelines for Alzheimer's disease. *Alzheimers Dementia, 7*(3), 280-292.
- Struble, L. M., & Sullivan, B. J. (2011). Cognitive health in older adults. *Nurse Practice, 36*(4), 24-34; quiz 34-25.
- Sullivan, K., Finch, S., & O'Connor, F. (2003). A confidence interval analysis of three studies using the Alzheimer's disease knowledge test. *Aging and Mental Health, 7*(3), 176-181.
- Sullivan, K., Muscat, T., & Mulgrew, K. (2007). Knowledge of Alzheimer's Disease Among Patients, Carers, and Noncarer Adults: Misconceptions, Knowledge Gaps, and Correct Beliefs. *Topics in Geriatric Rehabilitation, 23*(2), 137-148.
- Tough, A. M. (1971). *The adult's learning projects; a fresh approach to theory and practice in adult learning*. Toronto, Ontario Institute for Studies in Education.
- Tough, A. M. (1979). *The adult's learning projects: a fresh approach to theory and practice in adult learning*. Toronto: Ontario Institute for Studies in Education.
- Valcour, V. G., Masaki, K. H., Curb, J. D., & Blanchette, P. L. (2000). The detection of dementia in the primary care setting. *Archives in Internal Medicine, 160*(19), 2964-2968.

Van Dalen, D. B. (1979). *Understanding educational research*. (4th edition).

van Hout, H., Vernooij-Dassen, M., Bakker, K., Blom, M., & Grol, R. (2000). General practitioners on dementia: tasks, practices and obstacles. *Patient Education Council, 39*.

Vaughn, L., & Baker, R. (2001). Teaching in the medical setting: Balancing teaching styles, learning styles and teaching methods. *Medical Teaching, 23*(6), 610-612.

Vickrey, B. G., Mittman, B. S., Connor, K. I., Pearson, M. L., Della Penna, R. D., Ganiats, T. G., . . . Lee, M. (2006). The effect of a disease management intervention on quality and outcomes of dementia care: A randomized, controlled trial. *Annals of Internal Medicine, 145*(10), 713-726.

Warshaw, G. A., & Bragg, E. J. (2003). The training of geriatricians in the United States: three decades of progress. *Journal of the American Geriatric Society, 51*(7 Suppl), S338-345.

Warshaw, G. A., Bragg, E. J., Thomas, D. C., Ho, M. L., & Brewer, D. E. (2006). Are internal medicine residency programs adequately preparing physicians to care for the baby boomers? A national survey from the Association of Directors of Geriatric Academic Programs Status of Geriatrics Workforce Study. *Journal of the American Geriatric Society, 54*(10), 1603-1609.

Welkenhuysen, M., Evers-Kiebooms, G., & Van den Berghe, H. (1997). Attitudes toward predictive testing for Alzheimer's disease in a student population. *Psychiatric Genetics, 7*(3), 121-126.

Appendix A

Informed Consent for Participation in Research Activities

Impact of Alzheimer's Disease Instruction On Seven Content Knowledge Domains

Participant _____ HSC Approval Number _____

Principal Investigator Joyce A. Taylor HayniePI's Phone Number (314) 249-3114

1. You are invited to participate in a research study conducted by Joyce Taylor Haynie, a doctoral candidate for PhD and Dr. Kathleen Haywood, PhD. The purpose of this research is to determine the knowledge level of Alzheimer's disease (AD) among primary health care providers and the impact of AD education on seven content knowledge domains. The aim of this study focuses on the knowledge and experiences of health care providers who provide care to adults. Participants will include physicians and nurse practitioners whose field of study is focused in the areas of family practice, internal medicine, geriatrics, neurology, and psychiatry.
2. A) Participation in this study will involve completion of the following:
 - Informed Consent Form
 - Demographic Questionnaire
 - Pre-test Survey / Posttest Survey
 - Alzheimer's Disease Education: Instructional ModuleB) The projected number of participants to be enrolled in this study is forty.
C) Your total involvement is estimated to take forty-five – sixty minutes.
D) For your participation, you will receive a gift card in appreciation for your time and effort.
3. There are no anticipated risks associated with this research study.
4. There are no direct benefits for your participation in this study. Your participation will contribute to the pool of knowledge about AD and enhance early detection of the disease in the future.

5. Your participation is strictly voluntary, and confidentiality will be maintained. You may choose not to participate in this study and you may withdraw your consent at any time. You may choose to participate by going to www.dementiaeducation.me.ht and click on "Alzheimer's Disease Education Research". Once you have read the consent, there will be a button to "Agree" or "Disagree" to participate. If consent is given, you may proceed to establish a username and password that will allow you to access the components of the research study. You will NOT be penalized should you choose not to participate or to withdraw from the study.
6. By agreeing to participate, you understand and agree that your data may be shared with other researchers and educators in the form of presentations and/or publications. In all cases, your identity will not be revealed. In rare instances, a researcher's study must undergo an audit or program evaluation by an oversight agency (such as the Office for Human Research Protection). This agency is required to maintain the confidentiality of your data. In addition, all data will be stored on a password – protected statistical program data file and/or locked office files.
7. If you have any questions or concerns regarding this study, or if any unexpected problems arise, you may contact the investigator, Joyce Haynie by phone at (314) 249-3114, by e-mail at jah7z3@mail.umsl.edu or Dr. Kathleen Haywood at (314) 516-5484.

Appendix B

Demographics Survey

Instructions – Please read each question carefully and place an “X” in the box that best describes your response. If you are unsure of an answer, please make your best guess.

Part 1

1. Gender: a. Male _____ b. Female _____
2. Select your age range
 a. 30-39 ____ b. 40-49 ____ c. 50-59 ____ d. 60-69 ____ e. 70-79 ____
3. Select your race/ethnicity
 a. Caucasian ____ b. African American ____ c. Hispanic ____ d. Asian ____
 e. Other ____
4. Education:
 a. BS/BA ____ b. MS/MA ____ c. Doctorate degree ____
5. Language: a. English _____ b. Other _____
6. Select the current training status:
 a. 1st year Med Student _____
 b. 2nd year Med Student _____
 c. 3rd year Med Student _____
 d. 4th year Med Student _____
 e. Resident _____
 f. Internist _____
 g. Fellow _____
 h. 1st year Nursing Student _____
 i. 2nd year Nursing Student _____
 j. 3rd year Nursing Student _____
 k. 4th year Nursing Student _____
 l. Other _____
7. Select the professional field of practice that applies to you
 a. Family Practice _____
 b. General Practice _____

- c. Internal Medicine _____
 - d. Geriatrics _____
 - e. Neurology _____
 - f. Psychiatry _____
 - g. Other _____
8. How long have you trained or practiced in your specialty area?
- a. 0-9yr ___ b. 10-19 yrs ___ c. 20-29yrs ___ d. 30-39 yrs ___ e. 40-49 yrs ___
9. What percentage of your practice is focused on AD or related disorder?
- a. Less than 10% ___ b. 10-25% ___ c. 30-45% ___ d. 50-65% ___ e. greater than 75% ___
10. What is the age range of your patient population?
- a. 40-49 ___ b. 50-59 ___ c. 60-69 ___ d. 70-79 ___ e. 80-89 ___
11. What percentage of your patients is diagnosed with Alzheimer's disease, a neuropsychiatric disorder, or other dementing illness?
- a. Less than 10% ___ b. 10-25% ___ c. 30-45% ___ d. 50-65% ___ e. greater than 75% ___
12. What percentage of your patients resides in a long term care facility?
- a. Less than 10% ___ b. 10-25% ___ c. 30-45% ___ d. 50-65% ___ e. greater than 75% ___
13. How would you describe your level of knowledge about Alzheimer's disease?
- a. Minimal ___ b. Average ___ c. Above Average ___ d. High ___ e. Expert ___
14. Select the following statements which best describe your previous experience with AD prior to current training. (Select all that apply)
- a. Relative or friend was diagnosed with AD or other related illness ___
 - b. Current or previous caregiver for a family member with AD ___
 - c. Job or volunteer responsibilities involved working with people who had AD or a related disorder ___
 - d. Employed in long term care, skilled care, or dementia care facility ___

- e. Attended a support group or educational program related to AD or a related disorder _____
- f. No prior experience with AD _____

Part II

Please read the following questions and place the number 1-5 in the blank that best describes your response.

1=Not at all 2=Somewhat 3=Neutral 4=Very much 5=Extremely so

15. How confident are you in your knowledge of the following?

- a. Assessment and diagnosis of AD _____
- b. Treatment, management and prevention of AD _____
- c. Recognition of symptoms of AD _____
- d. Course of AD _____
- e. Life impact of AD _____
- f. Differentiating delirium, dementia, depression _____
- g. Financial reimbursement policies _____
- h. Knowledge of patient education and referral resources _____
- i. Disclosing a diagnosis of AD _____
- j. Risk factors of AD _____
- k. Caregiving _____

16. Which training materials are most useful to you?

- a. Web-based courses _____
- b. Video tape reviews _____
- c. Internet resources _____
- d. CD-ROM _____
- e. Power Point Presentations _____
- f. Classroom Settings _____
- g. Other _____

Appendix C

Demographic Data Results Summary and Graphs

Gender

Male	14
Female	43

Age

<30 years	0
30-50 years	56
>50 years	1

Race

Caucasian	45
African American	5
Hispanic	3
Asian	3
Other	1

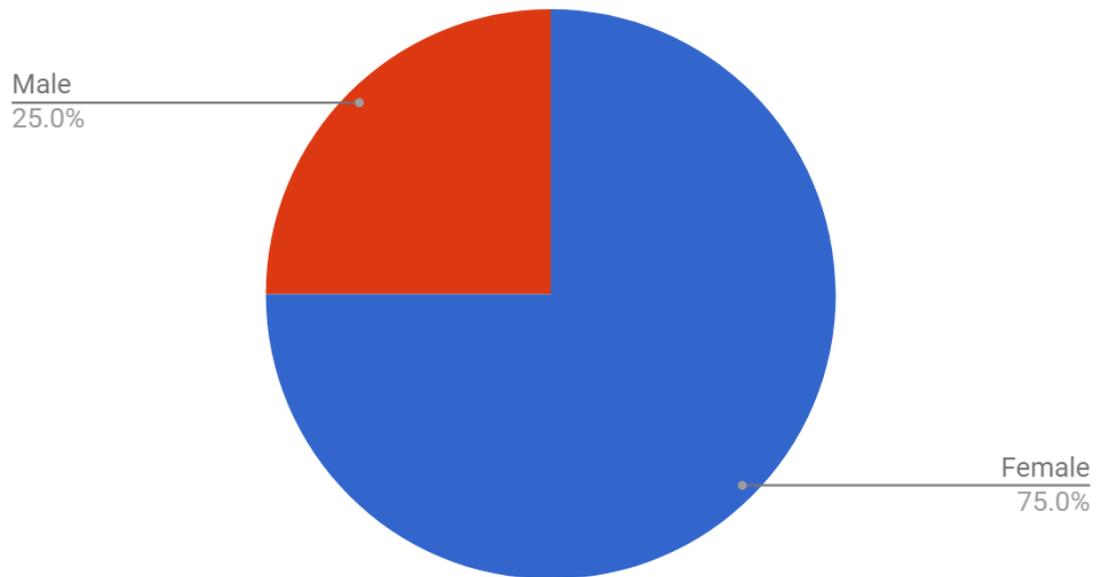
Education

BS/BA	38
MS/MA	5
MD/PhD.	14

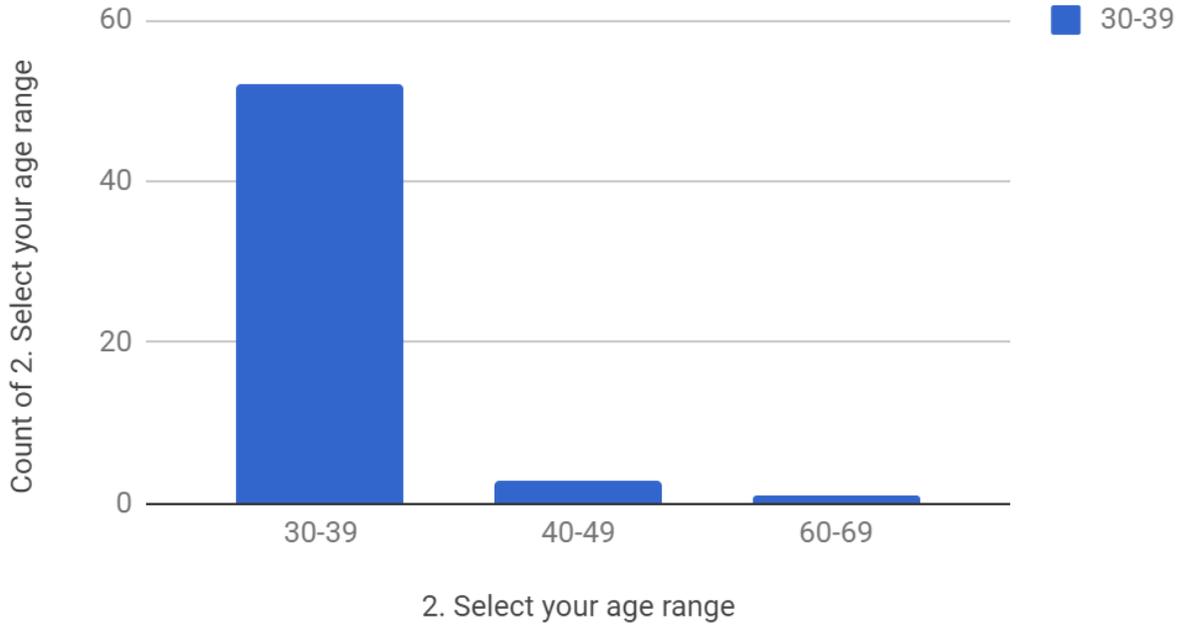
Training Level

1st year Nursing Student	20
2nd year Nursing Student	2
3rd year Nursing Student	8
4th year Nursing Student	14
Resident	12
Fellow	1

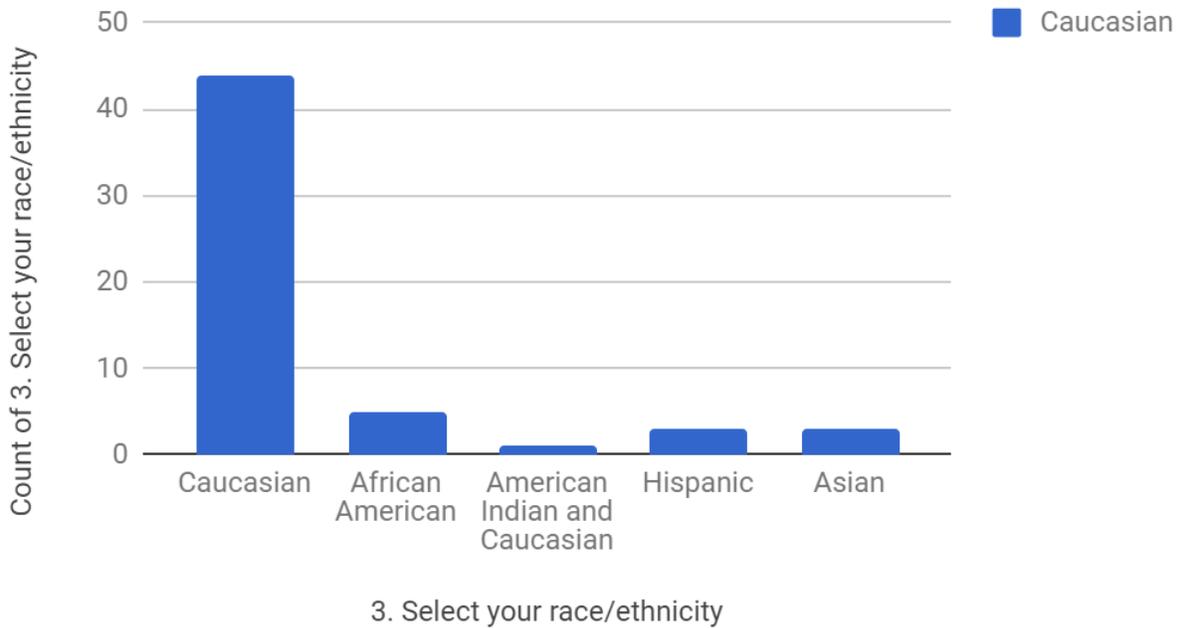
Count of 1. Gender



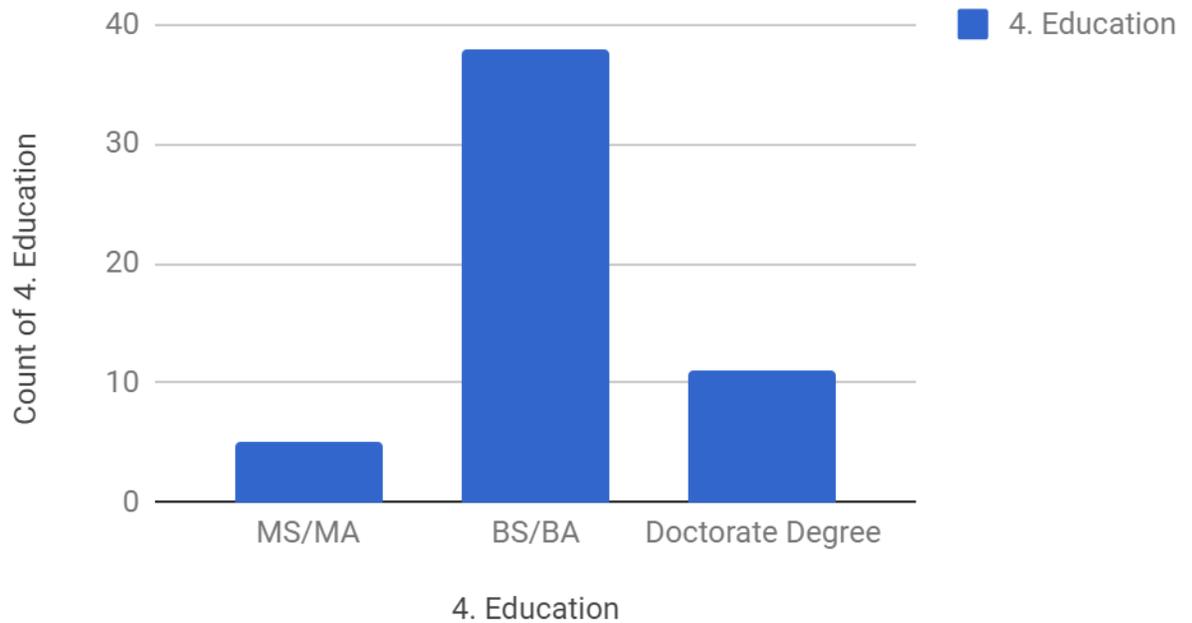
Count of 2. Select your age range



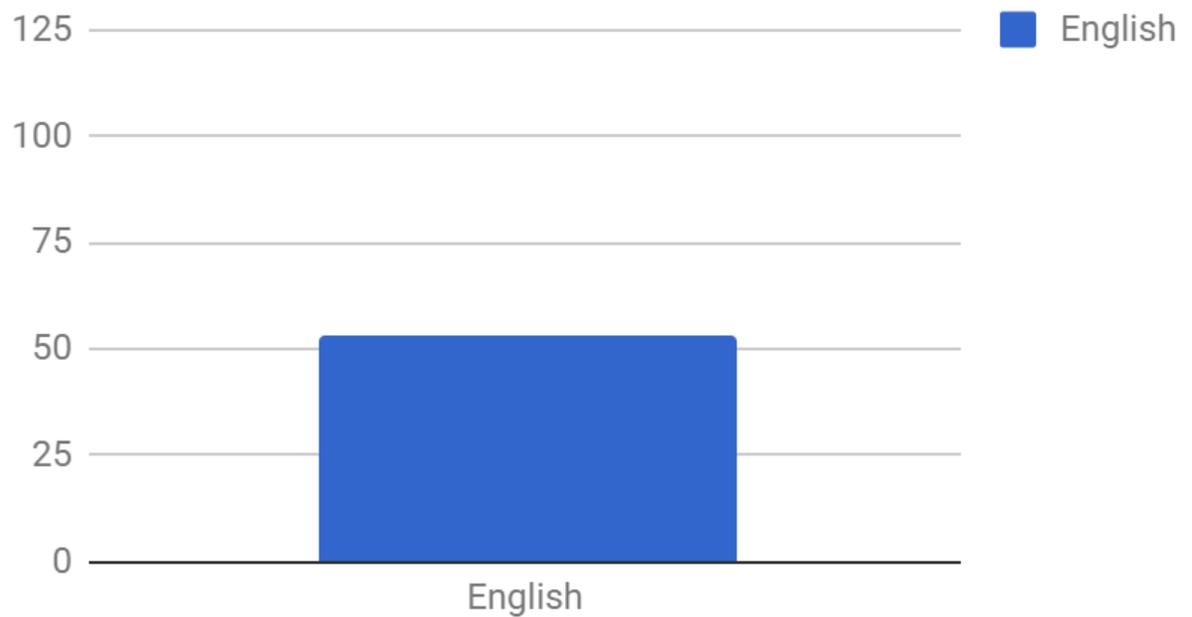
Count of 3. Select your race/ethnicity



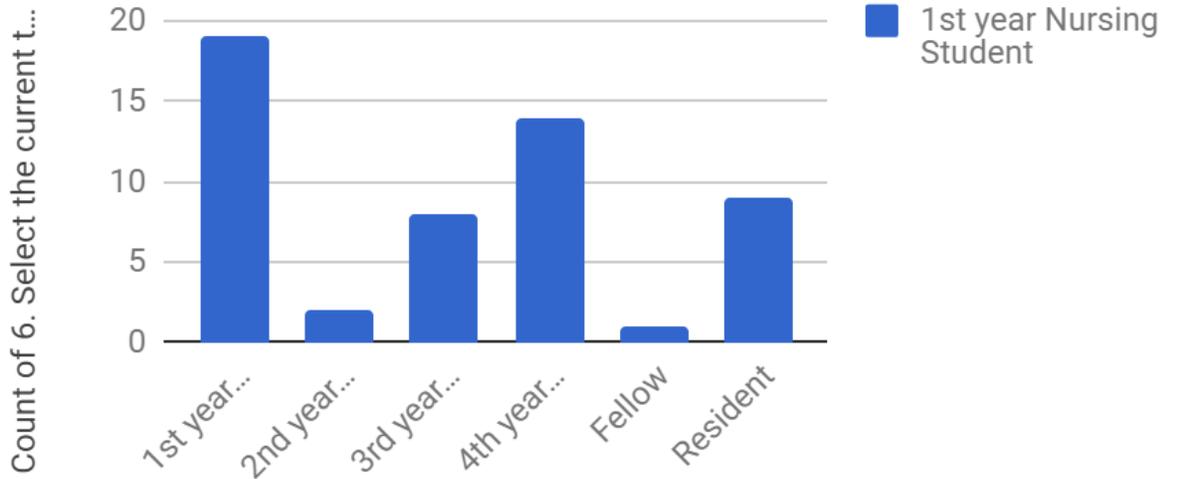
Count of 4. Education



Count of 5. Language

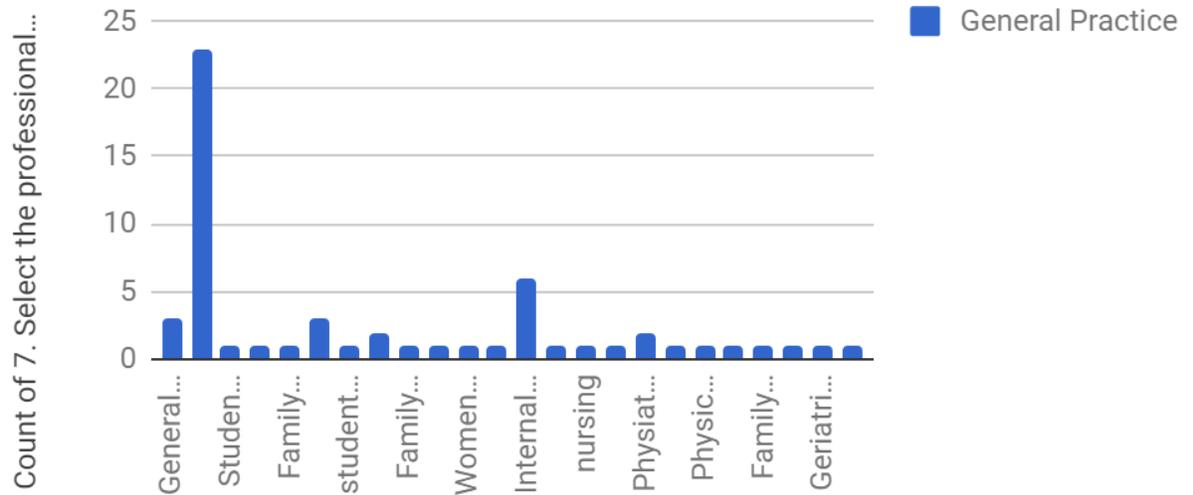


Count of 6. Select the current training status



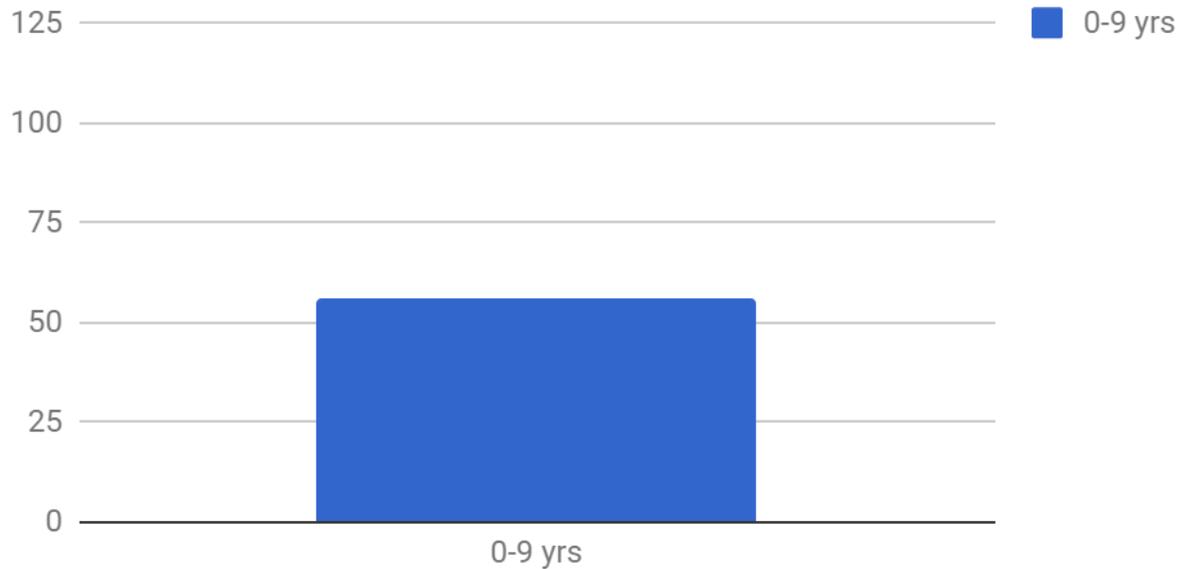
6. Select the current training status

Count of 7. Select the professional field that applies to you

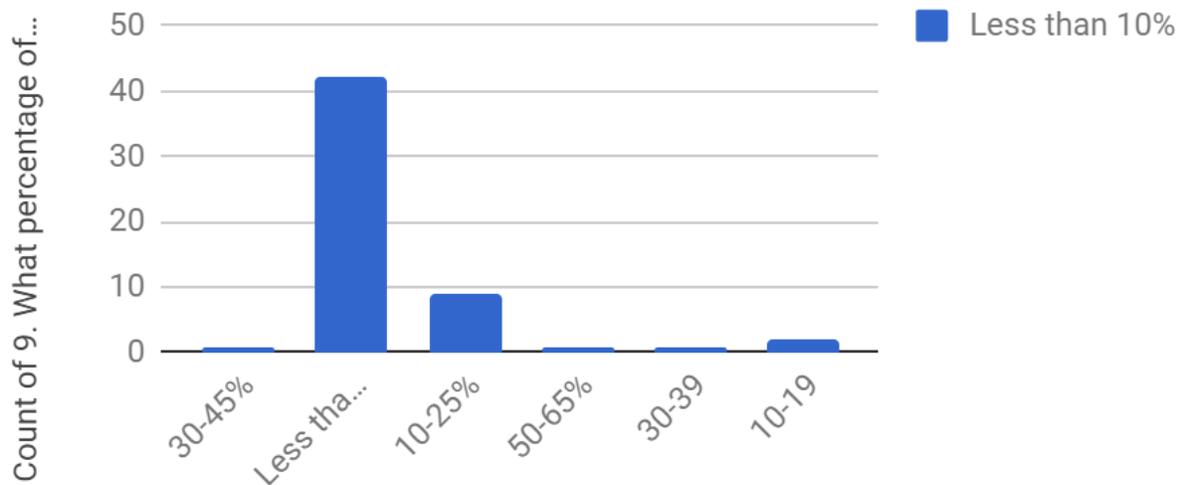


7. Select the professional field that applies to you

Count of 8. How long have you trained or practiced in your specialty area?

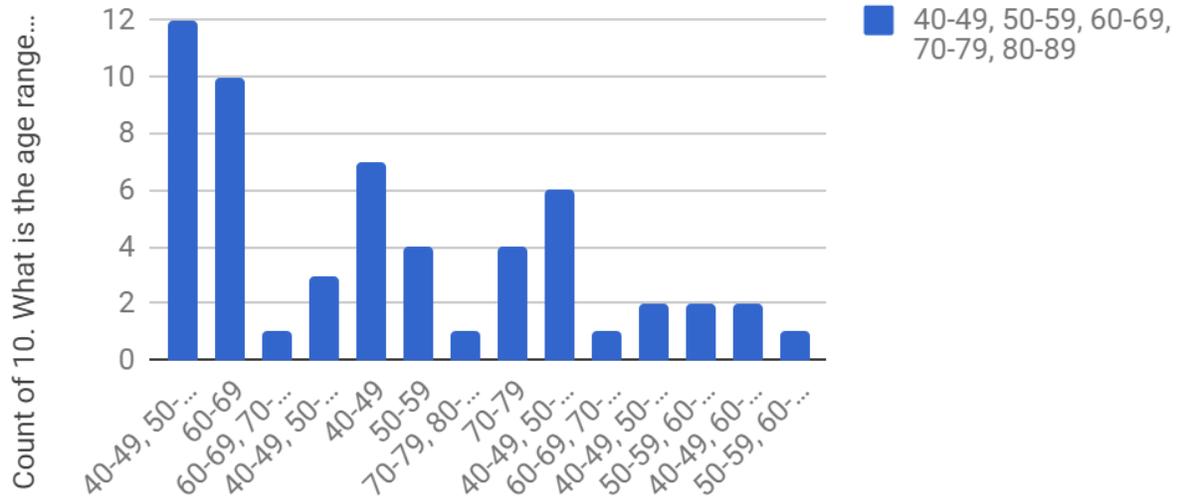


Count of 9. What percentage of your practice is focused on AD or related disorder?



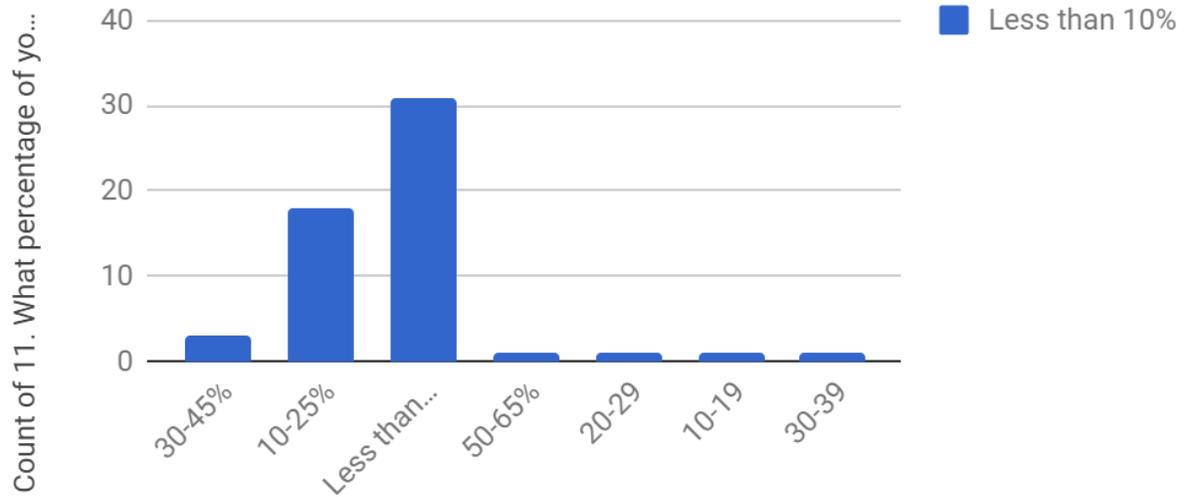
9. What percentage of your practice is focused o...

Count of 10. What is the age range of your patient population?



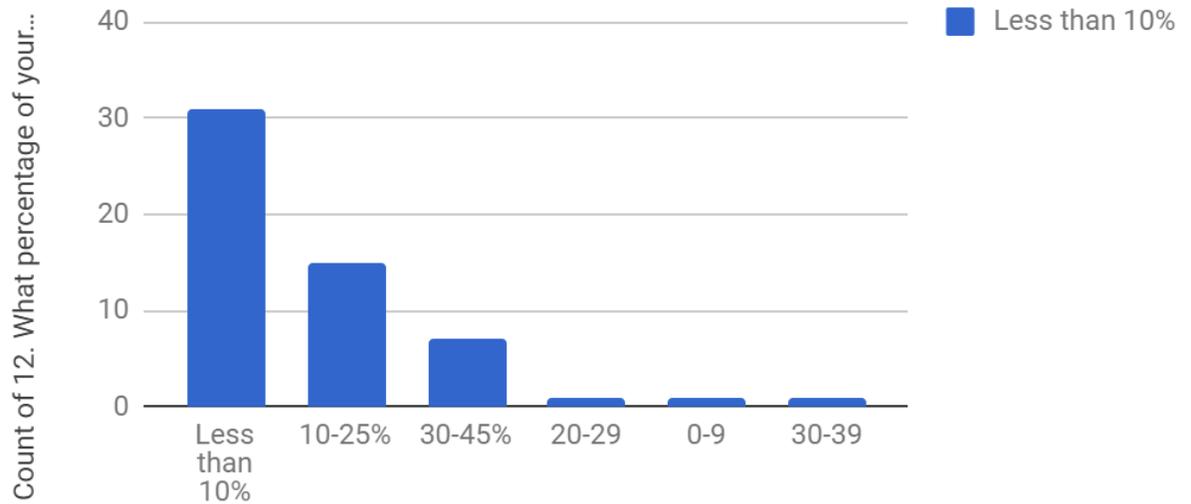
10. What is the age range of your patient population?

Count of 11. What percentage of your patients is diagnosed with Alzheimer's disease, a neuropsychiatric...



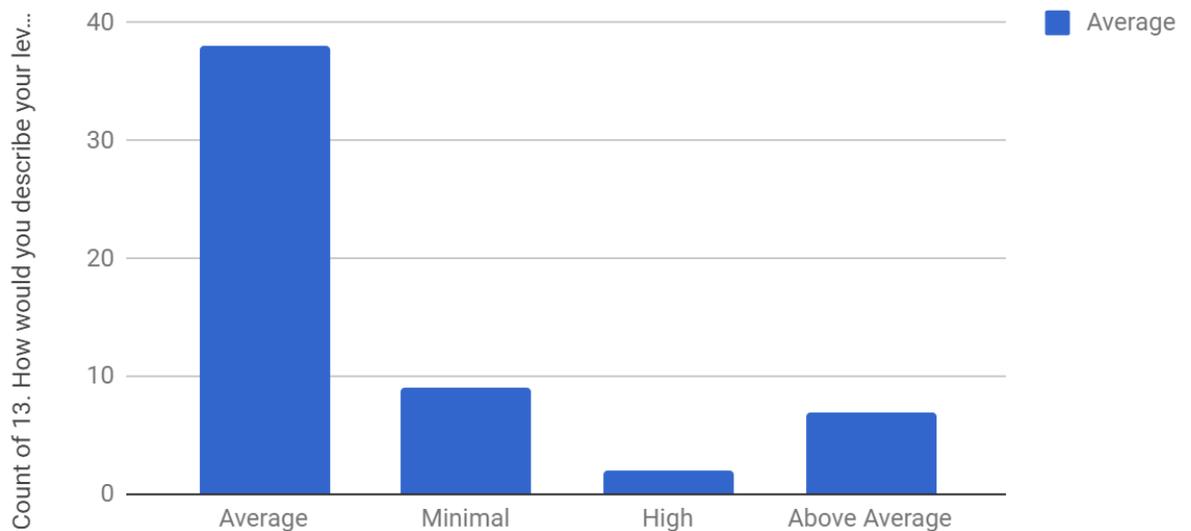
11. What percentage of your patients is diagnosed with...

Count of 12. What percentage of your patients resides in a long term care facility?



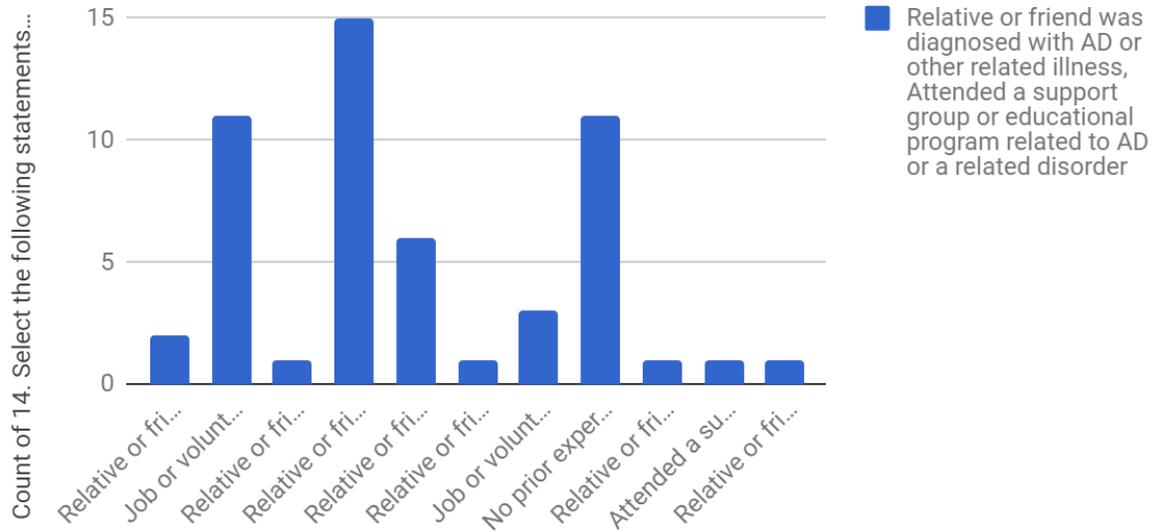
12. What percentage of your patients resides in a long term...

Count of 13. How would you describe your level of knowledge about Alzheimer's dementia?



13. How would you describe your level of knowledge about Alzheimer's demen...

Count of 14. Select the following statements which best describe your previous experience with AD prior to current trai...



14. Select the following statements which best describe your...

Appendix D

AD Instructional Module

ALZHEIMER'S DISEASE EDUCATION PROGRAM

**Impact of Alzheimer's Disease Instruction On Seven
Content Knowledge Domains**

**Joyce Taylor Haynie, PhD(c), MSN, RN
Doctoral Candidate**

University of Missouri-St. Louis

Website: www.dementiaeducation.me.ht

Email: jah7z3@mail.umsl.edu

INTRODUCTION

- ◆ The growing incidence of Alzheimer's disease (AD) implies that primary health care providers have inherited an increasingly important role in early detection, diagnosis, and management of AD.
- ◆ A diagnosis of AD will reduce life expectancy, can impair psychosocial support systems, and make other illnesses difficult to treat.
- ◆ Primary health care providers, who have updated knowledge and understanding of AD and its management, are instrumental in maintaining a reasonable quality of life for those affected by AD.
- ◆ Primary health care providers may benefit from Web-based AD education focused on seven content knowledge domains which assure comprehensive content coverage and content relevance.

Purpose

- ◆ To provide health care providers with knowledge to detect, manage, and assess cognitive impairment and dementia severity due to Alzheimer's disease in the primary health care setting.

Module I: Assessment and Diagnosis of Alzheimer's Disease

Objectives

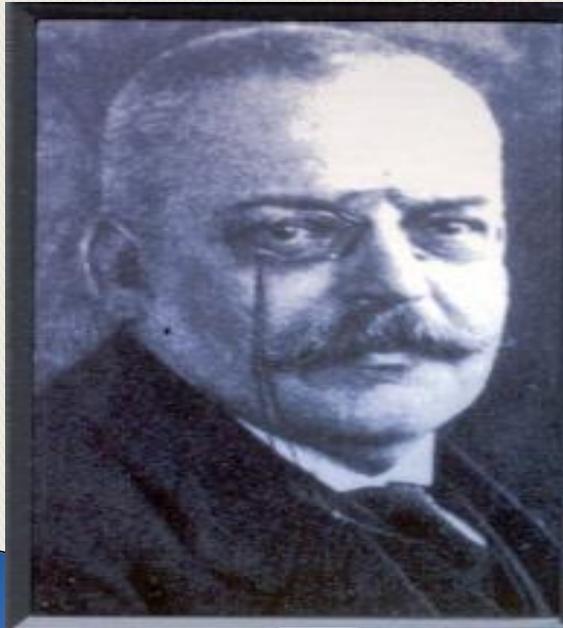
- Describe characteristics of Alzheimer's disease (AD)
- Summarize the pathophysiological changes in the brain due to AD
- Recognize clues to differential diagnosis
- Describe elements of a diagnostic workup
- Be aware of the tools and available resources for detection, evaluation and diagnosis
- Describe various cognitive tests that are available to the clinician

What is Alzheimer's disease?

AD is progressive, disabling, neurodegenerative brain disease

- The most common neurodegenerative brain disease
- Causes destruction of brain cells
- Commonly leads to loss of memory, global cognitive decline, confusion and disorientation, impairment in judgment, communication dysfunction, personality changes, and functional impairment
- Alzheimer's Disease is not synonymous with dementia of the Alzheimer's type (DAT).
- The 2011 criteria expand the definition of Alzheimer's Disease to include an asymptomatic (preclinical phase); a symptomatic (pre-dementia phase) and a dementia phase.

AD Discovery



- ▶ Alzheimer's Disease is named for Dr. Alois Alzheimer, the German physician who first characterized the illness in the early 20th century

Neuropathology of AD

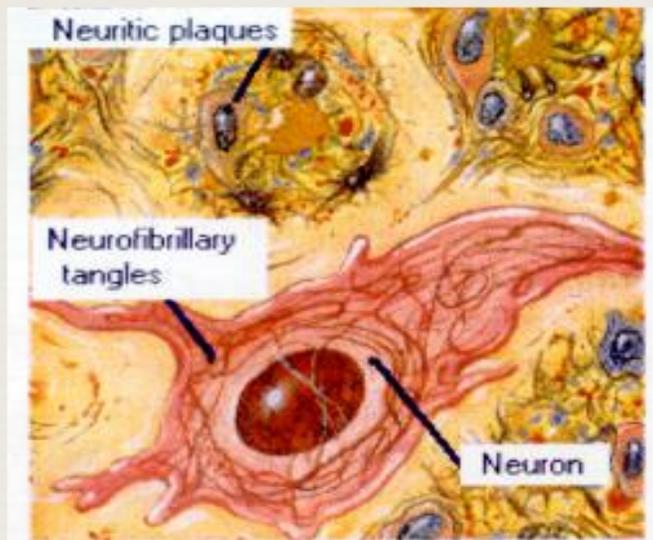
- ▶ Senile Plaques: extracellular deposits of Beta Amyloid, dendrites and glial cells.
- ▶ Neurofibrillary tangles: intracellular accumulation of tau and ubiquitin proteins.
- ▶ Early neuronal loss: especially in the hippocampus.
- ▶ The pathology of AD may be found in cognitively normal patients, patients with MCI, and patients with Dementia.

Neuropathology in AD (Con't)

Damage to the hippocampus and the cerebral cortex reflect memory loss, impaired cognition, and atypical behaviors caused by disruption in three major processes:

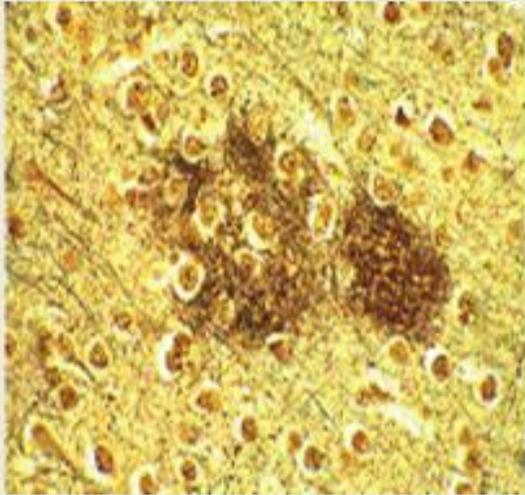
- **Communication between neurons** – This process depends on normal neuronal functions and the production of neurotransmitters.
- **Cellular metabolism** - Sufficient blood circulation is required to supply the cells with oxygen and nutrients such as glucose.
- **Repair of injured neurons** – If this process slows or stops for any reason, the cell cannot function properly.

Plaque Formation



- Current thinking is that the abnormal build up of certain protein plaques in the brain are the real cause of the problem. Some researchers believe that the plaques kill the cells, not that the plaques are byproducts of the death of the cell. Drugs that are used to delay the progress of Alzheimer's all work on stopping the formation of plaque.

Amyloid Plaque



This plaque is composed of beta amyloid. Amyloid is a protein which is normally present in the brain. In Alzheimer's Disease the protein is broken down into a version which forms deposits (plaques) in the brain.

Pictures & Text Courtesy of Dr. Daniel McKeel, Washington University

Neuropathology of AD

Beta-amyloid forms when a large protein is cut in the wrong place. It forms senile plaques between brain cells, interfering with brain communication.

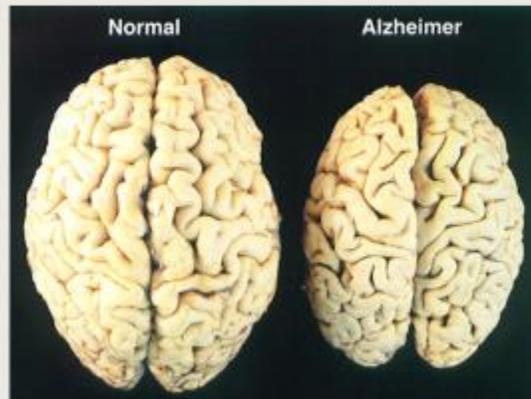
Much research is being done on these aggregations of sticky protein to see what causes it to form, how to stop formation, and maybe even to reverse the process.

Module II Course of Alzheimer's Disease

Objectives

- ❑ Discuss the course of AD
- Describe the prognosis for a person diagnosed with AD
- Describe the rate of prognosis
- ❑ Distinguish normal age-related changes in cognition

Atrophy Due AD



Over time with Alzheimer's disease, the brain atrophies and reduces both in size and functional ability.

Course of Alzheimer's Disease

- AD is not curable.
- People do not recover from Alzheimer's disease.
- After symptoms of AD appear, the average life expectancy is 6-12 years.
- A person with AD becomes increasingly likely to fall down as the disease gets worse.
- Eventually, a person with AD will need 24-hr supervision.

Course of Alzheimer's Disease

- ❑ AD can be diagnosed, even in the early stage.
- ❑ The onset of AD most often occurs after age 65, but occurs at younger ages as well.
- ❑ Typical causes of death are pneumonia and infections related to progressive debilitation
- Usually begins with gradual memory loss
- Will eventually cause more global cognitive decline, issues with communication, personality changes, disorientation and functional impairment
- Worsens over time until death

Course of Alzheimer's Disease

- Normal age-related changes in cognition
- ▶ Many older adults will complain of;
 - Difficulty with recalling proper names
 - Slow reaction time
 - Forgetting tasks when walking into a room
 - Problems multi-tasking
- ▶ These are age-related changes and do not indicate AD pathology
- ▶ More severe memory loss like repeating the same question or story in minutes or forgetting events is an example of pathologic memory loss

Course of Alzheimer's Disease

AD is not an inevitable consequence of aging.

- Normal Age-related cognitive changes
- ▶ Increased sensitivity to distractions
- ▶ More difficulty concentrating
- ▶ Less efficient processing & storage of new information
- ▶ Decreased ability to shift attention among many objects
- ▶ Slowing down of free recall (proper nouns / names / places)

MODULE III: Prevalence and Risk Factors for AD

Objectives

- Discuss the Prevalence of AD
- Recognize Risk factors of AD
- Identify common signs and symptoms of AD
- Describe Stages of AD

Prevalence of Alzheimer's Disease

- AD is the 6th leading cause of death in the U.S. after cardiovascular disease, cancer, and stroke.
- Average survival is 6~12 years from symptom onset to death, up to 20 yrs
- AD is the most common cause of dementia (70%) in people 65 years and older.
- Approximately 1 in 8 people over the age of 65 have AD
- In adults, ages 75-85 years of age, dementia occurs as often as heart attacks and more frequently than strokes
- 5.2 million Americans are affected with AD (Alzheimer's Association, 2013).
- Prevalence of AD increases with age:
 - Less than 5% before age 65
 - 10% at 65+
 - 50% at age 85 and over

Barring the development of effective new treatments, there will be an estimated 14 million AD patients in 2050.

Confirmed Risk Factors for AD

- Increasing age
 - 10% age 65 years and older
 - 50% age 85 and older
- Family history & genetics
 - First degree relative increases risk threefold
 - Less than 1% of patients with Alzheimer's disease have familial autosomal dominant Alzheimer disease
 - Rare kindreds in which AD is caused by a single gene mutation (*APP*, *PSEN1*, *PSEN2*) with autosomal dominant inheritance
 - Complex: Most AD cases result from a mixture of genetic susceptibility (*APOE*) and environmental risk factors
- Apolipoprotein (ApoE e4)
 - Especially before age 75
- Chromosomal disorder: All Down Syndrome individuals develop AD

Environmental Risk Factors

Early to Mid life factors

- ▶ Head injury
- ▶ Obesity
- ▶ Insulin resistance
- ▶ Vascular risk factors like : HTN, hyperlipidemia.
- ▶ OSA

Mid to late life factors

- ▶ Individuals with isolated lifestyles are more apt to develop cognitive decline with aging.
- ▶ Late life depression (there is the question if depression is a prodromal of AD)
- ▶ MCI (Minor Neurocognitive Disorder)

Possible Protective Risk Factors

- ▶ Education Level
- ▶ Socialization
- ▶ Regular Physical Activity
- ▶ Mediterranean Diet
- ▶ Adequate Sleep
- ▶ Treating Vascular Risk Factors (e.g. stop smoking, DM, HLD, HTN)

More research is needed!

Module IV: Symptoms of Alzheimer's Disease

Objectives

- Recognize signs and symptoms of AD
- Describe stages of AD
- Describe DSM-V Diagnostic Criteria for Major Neurocognitive Disorder
- Become familiar with DSM-V Major Neurocognitive Disorder Domains
- Describe the characteristics of dementia
- Know the common reversible dementias
- Identify common neurodegenerative brain diseases in older adults.

10 Warning Signs of AD

The Alzheimer's Association has a list of 10 warning signs that can help individuals recognize early indications

- ▶ Memory changes that disrupt daily life
- ▶ Challenges in planning or solving problems
- ▶ Difficulty completing familiar tasks at home, at work or at leisure
- ▶ Confusion with time or place
- ▶ Trouble understanding visual images and spatial relationships
- ▶ New problems with words in speaking or writing
- ▶ Misplacing things and losing the ability to retrace steps
- ▶ Decreased or poor judgment
- ▶ Withdrawal from work or social activities
- ▶ Changes in mood and personality

Symptoms of Early Stage AD

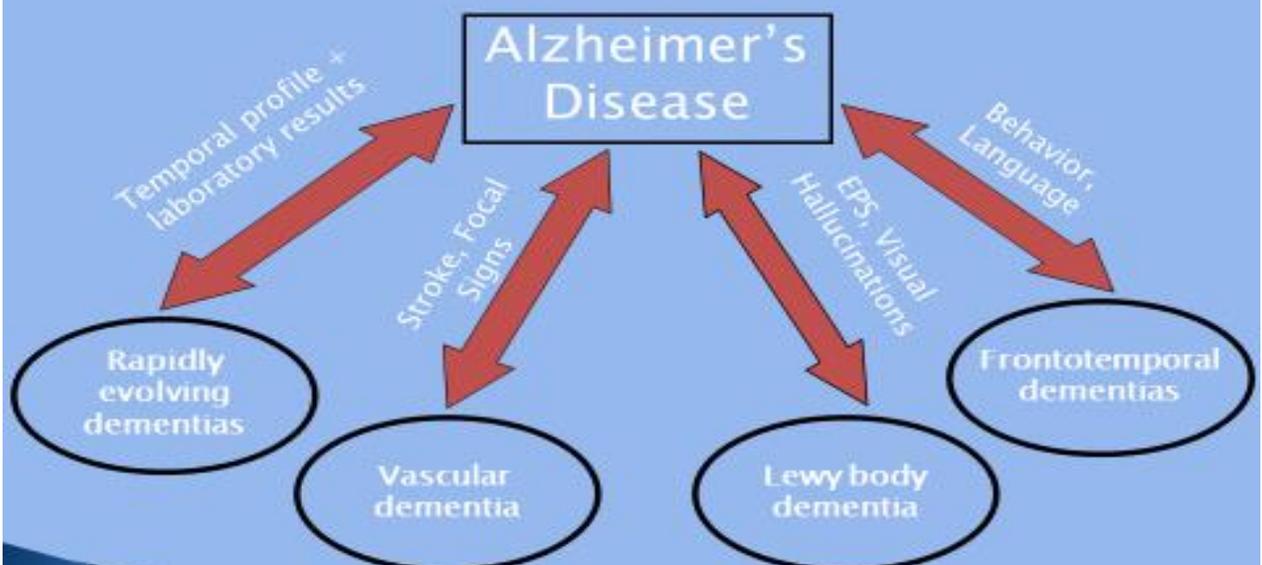
- Trouble with spatial ability & orientation
 - Trouble finding one's way around familiar places; Trouble organizing objects around the home
- Language difficulty
 - Increasing difficulty with finding words to express oneself & with following conversations
- Change in behavior
 - More passive & withdrawn in social situations; More irritable
- Trouble learning & retaining new information
 - Repetitive, Forgets recent conversations or events; Misplaces common objects
- Difficulty handling complex tasks
 - Trouble balancing a checkbook
- Impaired reasoning ability
 - Would not know what to do if the bathroom was flooded; Disregard for rules of social conduct

Dr. John Morris, Director of Knight ADRC View of AD

- ▶ "Alzheimer disease" (AD) refers to the neurodegenerative brain disorder, regardless of clinical status, representing a continuous process of synaptic and neuronal deterioration
- ▶ AD has two major stages:
 - Preclinical (presymptomatic; asymptomatic)
 - Symptomatic (clinical)
- ▶ Symptomatic AD is defined by intraindividual cognitive decline, from subtle to severe, that interferes with daily function, and can be subclassified on symptom severity:
 - Incipient (prodromal; mild cognitive impairment)
 - Dementia

Morris JC, Arch Neurol 2012; 69:700-708.

Clues to Specific Neurodegenerative Diseases



Middle Stage AD

- ❑ New information rapidly lost
 - Shorter attention span
- ❑ Long term memory is altered
 - Problems recognizing close friends, family
- ❑ Behavioral changes
 - May be suspicious, irritable, fidgety, teary or silly
- ❑ Independent living becomes dangerous
 - Needs full time supervision, assistance with complex tasks such as bathing

Advanced AD

- ❑ Remnants of memory remain
 - Fail to recognize familiar objects & people
- ❑ Unable to use language
- ❑ Requires assistance with even simple tasks
 - Little capacity for self care
- ❑ Cannot control bladder and bowel
- ❑ Walks with a shuffle, increased risk of falls

DSM-V Diagnostic Criteria for Major Neurocognitive Disorder

- ▶ A. Evidence of significant cognitive decline from a previous level of performance in one or more area of cognitive domains (complex attention, executive function, learning and memory, language, perceptual-motor or social cognition) based on:
 - Concern of the individual, a knowledgeable informant or the clinician that there has been a significant decline in cognitive function; and
 - Substantial impairment in cognitive performance, preferably documented by standardized neuropsychological testing or, in its absence, another quantified clinical assessment.
- ▶ B. The cognitive deficits interfere with independence in everyday activities.
- ▶ C. The cognitive deficits do not occur exclusively in the context of a delirium.
- ▶ D. The cognitive deficits are not better explained by another mental disorder (e.g., major depressive disorder, schizophrenia).

DSM-V Major Neurocognitive Disorder Domains

- ▶ Complex attention: patient has increased difficulty in environments with multiple stimuli (TV, radio, conversation). Has difficulty holding new information in mind (recalling phone numbers, or addresses just given or reporting what was just said).
- ▶ Executive function: patient is not able to perform complex projects. Needs to rely on others to plan instrumental activities of daily living or make decisions.
- ▶ Learning and memory: patient repeats self in conversation, often within the same conversation. Cannot keep track of short list of items when shopping or of plans for the day. Requires frequent reminders to orient task in hand.
- ▶ Language: patient has significant difficulties with expressive or receptive language. Often uses general terms such as "that thing" and "you know what I mean". With severe impairment may not even recall names of closer friends and family.
- ▶ Perceptual - Motor: Has significant difficulties with previously familiar activities (using tools, driving motor vehicle), navigating in familiar environments.
- ▶ Social cognition: patient may change changes in behavior (shows insensitivity to social standards). Makes decisions without regard to safety. Patient usually has little insight into these changes.

Major Neurocognitive Disorder Due to AD

- ▶ A. the criteria are met for major neurocognitive disorder.
- ▶ B. There is insidious onset and gradual progression of impairment in one or more cognitive domains.
- ▶ C. Criteria are met for either probable or possible Alzheimer's disease as follows:
 - ▶ For major neurocognitive disorder probable Alzheimer's disease is diagnosed if either of the following is present; otherwise, possible Alzheimer's disease should be diagnosed.
 - ▶ 1. Evidence of a causative Alzheimer's disease genetic mutation from family history or genetic testing.
 - ▶ 2. All 3 of the following are present:
 - a. Clear evidence of decline in memory and learning and at least one other cognitive domain(based on detail history or serial neuropsychological testing).
 - b. Steadily progressive, gradual decline in cognition, without extended plateaus.
 - c. No evidence of mixed etiology(i.e., absence of other neurodegenerative or cerebrovascular disease or another neurological, mental or systemic disease likely contributing to cognitive decline).

Understanding Dementia

- ▶ Definition: An umbrella term used to describe an acquired syndrome of sustained loss of memory and decline in other cognitive domains in a person who is otherwise alert sufficient to affect daily function and social relationships.
- ▶ DSM-V definition - the term Alzheimer's dementia = Major Cognitive Disorder due to Alzheimer's Disease.

Medicare Annual Wellness Visit Algorithm for Assessment of Cognition

- ▶ The goal is to detect during the primary care visit the patients with high likelihood of having dementia.
- ▶ “Have you noticed any changes in your memory or ability to complete routine tasks, such as paying bills or preparing a meal?”

Dementia—Nonreversible?

- ▶ The common brain neurodegenerative diseases are;
 - **Alzheimer's disease** (60 - 80% of cases)
 - **Dementia with Lewy Bodies** (15 - 20%)
 - **Vascular dementia**
 - **Frontotemporal dementia (e.g. language and/or behavior changes)**
- ▶ **Less common conditions include;**
 - **Normal pressure hydrocephalus**
 - **Creutzfeld-Jacob Disease**
 - **Autoimmune mediated encephalitis**

Potentially Reversible Causes of Dementia

- ▶ D - Drugs
- ▶ E - Emotional disorders
- ▶ M - Metabolic or endocrine disorders
- ▶ E - Eye and ear dysfunction
- ▶ N - Nutritional deficiencies
- ▶ T - Tumor and trauma
- ▶ I - Infections
- ▶ A - Arteriosclerotic complications and alcohol

From Lamy, P.P. *Prescribing for the Elderly*. Littleton, MA:PSG Publishing Co, 1980

Dementia Screening

- ▶ Considering the increased prevalence of AD with age, older adults seem to be a natural choice for screening
 - ▶ US Preventive Services Task Force has not always supported general dementia screening
 - ▶ Brief screening measures have only fair specificity
 - ▶ Treatments are symptomatic with modest effect
 - ▶ Unclear whether benefit outweighs harm
- www.ahrq.gov/clinic/uspstf/uspsdeme.htm

Current practice is to conduct screening when concerns are raised by the patient or caregiver

Diagnostic Workup

Elements of Dementia Evaluation

- ▶ Assessment of presenting problem
- ▶ Informant-based history
 - Medical/psychiatric hx, family hx, drug hx
 - Pt's cognitive, behavioral, and functional status
- ▶ Mental Status tests
- ▶ Physical and neurological exams

Screen for unsuspected or contributory disorders

- Brain scans – CT or MRI
- Depression Screen
- Laboratory tests – B₁₂, TFTs

Knopman et al, Neurology 2001;56:1143-1153

AD-8 Eight Item Questionnaire to Detect Dementia

- ▶ Detect change in individuals previous level of function
 - No need for baseline assessment
 - Patients serve as their own control
 - Not biased by education, race, gender
- Brief (< 2 min), Yes/No format
 - 2 or more "Yes" answers highly correlated with presence of dementia
- Administration to patients may also be useful in absence of informant

The AD-8 is a copyrighted instrument of the Alzheimer's Disease Research Center, Washington University.

The AD-8 is not a substitute for clinical judgment.

Galvin J, Roe CM, Xiong C. Validity and reliability of the AD-8 informant interview in dementia. Neurology 2006;67:1942-1948.

The AD-8

	YES A change	NO No change	N/A Don't know
Remember, "Yes, a change" indicates that you think there has been a change in the last several years cause by cognitive (thinking and memory) problems			
Problems with judgment (e.g. falls for scams, bad financial decisions, buys gifts inappropriate for recipients)			
Reduced interest in hobbies/activities			
Repeats questions, stories or statements			
Trouble learning how to use a tool, appliance or gadget (e.g. VCR, computer, microwave, remote control)			
Forgets correct month or year			
Difficulty handling complicated financial affairs (e.g. balancing checkbook, income taxes, paying bills)			
Difficulty remembering appointments			
Consistent problems with thinking and/or memory			
TOTAL AD-8 SCORE			

Cognitive Screen: The Short Blessed Test

Question	Max Error	Error Score	x Weight	Subscore
What year is it?	1	-----	4	-----
What month is it?	1	-----	3	-----
Repeat and remember:	John Brown	42 Market St	Chicago	-----
About what time is it (one hour)?	1	-----	3	-----
Count backwards from 20 to 1	2	-----	2	-----
Months of the year backwards.	2	-----	2	-----
Repeat name and address.	5	-----	2	-----

A total weighted score of 6 or more indicates need for further assessment

SCREENS FOR DEPRESSION: GDS vs. PHQ

The Patient Health Questionnaire (PHQ-9)

Patient Name _____ Date of Visit _____

Over the past 2 weeks, how often have you been bothered by any of the following problems?

	Not At all	Several Days	More Than Half the Days	Nearly Every Day
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed or hopeless	0	1	2	3
3. Trouble falling asleep, staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself - or that you're a failure or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed. Or, the opposite - being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3
9. Thoughts that you would be better off dead or of hurting yourself in some way	0	1	2	3

The Importance of the Informant Interview

- ▶ Report cognitive loss in comparison with patient's premorbid function
- ▶ Report interference with activities usually performed by the individual
- ▶ Consistent change reported by observant/informant, even when patient's cognitive test performance is "normal"; one can detect earliest symptomatic stages of dementia
- ▶ Unbiased by race, culture, education or SES

Differential Diagnosis

- ❑ **Acute changes in memory and thinking are not due to dementia of the Alzheimer's type.**

There can be many causes of sudden changes in memory and thinking including:

- Stroke and TIAs
- Delirium – “acute confusional state”
Changes happen within hours or days
- For a sudden change in memory and thinking a doctor or emergency care should be consulted.

Dementia with Lewy Bodies: Consensus Criteria

- ▶ Progressive cognitive decline of sufficient magnitude to interfere with normal social or occupational function
- ▶ Core features (2→probable DLB; 1→possible DLB)
 - Fluctuating cognition
 - Recurrent visual hallucinations
 - Parkinsonism
- ▶ Supportive features
 - Repeated falls
 - Syncope and transient loss of consciousness
 - Neuroleptic sensitivity
 - Systematized delusions
 - Hallucinations in other modalities
 - REM sleep disorder

DLB = dementia with Lewy bodies; REM = rapid eye movement.
Source: McKeith IG, et al. *Neurology*. 1996;47:1113-1124.

Frontotemporal Dementia: Clinical Diagnostic Criteria

- ▶ Core features
 - Insidious onset and gradual progression
 - Early decline in social interpersonal skills or language skills
 - Early emotional blunting or early loss of insight
- ▶ Supportive features
 - Behavioral disorders
 - Speech/language disorders: asponaneity, pressure speech, stereotypical speech, echolalia, perseveration, and mutism
 - Physical signs: primitive reflexes, incontinence, parkinsonism, and low/labile blood pressure
 - Neuropsychology testing: significant frontal lobe impairment
 - Neuroimaging: frontal and/or anterior temporal lobe abnormalities

Source: Neary D, et al. *Neurology*. 1998;51:1546-1554.

Behavioral and Psychological Symptoms of Dementia (BPSD)

- ▶ Common: >90% of patients have at least 1 symptom
- ▶ Occur early in the disease—present in MCI
- ▶ Multiple simultaneous symptoms
- ▶ Symptoms emerge as disease progresses
- ▶ Once present, highly recurrent
- ▶ Decrease patient and caregiver quality of life
- ▶ Precipitate institutionalization

Sources: Srikanth S, et al. *J Neurol Sci*. 2005;236:43-48.
Shin IS, et al. *Am J Geriatr Psychiatry*. 2005;13:469-474.
Phillips VL, et al. *J Am Geriatr Soc*. 2003;51:188-193

Differential Presentation of BSPD

- ▶ Alzheimer's disease:
 - Irritability
 - Self-centeredness
 - Delusions
 - Hallucinations
 - Apathy
 - Depression
 - Insomnia
 - Agitation and aggression
- ▶ Vascular dementia:
 - Emotional lability
 - Severe depression
 - Apathy
 - Disinhibition
- ▶ Frontotemporal dementia:
 - Decline in interpersonal skills
 - Apathy
 - Decline in personal hygiene
 - Mental rigidity/inflexibility
 - Distractibility
 - Hyperorality
 - Stereotyped behavior
- ▶ Dementia with Lewy bodies:
 - Psychosis
 - Anxiety and/or depression
 - Apathy/amotivational states
 - Aggressivity/violent behavior
 - Nocturnal confusion/insomnia
 - REM behavior disorder

Sources: Bakker TJEM, et al. *Dement Geriatr Cogn Disord*. 2005;20:215-224; Neary D, et al. *Neurology*. 1998;51:1546-1554; Roman GC. *J Am Geriatr Soc*. 2003;51(5 Suppl Dementia):S296-S304; McKeith IG, et al. *Neurology*. 1996;47:1113-1124; McKeith IG, et al. *Neurology*. 1999;53:902-905.

Mild Cognitive Impairment (MCI)

- MCI - a clinical state that lies between cognitive changes expected in aging and true dementia
- Deficits may be in only one cognitive domain, like short term memory. A person with only short term memory loss and no other affected domain is "amnesic" but not demented by current criteria.
- Clinical diagnosis of dementia requires deficits in two domains
 - Memory (typical)
 - Language
 - Visuospatial
 - Executive function (frontal lobe function).
- It is in this group that the meaningfulness of many of the biomarkers has become understood among people with memory loss greater than expected for age (Amnesic MCI):
 - If the LP/CSF does not show the low A β /high Tau pattern, the 5 year risk of developing a clinical diagnosis of AD is <10%.
 - If CSF reveals the signature low A β / high Tau pattern, the 5 year risk of developing clinically diagnosed AD is >90%.

MODULE V: Treatment & Symptom Management

Objectives

- Describe current pharmacological and non-pharmacological treatment options for AD

- Describe successful behavioral management interventions for specific behaviors common to AD

TREATMENT AND SYMPTOM MANAGEMENT

Pharmacological

- Cholinesterase Inhibitors (treat mild to moderate AD symptoms)
 - Aricept/donepezil (1996)
 - Exelon/rivastigmine (2000)
 - Razadyne/galantamine (formerly Reminyl, 2001)
 - Do not stop or reverse AD
 - Have modest effects to stabilize symptoms over months to years
 - Generally well tolerated
 - Common side effects include nausea, vomiting, anorexia, weight loss, bradycardia, syncope, muscle cramps, nightmares and urinary frequency

TREATMENT FOR AD (CON'T)

Pharmacological

- NMDA receptor antagonist
 - Namenda/memantine (2003)
- Treat moderate to severe AD symptoms
 - Efficacy in mild to moderate AD is yet to be established
- Will not stop or reverse AD
- Appears to be beneficial alone or in combination with cholinesterase inhibitors
- Generally well tolerated
- Side effects include constipation, headache, dizziness

TREATMENT FOR AD (CON'T)

Pharmacological

- ▶ Treat behaviors that impair quality of life of the caregiver and/or patient
- ▶ Individualize treatment based on patient characteristics and behaviors
- ▶ Titrate to effective dose or discontinue
- ▶ That being said, always go with the lowest dose
- ▶ Monitor for side effects
- ▶ Reevaluate need and consider tapers!

AD Symptom Management

Non-pharmacological Interventions

- ❑ Consistent regular physical exercise
- ❑ Eat a brain-healthy diet
- ❑ Challenge the mind
- ❑ Simplify environment - Avoid over stimulation; use reminder notes; one-step instructions
- ❑ Frequent engagement in social activities
- ❑ Supportive counseling for depression and anxiety

AD Symptom Management (con't)

Non-pharmacological Interventions

- ❑ Get regular and restful sleep
- ❑ Minimize stress
- ❑ Avoid smoking and drinking alcohol
- ❑ Recommend driving evaluation
 - Warning signs: fender binders, driving at inappropriate speeds, getting lost
 - Limit driving opportunities - eventually stop driving
- ❑ Ensure home safety
- ❑ Protect financial matters from fraud; check to see how the person is managing bills

Behavior Management

- ▶ Implement the goals of the PLST model (Progressively Lowered stress threshold) to explain alternative approaches for managing persons with dementia. Utilization of PLST requires assessment of the total person.
- ▶ Promote baseline/normative behavior
- ▶ Identify anxious behaviors and provide interventions to prevent dysfunctional or catastrophic behavior.

Initial Choices for Behavioral Management if Drugs are Needed

For Sleep

- Trazadone 50-100mg po qhs
 - Priapism, SSS, Sedation
- Melatonin 2-5 mg po qhs
- Ramelteon 8mg po qhs
 - Dizziness, Headache, Nausea, Somnolence

For Anxiety

- SSRI/SNRI/Buspirone
- Avoid Benzo's

JAMA 2014; Citalopram
JAMA 2015; Nuedexta

For Psychosis

- Chronic Treatment: Quetiapine 25mg BID and 50mg qhs...
- Acute Control: If no prolonged QTc or EPD: Haldol/Risperdal

If unsure, can use Olanzapine ODT, IM...

Geriatrician Picks for Chronic Behavioral Management if Drugs are Ordered

Cholinesterase Inhibitors

- Donepezil (Aricept)
- Galantamine (Razadyne)
- Rivastigmine (Exelon-patch or pill)
- Approved for use in mild to moderate AD

N-Methyl-D-Aspartate (NMDA)-Receptor Antagonist

- Memantine (Namenda)
- Approved for use in moderate to severe AD

Module VI: LIFE IMPACT OF ALZHEIMER'S DISEASE

Objectives

- Describe the Impact of AD
 - > Economic Cost
- Describe impact on epidemiology

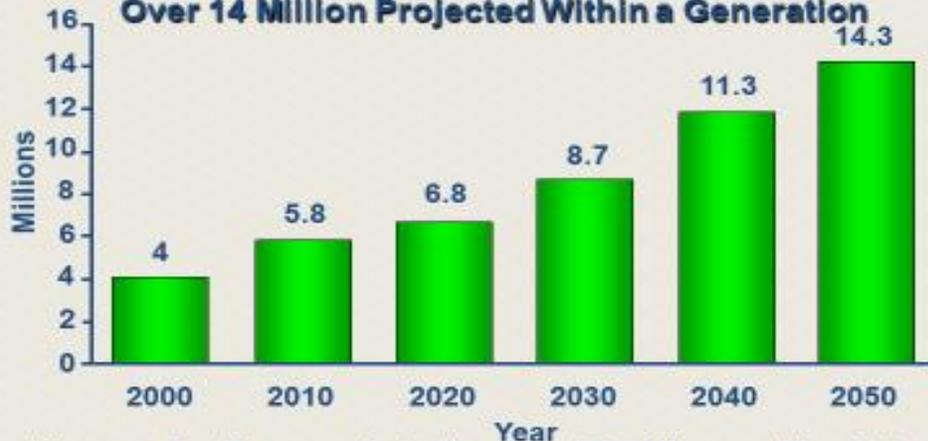
LIFE IMPACT OF ALZHEIMER'S DISEASE

□ Economic Cost

- > More than 15 billion Americans provide unpaid care for someone with dementia due to AD.
- > The overwhelming majority of people with AD live at home (80%) and are cared for by family and friends.
- > 70% of nursing home residents have some degree of cognitive impairment.
- In 2011, AD cost an estimated \$183 billion annually nationwide. Projected costs for 2050 are \$1.1 trillion annually.
 - > Medicare coverage for hospital and physician services accounts for \$93 billion
 - > Medicaid costs associated with the long term nursing home care accounts for \$37 billion. Out-of-pocket accounts for \$31 billion.
 - > Other related costs account for \$36.5 billion
 - > Private insurance funding accounts for only 9% of total care costs
 - > Families incur high out-of-pocket expenses as a result of premiums, deductibles co-payments and other healthcare costs not covered by Medicare.

Epidemiology

**5 Million AD Cases Today—
Over 14 Million Projected Within a Generation**



Affects > 5 million people in the U.S. (20 million world-wide)
Results in > 100,000 deaths per year/Costs > \$100 billion annually

MODULE VII: Care Giving

Objectives

Describe management strategies

- Identify caregiving considerations
- **Caregiver Interventions**
 - Consider psychosocial issues
 - Caregiver needs
 - Alzheimer's Association

Care Giving

Considerations for Management of Care

- ▶ Nature of the illness
- ▶ Extent of Disability
- ▶ Social and psychological needs/support services
- ▶ Future changes/prognosis
- ▶ Treatment
- ▶ Referral
- ▶ Readings: The 36-Hour Day
- ▶ Alzheimer Association
- ▶ Legal issues



Care Giving

Caregiving Considerations

- Consult Social Worker and or Case Management services early
- Most people with AD live at home
- 80% of care is provided by family and friends.
- Do legal & financial planning early
 - DPOA, healthcare directive, will
- Monitoring is the first step
 - Do not take over right away!
 - People with early AD can make their own decisions.
 - Eventually will need 24-hour care
- Treat the person with respect & dignity
 - Avoid talking down to or around the person

Care Giving

Caregiving Considerations (con't)

- > Avoid correcting and quizzing
- > Make negatives into positives
 - Say, "Let's go here" instead of "Don't go there"
- > Break tasks & instructions into simple steps
- > Increase stimulating activities during the day to prevent sleep problems
- > Encourage caregivers to seek information & ask for help

Care Giving

Caregiver Interventions

- ▶ Respite care for patient and caregiver
- ▶ Counsel caregiver, progression of the illness
- ▶ Provide sources of support
- ▶ Encourage involvement of other family members
- ▶ Provide information regarding NH placement
- ▶ Recommend financial and legal planning

Get Help and Support

- **The Alzheimer's Association can help**
 - ▶ Support Groups for both patient/caregiver
 - ▶ Education (Professional and Family)
 - ▶ Safe Return Program
 - ▶ 24 hour Help Line
 - ▶ Referrals to dementia friendly clinics
 - ▶ Driving evaluation suggestions
 - ▶ Day Center Information

Why Early Detection and Future Directions

- With the unraveling of the human genome, research into the prevention and treatment of dementia has advanced light years.
- Current research studies are investigating vaccines, genetic interventions, and hundreds of medications to conquer dementia.
- Research efforts offer hope to countless dementia patients and their families
- Research has advanced more quickly on the diagnostic methods than on the therapeutic strategies
- The advantages of early biomarker diagnosis are currently of greatest help to researchers.
- The value of early diagnosis in clinical settings will be optimized when more potent, and possibly even preventative, treatments become available.

SUMMARY...

- DSM-V definition - Alzheimer's dementia = Major Cognitive Disorder due to Alzheimer's Disease.
- Alzheimer's disease accounts for between 50% and 70 % of all cases of dementia.
- The structured cognitive assessment tools recommended for AWW: Memory Impairment Screen (MIS), General Practitioner Assessment of Cognition (GPCOG), Mini-Cog, Short IQCODE, AD8 and GPCOG. All of these assessments are free – online.
- The pathology of Alzheimer's Disease (senile plaques, neurofibrillary tangles, early neuronal) loss may be found in cognitively normal patients, patients with MCI and patients with Dementia.
- The National Institute of Aging-Alzheimer's Association Workgroups do not advocate the use of AD biomarkers for routine diagnostic purposes at current time
- Know your Dementia Subtypes!
- Practice The DRNO approach - (Describe, Reason, Non-pharm, Order Meds)
- Know when to work up changes in behavior

Websites

- ▶ Alzheimer's disease, including clinical trials
 - clinicaltrials.gov
 - www.alz.org
 - www.alzforum.org
 - www.alzheimers.org
 - www.hbo.com/docs (The Alzheimer Project)
 - www.nia.nih.gov/research/cognitive-instrument

Websites

- Community Programs:
 - Contact a local Area Agency on Aging (AAA)
 - Contact a local Aging & Disability Resource Center (ADRC)
 - Or, go to <http://eldercare.gov/>
- National Institutes of Health: <http://nih.gov>
- National Institute on Aging at NIH: <http://nia.nih.gov>
- ClinicalTrials.gov, a service of NIH: <http://clinicaltrials.gov>
- Centers for Disease Control and Prevention:
 - <http://www.cdc.gov/aging>
 - <http://www.cdc.gov/physicalactivity>

END of PPt. Presentation

Appendix E

Pre-Test /Post-Test Survey

Alzheimer's Disease Knowledge Scale (ADKS)

Instructions - Below are statements about Alzheimer's disease. Please read each statement carefully and select the response you believe is True or False. If you are not sure of the correct response, make your best guess. It is important to select a response for every statement, even if you are not completely sure.

1. People with Alzheimer's disease are particularly prone to depression.
 - A. True
 - B. False
2. It has been scientifically proven that mental exercise can prevent a person from getting Alzheimer's disease.
 - A. True
 - B. False
3. After symptoms of Alzheimer's disease appear, the average life expectancy is 6 to 12 years.
 - A. True
 - B. False
4. When a person with Alzheimer's disease becomes agitated, a medical examination might reveal other health problems that caused the agitation.
 - A. True
 - B. False
5. People with Alzheimer's disease do best with simple, instructions given one step at a time.
 - A. True
 - B. False
6. When people with Alzheimer's disease begin to have difficulty taking care of themselves, caregivers should take over right away.
 - A. True
 - B. False

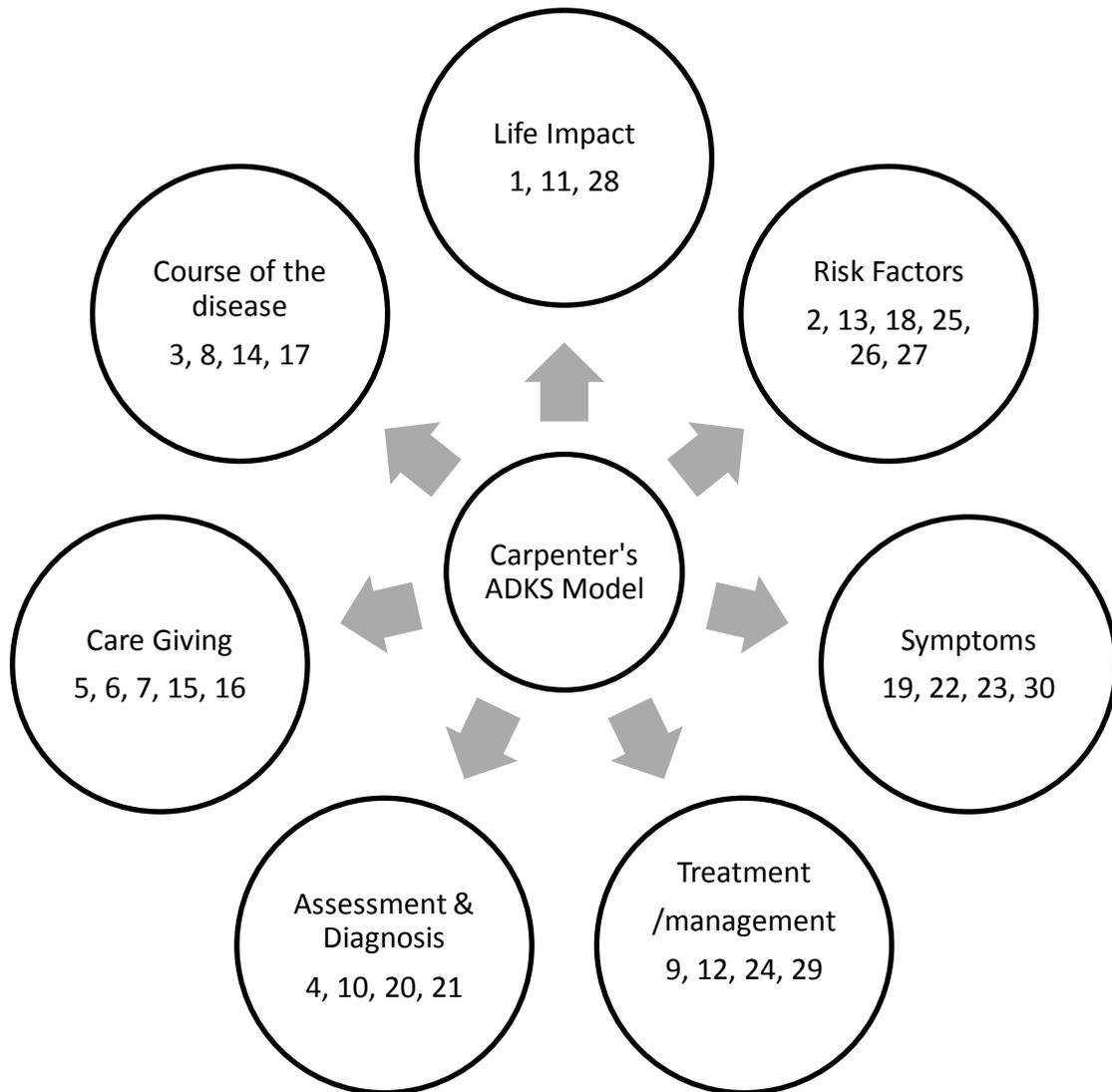
7. If a person with Alzheimer's disease becomes alert and agitated at night, a good strategy is to try to make sure that the person gets plenty of physical activity during the day.
 - A. True
 - B. False
8. In rare cases, people have recovered from Alzheimer's disease.
 - A. True
 - B. False
9. In rare cases, people have recovered from Alzheimer's disease.
 - A. True
 - B. False
10. If trouble with memory and confused thinking appears suddenly, it is likely due to Alzheimer's disease.
 - A. True
 - B. False
11. Most people with Alzheimer's disease live in nursing homes.
 - A. True
 - B. False
12. Poor nutrition can make the symptoms of Alzheimer's disease worse.
 - A. True
 - B. False
13. People in their 30s can have Alzheimer's disease.
 - A. True
 - B. False
14. A person with Alzheimer's disease becomes increasingly likely to fall down as the disease gets worse.
 - A. True
 - B. False
15. When people with Alzheimer's disease repeat the same question or story several times, it is helpful to remind them that they are repeating themselves.
 - A. True
 - B. False

16. Once people have Alzheimer's disease, they are no longer capable of making informed decisions about their own care.
 - A. True
 - B. False
17. Eventually, a person with Alzheimer's disease will need 24-hour supervision.
 - A. True
 - B. False
18. Having high cholesterol may increase a person's risk of developing Alzheimer's disease.
 - A. True
 - B. False
19. Tremor or shaking of the hands or arms is a common symptom in people with Alzheimer's disease.
 - A. True
 - B. False
20. Symptoms of severe depression can be mistaken for symptoms of Alzheimer's disease.
 - A. True
 - B. False
21. Alzheimer's disease is one type of dementia.
 - A. True
 - B. False
22. Trouble handling money or paying bills is a common early symptom of Alzheimer's disease.
 - A. True
 - B. False
23. One symptom that can occur with Alzheimer's disease is when he/she believes that other people are stealing one's things.
 - A. True
 - B. False
24. When a person has Alzheimer's disease, using reminder notes is a crutch that can contribute to decline.

- A. True
 - B. False
25. Prescription drugs that prevent Alzheimer's disease are available.
- A. True
 - B. False
26. Having high blood pressure may increase a person's risk of developing Alzheimer's disease.
- A. True
 - B. False
27. Genes can only partially account for the development of Alzheimer's disease.
- A. True
 - B. False
28. It is safe for people with Alzheimer's disease to drive, as long as they have a companion in the car at all times.
- A. True
 - B. False
29. Alzheimer's disease cannot be cured.
- A. True
 - B. False
30. Most people with Alzheimer's disease remember recent events better than things that happened in the past.
- A. True
 - B. False

Appendix F

Carpenter's ADKS Model of Content Knowledge Domains



Appendix G

Carpenter's ADKS Model of Content Knowledge Domains: Item Characteristics

1. Life Impact

- # 1 People with AD are particularly prone to depression.
- # 11 Most people with AD live in nursing homes.
- # 28 It is safe for people with Alzheimer's disease (AD) to drive, as long as they have a companion in the car at all times.

2. Risk Factors

- #2 It has been scientifically proven that mental exercise can prevent a person from getting AD.
- #13 People in their 30s can have AD.
- #18 Having high cholesterol may increase a person's risk of developing AD.
- #25 Prescription drugs that prevent AD are available.
- #26 Having high blood pressure may increase a person's risk of developing AD.
- #27 Genes can only partially account for the development of AD.

3. Symptoms

- #19 Tremor or shaking of the hands or arms is a common symptom in people with AD.
- #22 Trouble handling money or paying bills is a common early symptom of AD.
- #23 One symptom that can occur with AD is believing that other people are stealing one's things.
- #30 Most people with AD remember recent events better than things that happened in the past.

4. Treatment/Management

- #9 People whose AD is not yet severe can benefit from psychotherapy for depression and anxiety.
- #12 Poor nutrition can make the symptoms of AD worse.
- #24 When a person has AD, using reminder notes is a crutch that can contribute to decline.
- #29 AD cannot be cured.

5. Assessment/ Diagnosis

- #4 When a person with AD becomes agitated, a medical examination might reveal other health problems that caused the agitation.
- #10 If trouble with memory and confused thinking appears suddenly, it is likely due to AD.
- #20 Symptoms of severe depression can be mistaken for symptoms of AD.
- #21 AD is one type of dementia.

6. Care Giving

- #5 People with AD do best with simple instructions giving one step at a time.
- #6 When people with AD begin to have difficulty taking care of themselves, caregivers should take over right away.
- #7 If a person with AD becomes alert and agitated at night, a good strategy is to try to make sure that the person gets plenty of physical activity during the day.

#15 When people with AD repeat the same question or story several times, it is helpful to remind them that they are repeating themselves.

#16 Once people have AD, they are no longer capable of making informed decisions about their own care.

7. Course of the Disease

#3 After symptoms of AD appear, the average life expectancy is 6-12 years.

#8 In rare cases, people have recovered from Alzheimer's disease.

#14 A person with AD becomes increasingly likely to fall down as the disease gets worse.

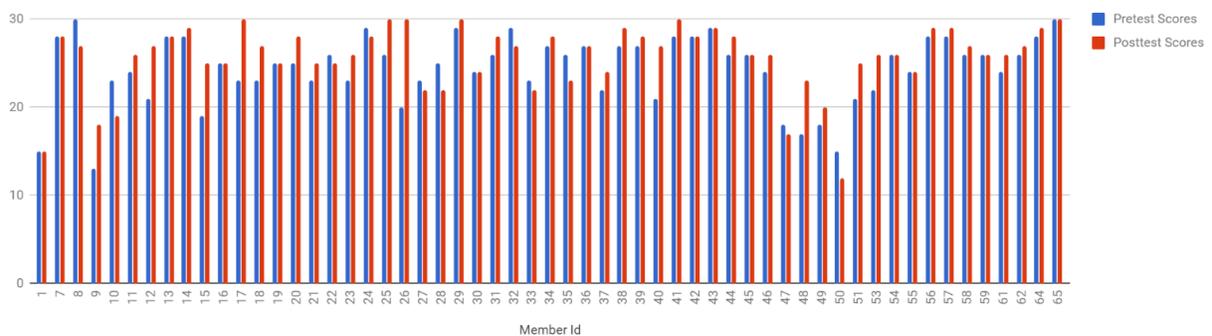
#17 Eventually, a person with AD will need 24-hr supervision.

Appendix H

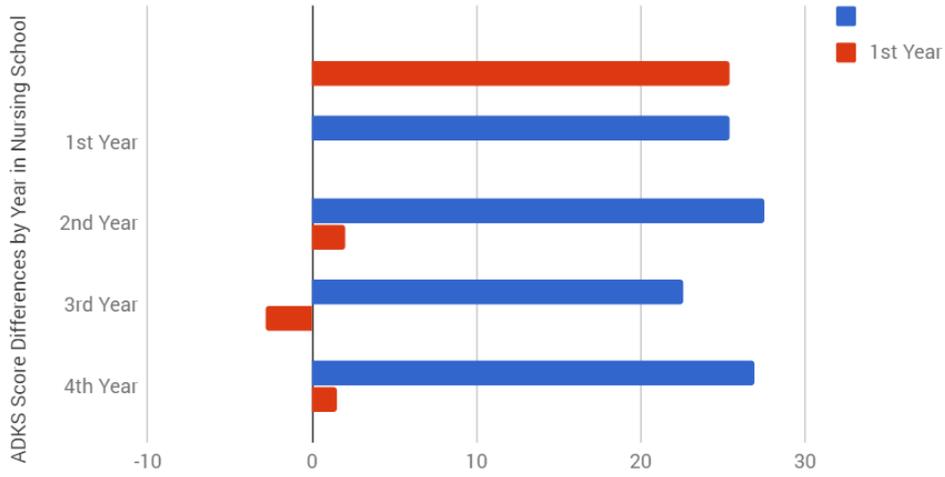
ADKS Scores and Graphs for all Participants

ADKS Scores (M)					
All Nurses	25.6275				
Doctors	25.29				
Difference	-0.3375				
ADKS Score Differences by Year in Nursing School					
		1st Year	2nd Year	3rd Year	4th Year
		25.45	27.5	22.63	26.93
1st Year	25.45	0	-2.05	2.82	-1.48
2nd Year	27.5	2.05	0	4.87	0.57
3rd Year	22.63	-2.82	-4.87	0	-4.3
4th Year	26.93	1.48	-0.57	4.3	0

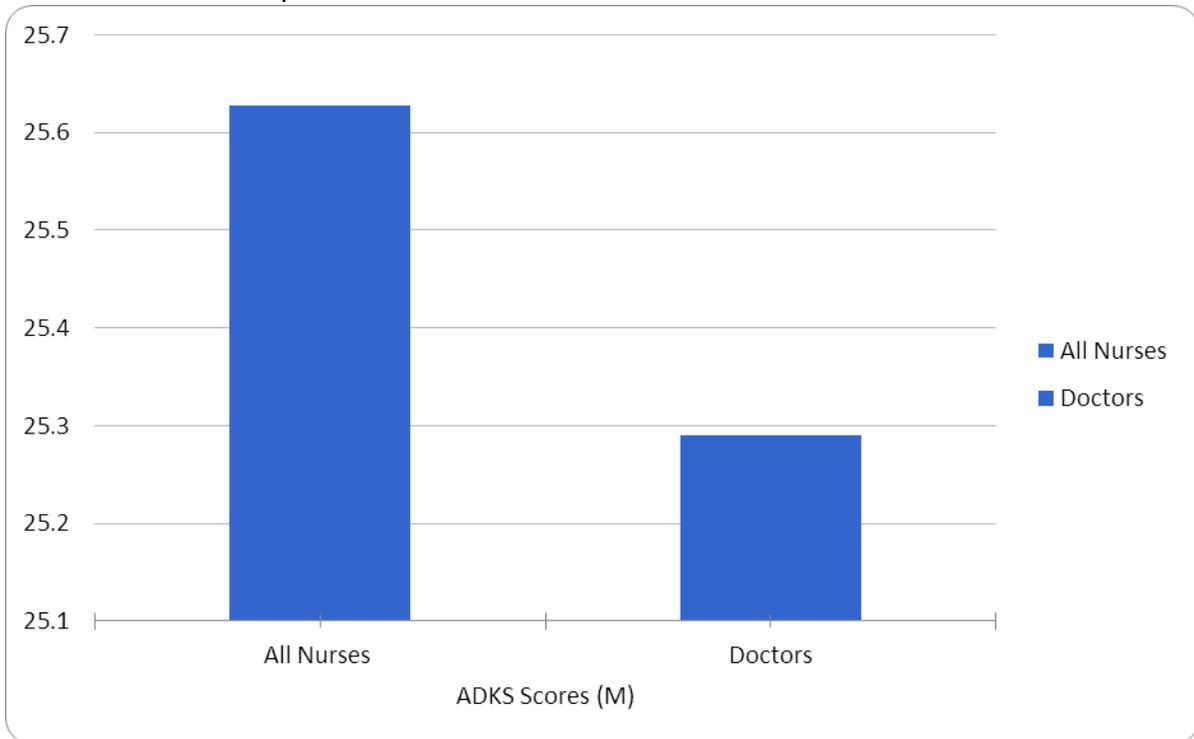
All Subjects Pretest Scores and Posttest Scores



ADKS Score Differences by Year in Nursing School and 1st Year



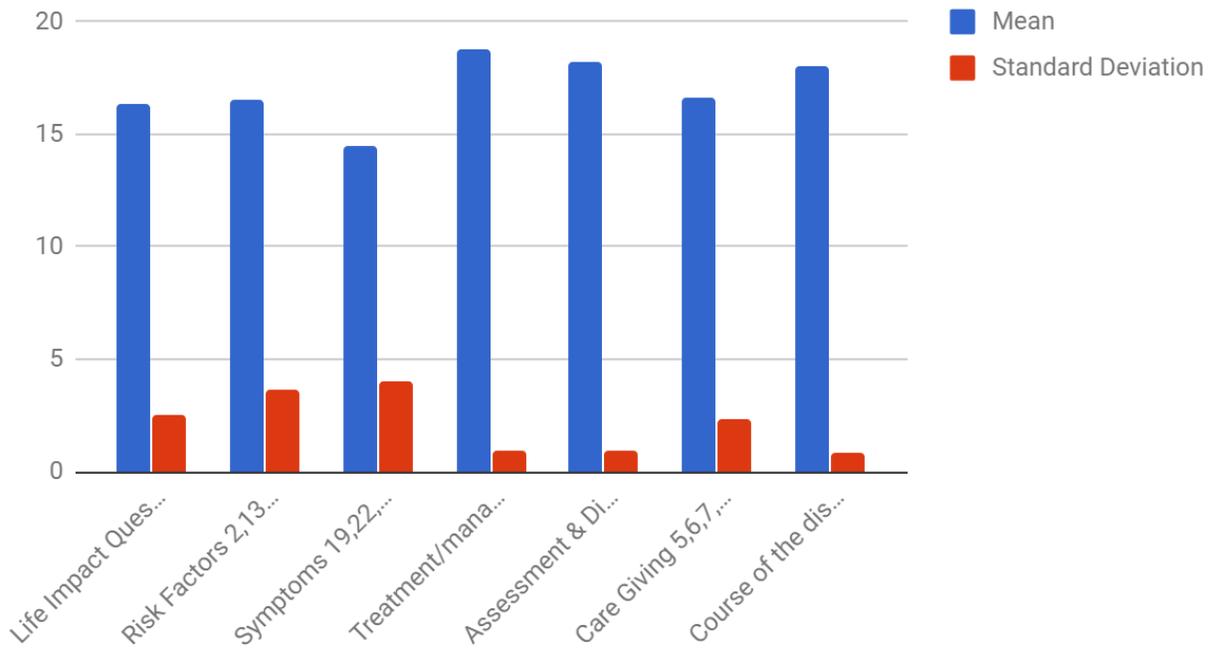
ADKS Scores: Comparison between nurses and doctors



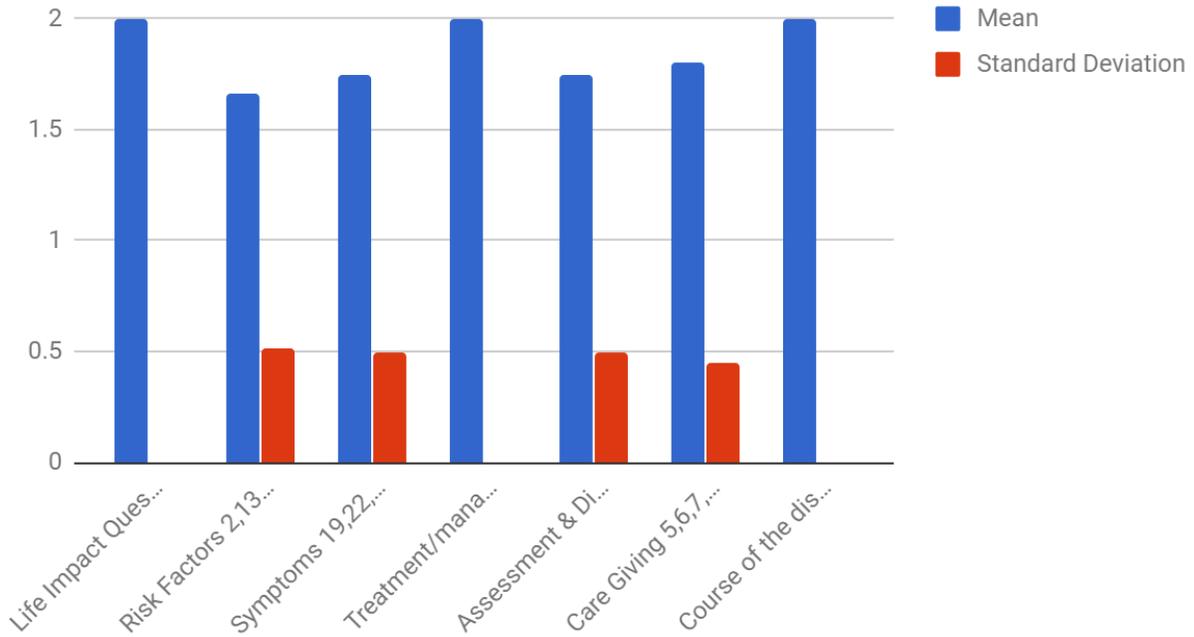
Appendix I

Graphs of the Seven Content Knowledge Domains: Means and Standard Deviations of Subgroup Scores and All Participants

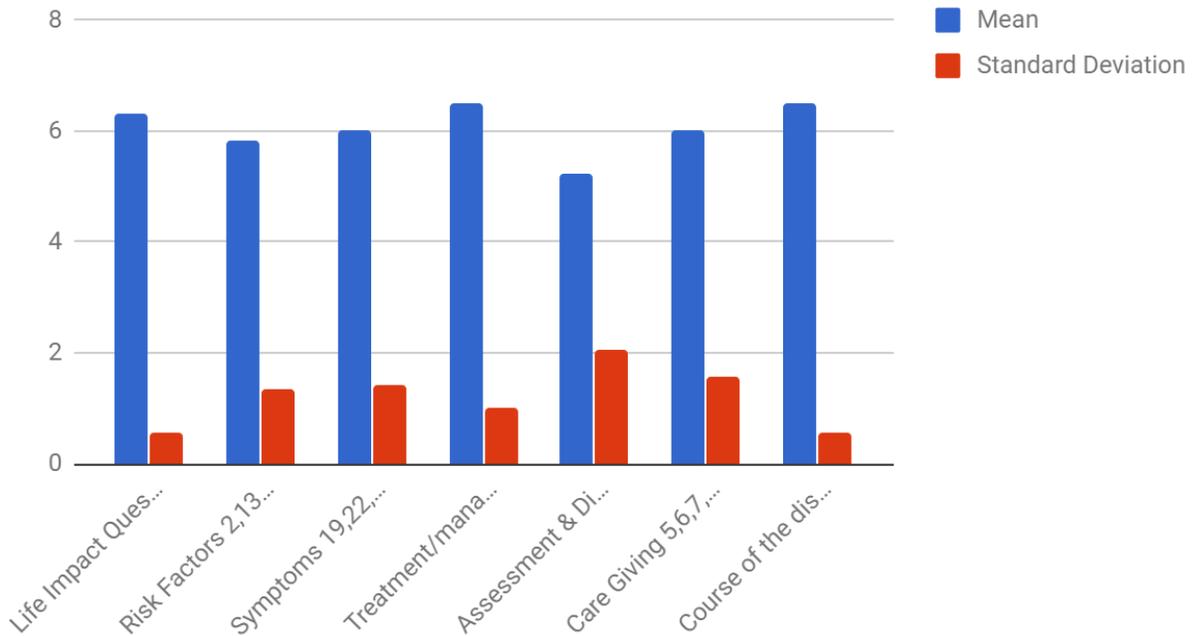
1st Year Nursing Student M and Sd



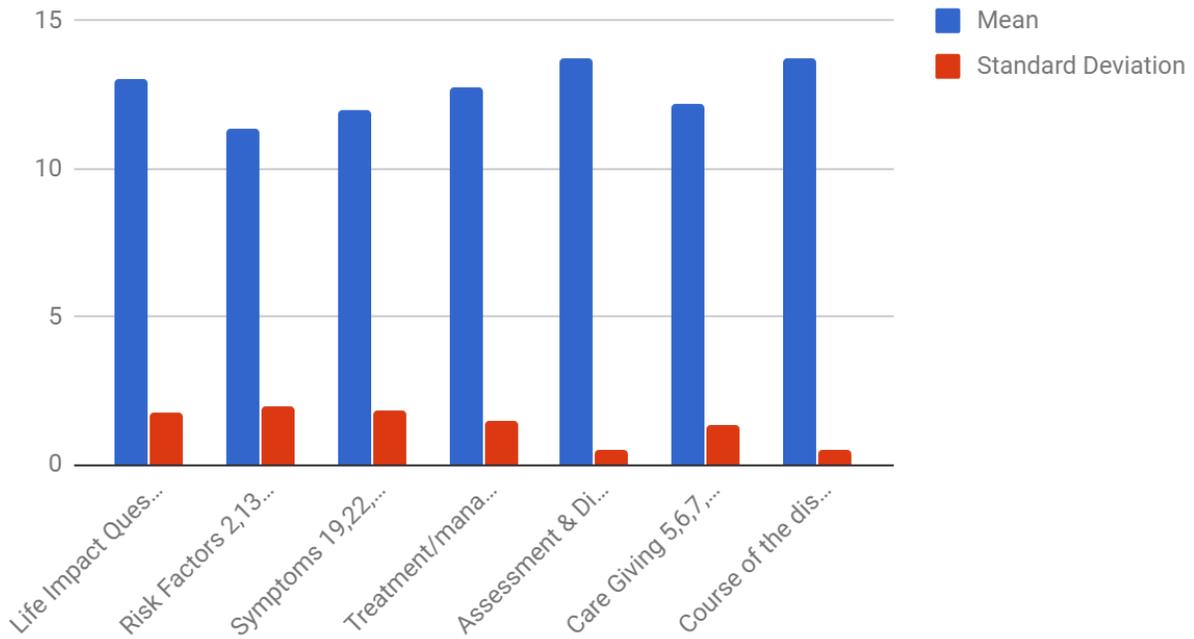
2nd Year Nursing Student (M & Sd)



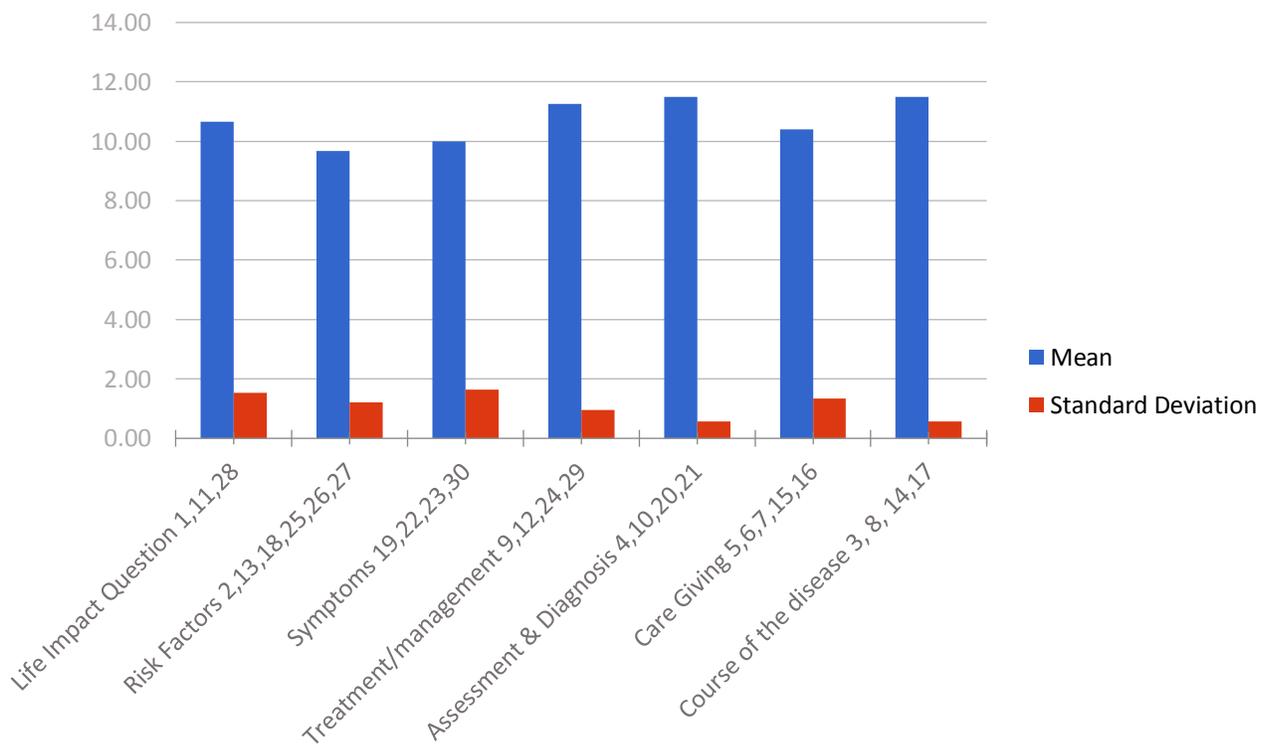
3rd Year Nursing Student (M & Sd)



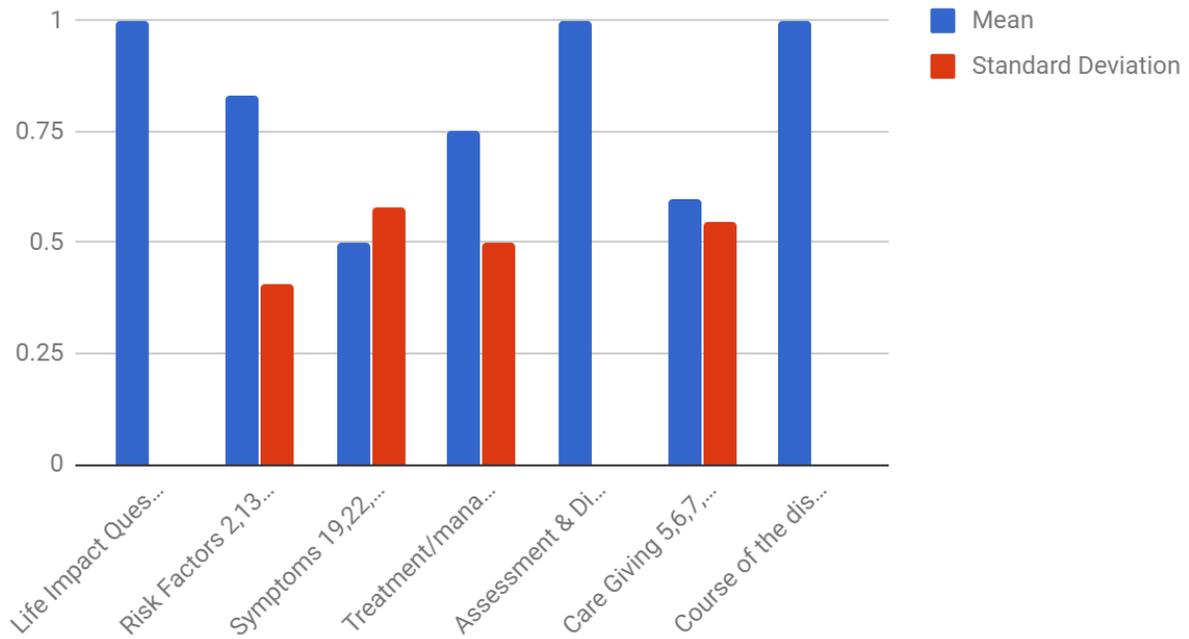
4th Year Nursing Student (M & Sd)



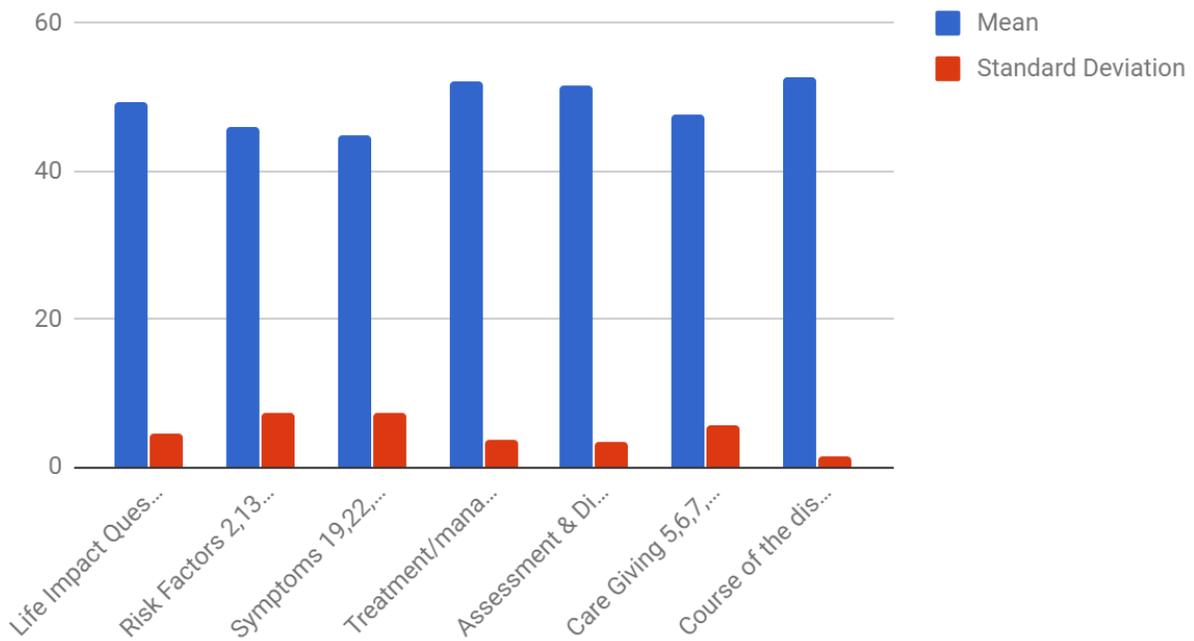
Resident (M & Sd)



Fellow (M & Sd)



All Subjects (M & Sd)



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