Summer 2016

Exploring the Influence of BC-ADM Certification on Advanced Practice Nurses' Clinical Practice and Knowledge of Cognitive Dysfunction in Geriatric Diabetes Care

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Submitted as Partial Fulfillment of the Doctor of Nursing Practice Degree

Regis University

August 1, 2016

Abstract

To meet the healthcare demands of an aging population one strategy is the use of advanced practice nurses (APN) in primary care (Buerhaus, DesRoches, Dittus, & Donelan, 2015). Diabetes affects 26.9% of people aged 65 and older in the United States. Mild cognitive impairment (MCI) is often unrecognized in this population (Munshi, Hayes, Iwata, Lee &Weinger, 2012). Information on APN knowledge of this comorbidity or practice characteristics regarding cognitive function assessment is limited.

This capstone project sought to increase understanding of APN practice and knowledge of MCI, comparing APNs board certified in advanced diabetes management (BC-ADM) to those without certification. An original measurement tool, created with expert consultation (Cronbach's α =.810), was sent via a secure web-based questionnaire to a convenience sample of 743 APNs in active adult practice, who were members of the American Association of Diabetes Educators. Response rate was 29% (n=216). Measured outcomes included knowledge scores on a five-item test, and reported frequency and outcomes of cognitive function assessment. Statistical significance was demonstrated between groups for cognitive function assessment at times other than Medicare Annual Well Visits (X^2 (2, n=181)=11.34, p=.003, CI 95%. More APNs without BC-ADM certification completed cognitive function assessment than APNs with BC-ADM certification. Overall, knowledge level did not differ between APN groups. Correlations were found between how APNs answered questions related to executive function symptoms (t=2.71, p=< .05), situations indicating unrecognized MCI (t= 2.45, p=.016), and awareness of the ADA Clinical Practice Recommendations (t=2.034, p=.044). Further research and resource development is indicated.

KEYWORDS: DNP Capstone Project, ADA Clinical Practice Recommendations, MCI, APN

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Executive Summary

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Problem

A significant health issue in the field of diabetes involves: 1) escalating aging, and 2) incidence and prevalence of diabetes and cognitive impairment. Recognition for the relationship of each factor to diabetes management continues to grow. The American Diabetes Association Practice Guidelines recommend cognitive function assessment, however, how often Advanced Practice Nurses complete this assessment remains unclear.

Purpose

The purpose of this quality improvement project was to increase understanding of APN practice and ask: "What is the knowledge level and completion rate of cognitive function assessment of older adults with diabetes by advanced practice nurses (APN) who are board certified in advanced diabetes management (BC-ADM) compared to APNs who are not board certified in diabetes management?"

Goals

The goals were to determine if board certification in advanced diabetes management influenced basic knowledge of mild cognitive impairment (MCI) in elders with type 2 diabetes, and to identify the frequency and outcome of cognitive function assessment.

Objectives

The objectives were to: 1) assess APN basic knowledge regarding the association between diabetes and MCI; 2) ascertain current practices related to MCI assessment in older adults with diabetes; and 3) determine if BC-ADM certification influenced knowledge or practice compared to APNs without the certification.

Plan

A tool entitled *Questionnaire of Adult Advanced Practice Nurses with and without BC-ADM Credentials* was created with expert consultation (Cronbach's α =.810). Approval from the Regis University IRB was obtained and a small pilot was completed to document tool reliability (Cronbach's α =.827). All active adult APN members of the American Association of Diabetes Educators received the questionnaire via email. The four-week data collection was completed, data were analyzed, and the results were presented to key stakeholders.

Outcomes and Results

A total of 743 questionnaires were sent, with a response rate of 29% (n=216; 58 BC-ADM). Statistical significance was demonstrated between groups for cognitive function assessment at times other than Medicare Well Visits (X^2 (2, n=181)=11.34, p=.003, CI 95%. More APNs without BC-ADM certification completed cognitive function assessment than APNs with BC-ADM certification. No difference in overall knowledge level was seen between APN groups. Correlations between 1) how APNs answered questions related to executive function symptoms (t=2.71, p=< .05), 2) situations indicating unrecognized MCI (t= 2.45, p=.016), and 3) awareness of the ADA Clinical Practice Recommendations for cognitive function assessment (t=2.034, p=.044) were statistically significant. Further research and resource development is indicated.

Acknowledgements

Any journey of knowledge acquisition that leads to the betterment of oneself can only be completed by surrounding oneself with excellence.

To my Capstone Chair Dr. Judy Crewell, my mentor Dr. Jane Dickinson, and Regis faculty, I extend my humblest appreciation for their belief in this project and their consistent support. Both led to a project I am proud of, and which I believe will make a difference in my area of specialty.

My initial observations for the need of this project might have been a passing thought without the insight and assistance of Drs. Robert Petersen, Medhi Munshi, and Rosebud Roberts. Special thanks to the Abigail van Buren Alzheimer's Disease Research Program, the Mayo Clinic, and the Joslin Diabetes Center.

Dale Wood's and Mary Ann McDonald's editorial assistance and persistence with proper grammar and punctuation assisted me in expressing the importance of this project and my desire to make a difference in the care of elders with diabetes.

Without the fellowship and comradery of my Regis 2015 DNP classmates this journey would have been arduous and lonely, and for your presence and support I am forever indebted.

For over 30 years, an amazing network of diabetes educators and advanced practice nurses has taught me what is most important when caring for the individuals living with diabetes. My colleagues at Abbott Diabetes Care were my champions during this process. Without their support, my persistence would have been diminished.

As a 20-year-old novice nurse, Dr. Rita Frantz became my mentor. She never told me how to excel, rather she showed me. I owe my understanding of the importance and pursuit of nursing excellence to her.

The hundreds of patients I have had the privilege to care for have been my best teachers. I hope the outcome of this work helps to improve their lives.

When I told my family and friends of my plans to pursue this DNP degree, every one offered their immediate support and enthusiasm. Without both, I would have quit. In addition, I thank my dear Nancy Suty for leaving the furnace turned up, the lights on, and providing exactly what I needed.

To my Divine Spirit, I have emblazoned Your promise upon my heart: "For I know the plans I have for you," declares the Lord, "plans to prosper you and not to harm you, plans to give you hope and a future." Jeremiah 29:11

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Problem Recognition and Definition

Mild cognitive impairment (MCI) has been identified as an under recognized comorbidity in individuals with type 2 diabetes. Defined as the clinical, transitional condition that occurs between normal aging and Alzheimer's disease (Petersen et al., 2001; Langa & Levine, 2014), MCI leads to the gradual loss of abstract thinking and judgment capabilities (Eckman, 2011). Throughout this stage of cognition, an individual experiences a greater extent of memory loss than expected for their age or educational level (Gauthier et al., 2006; Pankratz et al., 2015). MCI does not initially interfere with independence or normal daily activities and can progress to dementia within 5 years of diagnosis. For a decade, the American Diabetes Association (ADA) has understood the importance of the impact of cognitive function on the achievement of optimal glycemic outcomes. In 2004, the ADA Clinical Practice Recommendations added cognitive function assessment for individuals who are either disengaged from self-management care or encountering declining glycemic control (American Diabetes Association [ADA], 2016). Wagle (2014) described the formidable challenges confronted by health professionals caring for people with both cognitive impairment and diabetes. Cognitive compromise significantly impacts executive functioning, verbal and working memory, attention, perceptions, processing speed and accuracy, problem solving, and decision making (Jefferson, Paul, Ozonoff, & Cohen, 2006; Kravitz, Schmeidler, & Beeri, 2013; Petersen, 2013). The Affordable Care Act has mandated Medicare annual wellness visits (AMV) where cognitive assessment should be completed. To date this assessment has been significantly underutilized nationally (Brooks, 2016). Adequate preparation to assess for MCI is a priority for health care providers working with older adults.

The scope of practice for both Nurse Practitioners (NP) and Clinical Nurse Specialists (CNS) includes assessment responsibilities to guide clinical decision-making (Zaccagnini & White, 2014). Advanced practice nurses (APNs) consistently provide care for individuals with diabetes. The ADA practice recommendation regarding cognitive function assessment extends to APNs. In order to improve the provision of appropriate treatment interventions in cognitively impaired elders with diabetes, adequately trained health professionals are needed. (Bartol, 2012; Munshi, et al, 2012).

Universally, ambiguity surrounds the correct term for referring to individuals as they grow into old age (World Health Organization, 2016). Common terms include old people, seniors, senior citizens, older adults, the elderly, young old, older old, and elders (Taylor, Morin, Parker, Cohn, & Wang, 2009). For the purposes of this project, older individuals are referred to as elders or older adults.

Project Overview

Project Purpose

In a discussion of the key factors that interfere with the translation of research to practice, Glasgow and Emmons proposed that quality improvement data encourages the refinement and adaptation of evidence often used in best practice (2007). This Capstone project was a quality improvement process project, intended to increase understanding of a specific area of clinical practice. Generalizations of the findings are limited to the specific population of APNs studied.

The purpose of this project was to explore the influence of board certification in advanced diabetes management (BC-ADM) on assessment completion rate and basic knowledge of mild cognitive impairment by APNs. Gaining insight into gaps in knowledge regarding the

association between diabetes and MCI, and identifying practice behaviors related to formal cognitive assessment in elders with diabetes were projected.

Problem Statement

The project purpose was influenced by the author's experience that the significant differences between symptoms of dementia and executive function decline in MCI are not fully appreciated by APNs. This inability to recognize the differences presents a potential for inappropriate clinical decision-making, resulting in preventable risk to patients with MCI. This is particularly true for patients who are at risk for hypoglycemia as the result of prescribed oral antidiabetic medications or insulin, or who have historically utilized intensive therapy regimens that demand intact executive function skills (Munshi, Slyne, Segal, Saul, Lyons, & Weinger, 2016).

The null hypothesis for the project was that no difference existed between APNs who held the BC-ADM certification and those APNs who were not board certified in advanced diabetes management.

PICO Statement and Project Question

The benefits of a PICO framework lie in its ability to structure and focus clinical questions, assist in identification of concepts, and guide appraisal of findings from a systematic review of the literature (Pardee & Rundquist, 2011). The PICO question was developed by identifying the four key components:

P (Patient, Population, or Problem): Adult Advanced Practice Nurses (APN) caring for older adults with diabetes

I (Intervention): Web-based questionnaire to measure knowledge level of the association between diabetes and mild-cognitive impairment (MCI); and evaluate the presence, frequency, and outcome actions of cognitive function assessment

C (Comparison with other treatments, if applicable): Board certification in advanced diabetes management (BC-ADM)

O (Outcomes): Knowledge score on a five-item test, and reported frequency and outcomes of cognitive function assessment identified on an eight item clinical practice questionnaire.

The PICO question was: "What is the knowledge level and completion rate of cognitive function assessment of older adults with diabetes, by advanced practice nurses (APN) who are board certified in advanced diabetes management (BC-ADM), compared to APNs who are not-board certified in diabetes management?"

Project Significance, Scope, and Rationale

A driving force in diabetes care today is the changing face of the American public (Gambert & Pinkstaff, 2006). In 2013, elders aged 65 or older represented one in every seven Americans, accounting for 4.1% of the United States (U.S.) population (44.7 million) (Administration on Aging [AOA], 2014). Additionally, the highest prevalence of diabetes of any age group in the U.S. occurs in individuals over the age of 65 (Sinclair & Morley, 2013). Experts in the field of geriatrics and diabetes released a consensus report in 2012 outlining the care of older adults with diabetes (Kirkman et al., 2012). Clinical concerns, resulting from both the escalating number of individuals aged 65 or older living with diabetes, and the complexity of care they require, served as the impetus for the consensus report. The report clearly described the reality of aging and diabetes, while identifying both as risk factors for physical and cognitive

functional impairment. Moreover, the report supported a longstanding appreciation of the impact of diabetes on executive functioning, memory, and psychomotor efficiency (Pasquier, 2010). Evidence of the maturing association between MCI and type 2 diabetes of long duration places additional challenges upon healthcare providers. These challenges are predominately related to the safe delivery of care in the aging population with diabetes (Luchsinger et al., 2007; Morris, Viodni, Honea, & Burns, 2014; Petersen et al., 2014; Schnaider et al., 2004; Tiji, Mustafa, Effendy, & Lindarto, 2014; Weinger, Beverly, & Smaldone, 2014; Winkler et al., 2014).

It is well recognized that diabetes self-care responsibilities are complex, multi-faceted, and require significant intact cognitive function (Weinger, et al., 2014 all authors cited prev. paragraph; Taylor, Morin, Parker, Cohn, & Want, 2009). As a component of cognition, executive function has been defined as the capability to connect past experience with present action. Processes involved with executive function during activity performance involve factors of planning, organizing, strategizing, attention to and remembering details, and the ability to manage time and space (Kennedy & Smyth, 2008). In order to maintain safe, optimal glycemic control, older adults must engage executive function capability when following meal plans; administering medications; monitoring glucose; exercising, and managing concomitant stressors, co-morbidities, and illnesses (Weinger et al., 2014; Koekkoek, Kappelle, Van den Berg, Rutten, & Bissels, 2015). Executive functioning is diminished when mild cognitive impairment develops. The inability to engage in familiar and previously successful self-management tasks ensues.

Bloom's taxonomy offers an opportunity to guide care planning and education for chronic disease self-management (Gottfredson, Stroh, & Sparling, 2011). This classification system organizes educational objectives into three domains: cognitive, affective, and

psychomotor (Anderson et al., 2000). Concepts of this taxonomy reflecting executive function capability have been identified as remembering, understanding, applying, analyzing, evaluating, and creating. The interplay of Bloom's taxonomy, with aspects of diabetes self-management where executive function is intact, is represented in Figure 1. Cognitive impairment has significant detrimental effects on this flow process. Effects extend from lower-order thinking skills related to activities such as remembering to take the correct dose of medication at the right time, or anticipating and managing factors that predispose one to hypoglycemia, to higher thinking skills such as analyzing factors that would lead to necessary medication adjustments or preemptive actions to avoid serious harm. Timely, accurate cognitive assessment can help insure a person's cognitive capability to participate in complex self-management regimens.

The prevalence of diabetes and cognitive impairment is growing. Rawlings et al. (2014) illuminated the magnitude of the emerging comorbidity of cognitive impairment and Alzheimer's disease in individuals with diabetes. Their data demonstrated

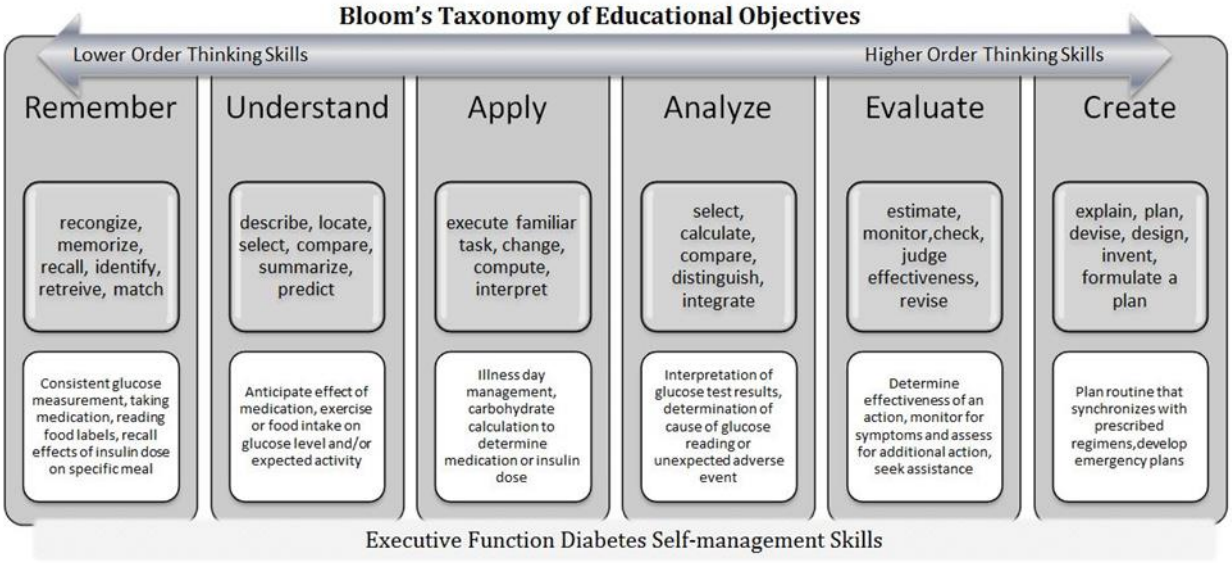

Figure 1. The interplay between Bloom's taxonomy constructs and tasks associated with diabetes self-management. Adapted from the work by Anderson et al., 2000 and Weinger et al., 2014.

mid-life diagnosis of diabetes was associated with a 19% greater cognitive decline over 20 years (adjusted global Z-score difference, −0.15 [95% CI, −0.22 to −0.08]) compared to individuals without diabetes. Additionally, cognitive decline among persons with prediabetes, defined as a hemoglobin A1c (HbA1c) level of 5.7% to 6.4%, was significantly greater than individuals with HbA1c less than 5.7%. Participants with a suboptimal HbA1c, defined as ≥ 7.0%, had greater cognitive decline than those who were adequately managed (adjusted global Z-score difference, −0.16; p = 0.071). Greater late-life cognitive decline was also associated with longer duration of diabetes (p for trend < 0.001).

A greater risk for executive function decline in people with diabetes has been reported when compared to individuals without diabetes (Roberts et al., 2008; Roberts et al., 2014; Ruis et al., 2009). Furthermore, when individuals with diabetes were evaluated for memory processing speed and executive function, they performed on average 0.3-0.4 standard deviations (SD) lower when matched with individuals without diabetes (Palta, Schneider, Biessels, Touradji, & Hill-Briggs, 2014).

The Fremantle Diabetes Study identified predictors of cognitive impairment in type 2 diabetes (Bruce, Davis, Starkstein, & Davis, 2014). The longitudinal, observational study, conducted between 2008 and 2010, assessed the cognition of 320 people aged 50 years or older with diabetes. Participants were originally assessed between 1993 and 1996, allowing evaluation of the effect of mid-life disease presence upon development of cognitive impairment. Study results demonstrated that diabetes-specific risk factors led to increased cognitive impairment. The strongest diabetes-specific risk factors encompassed duration of diabetes and insulin therapy. Individuals treated with insulin experienced a seven to eight times increased risk of

cognitive impairment when compared to patients treated with diet or oral antidiabetic medications.

Cheng, Huang, Deng, and Wang (2012) conducted a quantitative meta-analysis of longitudinal studies that examined the association of MCI or dementia and diabetes. Although only two studies compared the incidence of MCI between individuals with and without diabetes, an increased risk for MCI was reported in those with diabetes when compared to those without (RR: 1.21, 95% CI: 1.02-1.45). Larger, higher-quality studies continue to determine the association between MCI and diabetes.

Results from the Action to Control Cardiovascular Risk in Diabetes research trial (ACCORD) have added to concerns regarding patient safety due to this association (Skyler, J.R., American Diabetes Association; American College of Cardiology Foundation; American Heart Association [ADA, ACCF, AHA], 2009). The ACCORD trial process assumed participants were capable of adhering to a very complex protocol. Analysis of data uncovered that 20% of those in the ancillary trial of cognition had undiagnosed cognitive dysfunction at baseline (Punthakee et al., 2012). Data clearly demonstrated that hypoglycemic episodes were more common in older participants. Older participants in both glycemic intervention arms had approximately 50% higher rates of severe hypoglycemia requiring third-party assistance than participants under age 65 years. This finding, as it related to elders with diabetes prescribed regimens of varying degrees complexity, initiated an important clinical consideration on the part of the author: older adults with diabetes and unrecognized cognitive impairment can be at considerable risk of harm with routine treatment.

The Health, Aging, and Body Composition Study (Yaffe, et al., 2013) was a 12-year, prospective, population-based study with the aim of evaluating the association between

hypoglycemia and dementia in a biracial cohort of older adults with diabetes (n= 783; mean age 74.0 ; 47.0% of black race/ethnicity; and 47.6% female). A bidirectional association between hypoglycemia and dementia was found. Individuals who experienced a hypoglycemic event had a 2-fold increased risk for developing dementia, compared with those who did not have a hypoglycemic event (34.4% vs 17.6%, $p < .001$; multivariate-adjusted hazard ratio, 2.1; 95% CI, 1.0-4.4). A greater risk for having a subsequent hypoglycemic event was seen in older adults with diabetes who developed dementia compared with participants who had not developed dementia (14.2% vs 6.3%, $p < .001$; multivariate-adjusted hazard ratio, 3.1; 95% CI, 1.5-6.6).

Weinstock et al. (2013) reported hypoglycemic event data from the T1D Exchange Clinic Registry for individuals aged 65 and older (Figure 2). This data illustrated the impact of disease duration on the risk for severe hypoglycemia in patients aged 65 or older. Sircar, Bhatia, and Munshi (2016) suggest that the increased prevalence for hypoglycemia in elders is due in part to altered adaptive physiologic responses to low glucose levels, as well as cognitive function decline. Finally, elders aged 75 or older had double the rate of emergency department visits for hypoglycemia compared to the general population with diabetes (Kirkman et al., 2012).

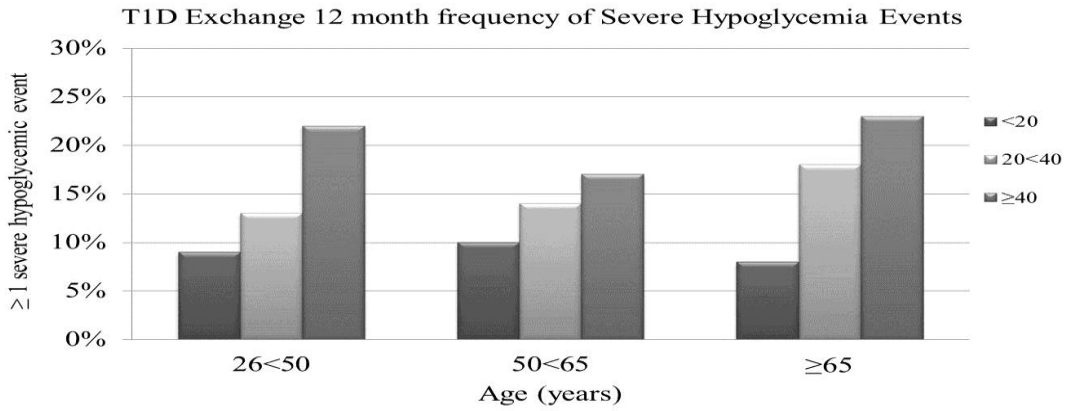

Figure 2. 1 year T1D exchange frequency of severe hypoglycemia by age and duration of disease. Weinstock, et al., 2013**.**

Nguyen et al. (2010) conducted a cross-sectional qualitative study of 95 rural elders with diabetes. Linear regression models adjusting for gender, age, education, ethnicity, duration of diabetes, and depressive symptoms, demonstrated significant association between executive function and glycemic control. A one-point higher executive function score was associated with a 0.47 lower HbA1c value (p=.01). Munshi et al. (2006) proposed that older adults with diabetes face increased risk of undiagnosed cognitive dysfunction. This is associated with poor glycemic outcomes and unsafe actions by health care providers.

Diabetes and aging. Diabetes affects an estimated 26.9% of all people aged 65 and older in the U.S. (American Diabetes Association, 2016). By 2050, the prevalence of elders living with diabetes is estimated to increase 4.5-fold (Hass & Burke, 2014). The specialty area of diabetes care faces a significant challenge as approximately 10,000 individuals turn 65 each day (Colby & Ortman, 2014). Over the past decade cognitive impairment (CI) has slowly gained recognition as a serious challenge to older adults' health (Arvanitakis, Wilson, Bienias, Evans, & Bennet, 2004; Geda et al., 2014; Kravitz et al., 2013; Morris et al., 2014; Sanz, Hanaire, Vellas, Sinclair, & Andrieu, 2011; Scharre & Trzepacz, 2013; Spauwen, Stenhouwer, Kóhler, Verhey, & Van Boxtel 2013; Tolppanen et al., 2013).

Diabetes and cognitive function. A 1.5-2.5-fold increased risk of dementia is associated with type 2 diabetes (Strachan, Reynolds, Marioni, & Price, 2011). Beeri et al. (2004) reported in a large 35 year prospective study that individuals diagnosed with diabetes in midlife had a threefold increased risk for the development of dementia. Although the etiology of cognitive impairment remains unclear, experts agree multifactorial characteristics are involved (Ascher-Svanum et al., 2015). Chronic hyperglycemia, microvascular disease and recurrent hypoglycemia have been implicated in the development of cognitive impairment (Biessels,

Strachan, Visseren, Kappelle, & Whitmer, 2014; Feinkohl et al., 2014; Yaffe et al., 2013). Higher risk of diabetes related MCI has been reported in the African-American and Hispanic populations when compared with Non-Hispanic whites (Luchsinger et al., 2007).

Self-disclosure of difficulty with either self-management activities or cognitive function reduction is often inhibited as the result of MCI characteristics (Matthew, Gucciardi, DeMelo, & Barata, 2012; Weinger et al., 2014). The impact of declining participation in self-care is often mistaken by health care providers as non-adherence or forgetfulness due to old age. Without proper screening for MCI, this barrier to self-care may result in physical harm if therapy requirements exceed functional capabilities. An example of this is the increased risk of severe hypoglycemia resulting from inappropriately dosed medication (Feinkohl et al., 2014; Geller et al., 2014). Additionally, diminished quality of life and depression often occurred in situations where MCI went unrecognized (Worcester, 2013).

A substantial amount of research illustrating the challenges and opportunities for patients with MCI and diabetes has been completed by the Geriatric Center at the Joslin Diabetes Center in Boston, MA (Munshi et al., 2006; Munshi et al., 2011; Munshi et al., 2012; Munshi et al., 2013; Weinger et al., 2014; Munshi, Slyne, Segal, Saul, Lyons, & Weinger, 2016). Studies have consistently concluded that declining ability to perform self-care tasks and follow complex insulin regimens presents the potential risk of harm. Significant work has been done in medical practice to address unrecognized MCI in diabetes (Munshi et al., 2006; Munshi et al., 2012; Weinger et al., 2014). Expanding this effort to nursing practice offers the best opportunity to address collaboratively the needs of elders with diabetes and cognitive dysfunction.

Theoretical Foundations

Inclusion of theory to establish the foundation of a DNP Capstone project allows for a systematic approach that challenges or validates intuition regarding a specific identified clinical practice problem (McEwen, 2011). Multiple nursing scholars have expanded the influence of nursing as a professional discipline through the development of grand, mid-level, and practice nursing theories. Additionally, nursing leaders have augmented the science behind nursing practice through the development of conceptual frameworks or models. A grand nursing theory and a conceptual framework guided this capstone project.

The Systems Theory, developed by Dr. Betty Neuman, addresses the principle that individuals require balance or harmony within their lives in order to achieve an optimal state of health and wellness. When faced with a stressor that introduces an element of risk or harm, Neuman proposes that nursing interventions serve to alleviate or protect an individual from the identified source of stress (Neuman & Fawcett, 2012). Problem identification through assessment, establishing mutually agreed-upon goals, and implementing preventative strategies result in the opportunity to restore balance (Wills, 2011). The overall goal of nursing in Neuman's model is the promotion of stability (Eldridge, 2014). Specifically, in the situation of diabetes and MCI, this can be accomplished by APNs' assessment of cognitive function and the identification of interventions that assist the patient to adjust to a greater level of safety. Appendix A illustrates a schematic overview of Neuman's systems model.

Elders often face challenges to independence, safety, and quality of life as a normal process of aging. Cognitive dysfunction can habitually disrupt elders' stability. Specific attention is required to recognize and treat the addition of MCI to diabetes and aging. Efforts directed toward effective, preventative actions that diminish unnecessary harm could serve to preserve lost stability in the lives of older adults with MCI and diabetes.

The Situated Clinical Decision-Making Framework, developed by Mary Gillespie, provided concepts by which nursing interventions, identified by Dr. Neuman, can be accomplished (Gillespie, 2010; Gillespie & Peterson, 2009). Although Gillespie's framework is intended for use with novice nurses, it encompasses situations where proficient nurses encounter new experiences. This model built upon Christine Tanner's Model of Clinical Judgment in Nursing, and acknowledges the complexity of clinical decision making. Within the framework, Dr. Gillespie identified four primary constructs: context, foundational knowledge, decision-making processes, and thinking processes (Gillespie & Peterson, 2009). APNs who seek to alleviate stressors in older adults with diabetes and MCI could draw upon the four constructs outlined by this framework. The degree to which each construct could influence the resolution of an identified clinical problem would depend, in part, on factors such as expertise, confidence, and knowledge on the part of the APN.

Within the construct of foundational knowledge, five knowledge features are recognized: knowing the profession, knowing the self, knowing the case, knowing the client or patient, and knowing the person. Foundational knowledge features direct the processes nurses utilize when making clinical decisions. A schematic overview of Gillespie's framework can be found in Appendix B.

The focus of this capstone project was to evaluate APNs' routine clinical practice of assessment of cognitive function. This would demonstrate adherence to an ADA clinical practice recommendation. In Gillespie's model, the feature of knowing the profession highlights knowledge of standards of practice, competence, and scope of practice. Each of the three aspects is directly linked to the focus of this capstone project.

Eldridge (2014) suggested that in order for nursing theory to become part of a nurse's daily practice, a conscious choice to use theories in practice must be made. Although several grand theories touch on aspects of this project, Neuman and Gillespie's respective models provided a theoretical structure and foundation, and fit into a personal philosophy of nursing clinical practice.

Review of Evidence

Literature Review

The literature search strategy involved identification of five relevant and specific areas:

- the comparison of role status in the delivery of care,
- the effect of specialized or credentialed status on clinical outcomes,
- APN clinical guideline adoption and utilization,
- the process of decision making by advanced practice nurses, and
- cognitive function assessment in diabetes care.

The databases of SCOPUS, CINAHL, PubMed, Cochrane Database, Google Scholar, and MEDLINE were utilized in the literature search. Keywords included: nurse practitioner, NP, Advanced Practice Nurse, APN, APRN, Clinical Nurse Specialist, CNS, certified diabetes educator, CDE, adoption of clinical guidelines, adoption of clinical recommendations, credentialing, specialization, certification, nurses decision making, BC-ADM, clinical outcomes with specialized nursing care, scope of practice, and SOP. In total, 501 articles were identified in the search, 43 of which were included in analysis for the project. An example of the systematic review of the literature analysis can be found in Appendix C.

Background of problem. Utilizing the seven tiered levels of evidence outlined by Houser and Oman (2011), very few Level 1 or 2 research papers were found that addressed any

of the five identified areas. The initial results of evidence comparing clinical outcomes between credentialed and general APNs were scarce. No article directly addressed APNs conducting cognitive assessment in elders with diabetes. Articles from four organizations outlining the recommendation for cognitive function assessment in elders with diabetes were found.

The Medicare Detection of Cognitive Impairment Workgroup (2013) provided guidance for practitioners to perform cognitive assessment during Medicare Annual Wellness Visits (AWV) (Cordell et al., 2013). As part of the Patient Protection and Affordable Care Act of 2010 (S. Res. 3590, 2010), a health risk assessment and AWV are reimbursed opportunities for cognitive assessment (Hain, 2013). Within a learning module for geriatric nurses, McDonald and Gray-Miceli (2007) included a discussion on cognitive impairment risk in elders with type 2 diabetes. The National Gerontological Nursing Association (NGNA) endorses this module. The American Diabetes Association Standards of Medical Care in Diabetes Clinical Practice Recommendations (2015) state: "Screening for diabetes complications should be individualized in older adults, but particular attention should be paid to complications that would lead to functional impairment" (p. S67). Finally, the Consensus Recommendations for Care of Older Adults with Diabetes advises, "In order to develop and update an individualized treatment plan, screen older adults periodically for cognitive dysfunction, functional status, and fall risk, using simple tools." (Kirkman et al., 2012, p. 2352).

General themes from the literature review included evidence demonstrating equivalency of care provided by an APN when compared to physicians or physician assistants (PA) (Mundinger et al., 2000; Naylor & Kurtzman, 2010; Obman-Strickland et al., 2008; Potera, 2012). Additionally, research clearly demonstrated a lack of superiority of care provided by an APN with additional certification.

Adoption or uptake of clinical practice guidelines varies across specialized areas of care. Limited utilization of clinical practice guidelines results from lack of consistency among professional organizations in terms of desired outcomes of treatment. A variety of diabetes professional organizations promote several different sources of practice guidelines, which can lead to confusion among healthcare providers regarding which of the guidelines to follow.

Comparison of role status in the delivery of care. There has been significant interest in demonstrating that APNs provide care equivalent to either physicians (MDs) or physician assistants. Nurse practitioners (NP) were found to outperform MDs in measures of consultation time, patient follow-up and patient satisfaction (Naylor & Kurtzman 2010). Furthermore, patients who were seen by NPs had longer consultations and were more satisfied. Two international systematic reviews reported no differences between patients treated by NPs and physicians, in terms of health outcomes, type of care provided, or resources used (Horrocks, Anderson, & Salisbury, 2015; Laurant et al., 2008).

The majority of articles reviewed involved surveys that sought to answer how clinical metabolic outcomes, such as HbA1c levels, blood lipids, or blood pressure differed when care was delivered by an APN when compared to a physician. (Everett et al., 2013; Hiss, Armbruster, Gillard, & McClure, 2007; Houweling et al., 2011; Litaker et al., 2003; Modic, Canfield, Kaser, Sauvey, & Kukla, 2012; Mundinger et al., 2000; Risema, Bingenheimer, Scholting, & Cawley, 2014). No article was found that compared assessment of cognitive function by APNs to either physician assistants or physicians.

Several additional studies demonstrated that APNs provide the same level of care as physicians. Comparability of care was observed despite limited training or knowledge prior to the experimental phase of the studies (Arts, Landewe-Cleuren, Schaper, & Vri Jhoef, 2012;

Deshefy-Longhi, Swartz, & Grey, 2008; Lenz, Mundinger, Hopkins, Lin, & Smolowitz, 2002; Newhouse et al., 2011; Potera, 2012; Richardson, Derouin, Vorderstrasse, Hipkens, & Thompson, 2014).

The effect of specialized or credentialed status on clinical outcomes. Another key area of literature review involved the differences in care provided by an APN credentialed or "specialized" in a particular area of nursing. Boyle, Cramer, Potter, Gatua, & Stobinskin (2014) proposed that specialty certification would improve patient safety and specialty areas of care were consistent with standards of excellence. This project proposed that APNs who secured BC-ADM status would more consistently adhere to ADA practice guidelines for cognitive function assessment in caring for patients with diabetes.

The relationship between specialty certification and outcomes in different areas of nursing was varied (American Board of Nursing Specialties, 2005; Blegen, 2012; DeSantis, Balt, & Blake, 2014; Drenkard, 2010; Hess, Talley, Saul, Mompoint, & McKie, 2014; Kendall-Gallagher, Aiken, Sloare, & Cimiotti, 2011; Krapohl, Manojlovich, Redman, & Zhang, 2010; Leak & Spruill, 2008; Lorenzo & Phillips, 2014; Miracle, 2007; Niebuhr & Biel, 2007; Samedy, Quinn-Griffin, Leask-Capitalo & Fitzpatrick, 2012; Schreiner, Kolb, O'Brian, Carroll & Lipman, 2015; Sechrist, Valentine & Berlin, 2006; Stromborg et al., 2005; Zulkowski, Ayello & Wexler, 2010). Research into the value of certification has predominantly been conducted in hospital settings (DeSantis, Balt, & Blake, 2014). Studies comparing certified nursing care to non-certified nursing care have reported positive outcomes in fall prevention (Boltz, Capezuti, Wagner, Rosenberg, & Secie, 2013), improved patient safety (Kendall-Gallagher & Blegen, 2009), decreased 30-day mortality and diminished failure to rescue (Kendall-Gallagher, et al., 2011), decreased RN vacancy rates and attrition (Cramer, Culross, Conley, & Nayar, 2014;

Craven, 2007), and increased patient satisfaction (Craven, 2007; DeSantis et al., 2014). Kaplow (2011) identified greater confidence in decision-making among certified nurses, resulting in fewer medication errors and increased ability to distinguish and respond to patient and family support needs. In a study on differences in perceptions of empowerment between certified and non-certified nurses, Piazza, Donohue, Dykes, Griffin, and Fitzpatrick (2006) reported that deepened personal confidence in clinical decision-making was appreciated by 97% of nurses studied. Enhanced collaboration, in addition to the aspect of empowerment and perceived value of certification, was identified as another benefit of nursing certification in a literature review of 160 articles published between 1980 and 2008. Wade (2009) expressed doubt that nurses will continue to incur the cost and time to become certified in their area of specialty unless healthcare administrators increase both compensation and recognition of certified nurses. A descriptive cross-section study of 912 public health nurses aimed to identify motivators and barriers to certification in public health nursing. Cost and perceived lack of value or reward by their employee were two barriers identified. (Vandenhouten, DeVance-Wilson, & Little, 2015). Finally, in a study evaluating nurses' empowerment and clinical competency of elders statistically significant improvements were demonstrated by those who passed the board certification ($M=2.64$ pre and 2.86 post, $t=6.7$, $p<0.001$). This occurred following the implementation of continuing education courses designed to prepare nurses for a national board certification exam.

Certification has not consistently resulted in distinguishable improvements in clinical outcomes. Ogolla and Cioffi (2007) conducted a review of 65 articles on public health and health care literature linking certification or credentialing to outcomes. They found a scarcity of quality research or compelling evidence to link certification or credentialing to any related

outcome. To date, a 2002 Cochrane systematic review is the only review to evaluate the effectiveness of specialty nurses in diabetes care (Loveman, Royle, & Waugh, 2003). The BC-ADM credential was initiated a year after this review. Although 300 nurses had advanced to BC-ADM status by 2002, research had not been conducted to illustrate their impact in specialty care. Despite the limitation of its age, the Cochrane review found no strong evidence that supported improved care provided by specialty nurses. Although short-term benefits were seen in a few studies, long-term benefits were not validated in the analysis.

Inconsistent definitions of certification in the nursing literature made it difficult to evaluate the full scope of improved patient outcomes or value. Certification is intended to protect the public by enabling individuals to identify healthcare providers with specific expertise and competency (Kaplow, 2011). Based on the literature review, it remains unclear as to whether board certification in diabetes management has led to any identified positive outcomes (Lorenzo & Phillips, 2014). The need for further research that clarifies the value and relationship between nursing certification and outcomes has been proposed (Hickey et al., 2014).

APN clinical guideline adoption and utilization. Evidence-based clinical practice guidelines (CPGs) have been the foundations of attempts to improve healthcare on a national level. In 2011, The Institute of Medicine formalized the definition of CPGs as "statements that include recommendations intended to optimize patient care that are informed by a systematic review of evidence and an assessment of the benefits and harms of alternative care options" (Institute of Medicine [IOM], 2011). Using clinical guidelines, APNs have the opportunity to introduce evidence-based care into clinical practice.

Mixed utilization and adoption of clinical practice guidelines by APNs in either diabetes or chronic disease management was appreciated in the majority of research reviewed (Hanbury,

Wallace, & Clark, 2009; Higuchi, Davies, Edwards, Ploeg, & Virani, 2011; Laustesen, 2013; Ritchie, Evans, & Matthews, 2010; Siminerio, Piatt, & Zgibor, 2005; Vigersky, Fitzner, & Levinsion, 2013.) Gracias et al. (2008) identified the value of evidence-based practice guidelines (EBPG) as decreased care variability, cost of care, and mortality resulting from the clinical consistency of EBPG. Guidelines were not followed, in part, due to lack of provider awareness, lack of agreement on the guideline's content, or provider inability to consistently implement the guidelines (p. 339).

Consistently, research evaluating diabetes guideline adherence measured clinical outcomes that were either metabolic in nature or involved quality of life. Guidelines are provided by any of the following international organizations: 1) the American Diabetes Association (ADA); 2) the American Association of Diabetes Educators (AADE); 3) the European Association for the Study of Diabetes (EASD); 4) the American Association of Clinical Endocrinologists (AACE); or 5) the American College of Endocrinologists (ACE). The extensive body of diabetes-related clinical care guidelines served as a limiting factor to consistent comparison of outcomes. This also underscored the difficulty an APN may face when considering which practice guideline(s) to adopt.

During the literature review no article specifically evaluated APNs' assessment of cognitive function in elders with diabetes. However, Shaw and Killeen (2011) conducted a doctorate of nursing practice (DNP) project investigating disparities in health care access by poor, uninsured adults with diabetes in rural Georgia. As part of a sub-analysis of data, they discovered a lack of consistency in depression screening in individuals who exhibited symptoms of depression or disinterest in self-management. The same ADA clinical practice guideline

recommending the assessment of cognitive function also covers the depression screening. This was the only evidence to indicate inconsistent implementation of this guideline.

In areas where clinical practice guidelines were introduced and adopted, difficulty in long-term sustainability of adherence occurred. Higuchi et al. (2011) evaluated implementation and sustainability in guideline adoption through specific care reminders to health care providers. First, their study found that successful long-term use of the guideline was not attainable without continuing education to sustain interest in implementing guidelines as recommended. Second, absence of ongoing support and encouragement negatively influenced the sustainability of guideline use. These findings supported the long-term objective of this project in providing materials and training in regards to cognitive function screening.

Bi-annual surveys of members by AADE have evaluated practice behaviors related to diabetes self-management education (Martin, Warren, & Lipman, 2013). The 2010 survey investigated knowledge of AADE practice guidelines, but did not evaluate the degree of implementation. The majority of responding managers (70%) indicated knowledge of the practice guidelines (Martin, 2012). The 2014 survey did not collect this information.

APN decision-making process. Melnyk, Gallagher-Ford, Long, and Fineout-Overholt (2014) proposed the best clinical decisions occur when integration of the science and art of health care are incorporated into an environment supportive of evidence-based practice. This results in the greatest potential for quality patient outcomes. Integral to this process, as illustrated in their model in Figure 5, were patient preferences and values, research evidence, evidence-based theories, and information from clinical assessments.

Although clinical decision-making by nurses was a heavily researched area, it rarely segregated the process of decision-making by APNs from the decisions of non-advanced

practice nurses. Participation in continuing education has demonstrated positive influence on how nurses make decisions (Griscti & Jacono, 2006). Personal experience, intuition, and peer opinion were the primary resources nurses used to make a decision (Glasgow & Emmons, 2007; Gillespie & Peterson, 2009; Gillespie, 2010).

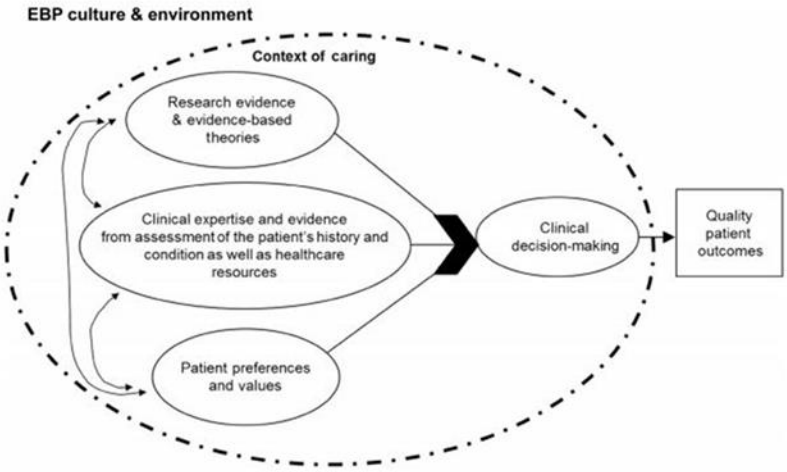

Figure 5. Quality patient outcomes resulting from evidence-based practice within the context of caring and an effective evidence-based culture. Melnyk, B. M., Gallagher-Ford, L., & Fineout-Overholt, E. (2014). *Worldviews on Evidence-Based Nursing, 11*(1), 5–15. Reprinted with permission.

Scope of Evidence Summary

Cognitive impairment is significantly under-recognized due to nurses' lack of familiarity with early symptoms, low knowledge, and insufficient training regarding available screening tools, as well as perceptions of complexity in addressing the situation (Borson, Scanlan, Watanabe, Tu, & Lessig, 2006). Abundant evidence supported that care provided by APNs without diabetes certification was equal or superior to care provided by other medical disciplines. However, evidence that supported APN's consistent adoption and adherence to cognitive function assessment practice guidelines aimed at recognizing and addressing cognitive function decline was lacking.

Market Risk Analysis

Strengths, Weaknesses, Opportunities and Threats

A SWOT analysis was completed in order to recognize strengths within the project, address potential threats or weaknesses, and comprehensively understand the areas of opportunity of the project (Zaccagnini & White, 2011). Several factors within each category of the SWOT analysis were identified and are represented in Figure 6.

The main influence on successful completion of this project was the consistent collaboration with experts in the field of dementia, diabetes, and geriatric nursing. This assisted in the development and refinement of the project's questionnaire. It also provided a degree of assurance that correct processes were in place, and that the questions developed would result in meeting short- and long-term goals. Cooperation with AADE stakeholders indicated questionnaires endorsed by AADE leadership reliably resulted in strong return rates. Endorsement for the project did not materialize although initially offered. Collaboration with the Mayo Clinic Alzheimer's Disease Research provided guidance regarding cognitive function assessment expectations by APNs. Additionally, a geriatric internal medicine physician at the Joslin Diabetes Center in Boston, Massachusetts (MA) assisted with identification of several areas of clinical concern for elders with unrecognized MCI. Concerns included potential detrimental outcomes of unrealistic medical therapy choices that could threaten patient safety, and appropriate expectations of APNs in relation to cognitive function assessment, action, and referral.

Weaknesses and threats to the project included time commitments of APNs to complete the survey, the use of a convenience sample, utilization of email notification for recruitment, and

STRENGTH	WEAKNESS
• Strong resource network (Mayo/Joslin) • Access to large professional organization of APNs who hold BC-ADM status • Support from key stakeholders at American Association of Diabetes Educators (AADE) • Reported strong survey return rate (47%)	• Developed survey tool • Convenience sample with strong potential of not reaching power • Web based survey • Potentially sensitive topic • Short duration of study • Limited staff time
OPPORTUNITIES	**THREATS**
• Obtain important insight into current practice habits • Determination of adherence to ADA practice guidelines • Interface and collaborate with national organization tasked with guiding credentialing requirements and process • Improving care to vulnerable population	• Time to complete survey • Potential for junk mail interference of communication • APN lack of interest in topic • Professional uncertainty or anxiety • Use of technology and the internet

Figure 6. SWOT Analysis. Source: Zaccagnini, M.E. & White, K.W. (2014). *The doctor of nursing practice essentials*. Burlington, MA: Jones & Bartlett Learning.

the potential for APN reluctance to disclose sensitive information regarding the degree of ADA guideline implementation. The use of a SurveyMonkey® questionnaire was a limitation due to a feature of "opt out" which allowed institutions or employers to block multiple IP addresses used by SurveyMonkey®. This resulted in failed delivery of 27 invitations to APNs asking for their participation in completing the project questionnaire, and reduced the total number of potential participants. Additionally, face and content validity of the measurement tool developed by the author was tested, but not construct validity. The opportunity to gain insight into the gaps in practice and knowledge level was realized. It remains to be seen how collaboration with AADE to share results of this project will unfold.

Driving and Restraining Forces

Driving forces identified for this project included:

- AADE collaboration and support;

- APN personal characteristics and altruism;
- professionalism;
- autonomous decision making and practice;
- familiarity and engagement with questionnaires delivered as part of AADE collaboration;
- limited current research regarding the quality of care delivered by credentialed versus non-credentialed APNs.

Restraining forces for this project included:

- potential for the invitation to participate to be delivered into junk mail or to bounce back due to incorrect email addresses;
- APN time availability;
- behavior privacy;
- negative or neutral opinions on the association of the comorbid conditions of diabetes and mild cognitive impairment.

Needs, Resources, and Sustainability

Resources required for the completion of this project, and for future study, included a project coordinator, a data entry assistant, a statistician, access to an online survey provider that allowed for participant anonymity, a computer with statistical analysis software, and an office. The use of the existing questionnaire in future research is feasible. However, results from the questionnaire would be strengthened through construct validity testing. It has been suggested by Regis faculty that the focus of future research regarding APN understanding of the impact of MCI on any clinical area should be to increase overall APN comprehension of executive functioning (P. Cullen, personal communication, August 13, 2015). Executive function

compromise can often be seen in several other chronic disease trajectories. Future sustainability of this project extends to inquiries into aspects that affect certified APNs' decision-making regarding adherence to evidence-based practice guidelines.

Stakeholders and Project Team

The AADE, advanced practice nurses, and patients and caregivers impacted by these comorbidities were stakeholders in this project. AADE has historically provided continuing education (CE) programs aimed at increasing its members' knowledge of, and adherence to, clinical best practices. Appreciation of the deficiencies in APNs' knowledge level and clinical practice regarding elder care and cognitive impairment in people with diabetes may prompt sponsorship or development of CE resources. With greater awareness of these comorbidities and their implications resulting from novel CE resources, APNs caring for elders could improve clinical care by routinely assessing cognitive function. Furthermore, APNs who watch for indications that MCI is interfering with patient safety could assist patients and their caregivers develop strategies to diminish harm.

The author; Dr. Judy Crewell, PhD, RN, Capstone project chair; and Dr. Jane Dickinson, PhD, RN, CDE, who served as the author's clinical mentor throughout the DNP program, led the project team. Collaborating experts who assisted with project scope and questionnaire development included Dr. Ronald Petersen, MD, PhD, director of the Mayo Clinic Alzheimer's Disease and Research Center in Rochester, Minnesota (MN); and Dr. Medha Munshi. Dr Munshi specializes in internal medicine and geriatrics at Beth Israel Deaconess Medical Center and oversees the geriatric diabetes clinic at the Joslin Diabetes Center in Boston, MA. Initial consultation with both Dr. Petersen and Dr. Munshi identified four grounding concerns regarding unrecognized MCI in elders with diabetes: 1) a lack of APN discrimination between MCI and

dementia or Alzheimer's disease (AD), leading to under appreciation of how executive function decline can affect therapy decision-making; 2) the use of cognitive assessment tools lacking sensitivity to the specific issues of MCI in diabetes; 3) prescription of drugs intended to treat AD that are ineffective in treating the executive function decline seen in MCI; and 4) the potential for APNs to be unaware of the ADA Clinical Practice Recommendations for cognitive function assessment. Their insights assisted in the development of constructs that informed the development of the project's questionnaire. An expert panel of 10 individuals assisted with questionnaire development and validity testing. These individuals included: Debbie Hinnen, ARNP, BC-ADM, CDE, FAAN; Laura Hieronymus, DNP, MSEd, RN, BC-ADM, CDE; Linda Siminerio, RN, PhD; Kathy Shaw, DNP, RN, CDE; Barbara Schreiner, PhD, APRN, BC-ADM, CDE, CPLP; Debra Hain, PhD, APRN, GNP-BC; Virginia Valentine, RN, MSN, CNS, BC-ADM, CDE; William H. Polonsky, PhD, CDE; Phyllis Horton, DNP, MSN, RN; and Shala Swarm, DNP, APRN, FNP-BC. Lastly, statistician Trevor Swarm and Cheryl Kruschke, EdD, MS, RN, CNE collaborated to perform statistical analysis of the survey results.

Cost-Benefit Analysis

Resources and staff cost estimates for this project were completed and are presented in Appendix D. The total cost to complete this project was higher than projected, due to time requirements in the development and validation of the project's questionnaire. Additionally, costs adjustments ensued due to AADE's generous provision of the email list free of charge. The total projected cost was $13,990.

The anticipated benefits included: (a) improved APN awareness of the comorbidities and the need for assessment as a result of completing the survey, (b) potential change to practice behaviors leading to increased assessment, (c) diminished patient risk due to increased

assessment and necessary adjustment to care by the APN, and (d) improved understanding of and adherence to the ADA Practice Recommendation for cognitive function assessment. Greater program revenue could potentially occur as the result of increased assessment completions during Medicare Annual Wellness visits (Hain, 2013).

Project Objectives

Mission and Vision

The mission statement of a capstone project includes the purpose of the activity, identification of the population that interfaces with the identified problem, and the specific processes by which the problem will be assessed and solved (Zaccagnini & White, 2011, p. 437). The mission statement for this project recognized that aging patients with comorbid diabetes and cognitive dysfunction were at risk of therapy errors that could lead to serious consequences. The three-fold project aims were:

- to evaluate both knowledge level and clinical assessment practice by conducting an 18-item, web-based questionnaire of APNs who were members of AADE,
- to determine the rate of APN adherence to the ADA Clinical Practice Recommendation of cognitive function assessment, and
- to compare the knowledge level of and rate of cognitive function assessment by APNs who were board-certified in advanced diabetes management, to those who were not.

Vision statements are intended to outline the primary objectives of a project. This enables development of effective strategies to achieve the identified goals of the capstone project. The vision of this project was to gain perspective into APNs' clinical practice behaviors related to cognitive function assessment and basic knowledge of MCI. Future development of

resources to enhance APNs' knowledge and guide safer clinical practice decision-making could arise from questionnaire data.

Goals

In a discussion of future roles for Clinical Nurse Specialists, Zaccagnini and White (2014) suggested several ways of improving care delivery through effective utilization of APNs, including improving effectiveness, quality, and safety of care for individuals with chronic disease**.** The project's goal was to determine if board certification in advanced diabetes management influenced APNs' basic knowledge of MCI in elders with type 2 diabetes. Additionally, identification of adherence facilitators and barriers experienced by APNs regarding ADA Clinical Practice Recommendations for cognitive function assessment was anticipated.

Outcomes Objectives

The objectives of the project were to: 1) assess APNs' basic knowledge regarding the association between diabetes and MCI through the completion of a five-item knowledge test; 2) ascertain current practices related to MCI assessment in older adults with diabetes through the completion of an eight-item questionnaire on clinical practice behavior; and 3) determine if BC-ADM certification influenced knowledge or practice when compared to APNs without the certification, through statistical comparison of test scores and practice behavior responses.

Evaluation Plan

The DNP capstone project model described by Zaccagnini and White (2011, p. 424) guided the overall process of project inception, development, implementation, and evaluation. This model is depicted in Appendix E. The initial identification of a clinical practice problem was followed by a needs assessment, literature review, and theory selection to support the project. Additionally, development of goals, objectives, mission and vision statements, and a

working plan was completed. Finally, identification of desired outcomes, team member selection, and a cost-benefit analysis occurred. A timeline of events is illustrated in Appendix F.

Logic Model

Organization, design, implementation, and evaluation processes were created through the development of the logic model. Logic models offer the ability to link anticipated short- and long-term outcomes to theoretical assumptions, specific project activities, and clear, effective evaluation measures (Kellogg, 2004). The model identified a flow from resource, inputs, and activities through outputs and outcomes. The potential, intended impact resulting from the project concluded the seven major components of the logic model illustrated in Appendix G.

Inputs included use of a content-validated, web-based questionnaire administered via SurveyMonkey®; and resources provided by a statistician, the investigator, and an administrative assistant. Identified constraints included APNs' perception of value of participation, willingness to disclose clinical practice activities, and reliance on technology. Receipt and response to email communications, accessing SurveyMonkey® to complete the questionnaire, and authentic responses were expected activities of the participants.

Outputs included completion of the 18-item questionnaire and knowledge test within a one-month period. Total project sample size was anticipated to be 134, with each group including 67 participants in order to meet calculated power.

There were two primary short- and long-term outcomes identified for this project. The short-term outcome focused on expanding the understanding of how BC-ADM certification influenced both APNs' knowledge of the association between MCI and diabetes, and current practice related to ADA guideline adherence. The long-term outcome centered on the application of new insights regarding clinical practice intended to guide development of future

training materials. Additional resources and training would potentially assist in improving care provided by APNs to individuals with diabetes and MCI.

The potential impact was divided into immediate impact and future impact. The immediate impact of this project was the discovery of new information on factors that impede the delivery of comprehensive care to elders with diabetes. Collaboration with AADE, as the national organization that oversees the BC-ADM credential process, might lead to future development of CE resources for APNs to expand their understanding of the comorbidities of diabetes and MCI.

Population and Sampling Parameters

Practice behaviors among three distinct groups of APNs who provide advanced diabetes management care to older adults were compared. Several categories exist for diabetes certification in the diabetes self-management and treatment milieu (American Association of Diabetes Educators [AADE], 2011; Burke et al., 2011).

A certified diabetes educator (CDE) certification is designed and intended for health professionals with responsibilities directed at the provision of diabetes self-management education (Powers et al., 2016; Valentine, Kulkarni, & Hinnen, 2003). This credential does not indicate advanced clinical practice capability.

Board Certification in Advanced Diabetes Management (BC-ADM) is a practice credential and does not indicate the expertise in self-management education (Schreiner, Kolb, O'Brian, Carroll, & Lipman, 2015). The person holding the BC-ADM manages complex patient needs and therapeutic problem-solving. Until recently, BC-ADM was a recognized advanced practice certification examination by American Nurses Credentialing Center (ANCC).

Three possible certification combinations exist:

- An APN is not required to hold any diabetes-related certification
- BC-ADM or CDE status may be the only diabetes related certification held by an APN, or
- BC-ADM and CDE can be simultaneously held by the APN.

The goal in sampling APN members of AADE was to generate a representative sample of APNs board certified in advanced diabetes management. A convenience sample was used of APNs in active, adult practice, who were current AADE members. This convenience sample had the advantage of ease in recruiting APNs. The major disadvantages of using a convenience sample were researcher bias, volunteer participation motivation, and the potential that participants who chose to participate may not truly be representative of the entire population. Due to the lack of generalizable findings to other groups, convenience sampling is considered the weakest form of sampling (Terry, 2012). This was a restraining force and a limitation of this project.

Inclusion criteria are attributes of participants that are essential for selection to participate. Careful selection of participants removed the influence of specific confounding variables (Terry, 2012). Exclusion criteria identified aspects of either the participant or specific situation attributes that eliminated the opportunity for involvement in the project. The inclusion and exclusion criteria are listed in Table 3.

Human Subjects Protection

According to the Belmont Report, three main ethical principles involving human research include respect for persons, beneficence, and justice (Terry, 2012, p. 52). Insuring protection of human subjects during this project included presentation to and approval by the Regis University

Table 3

Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
Adult Advanced Practice Nurse:	BC-ADM on non-nursing discipline
• Nurse Practitioner (NP)	RN only
• Clinical Nurse Specialist (CNS)	Retired
Current certification in diabetes:	Inactive practice
• Board certified in advanced diabetes management (BC-ADM)	Non-English speaking.
• Certified Diabetes Educator (CDE)	
Active license and practice	
English speaking	

Note. Characteristics for inclusion and exclusion of participants in capstone project

IRB, and assuring confidentiality of responses via a web-based questionnaire that eliminated identification of subject by name, email account or any other identifying parameters. Informed consent was inferred by the completion of the questionnaire. No formal, outside IRB approval was needed and the Regis IRB approval occurred under an exempt status (Appendix H). Contact information on how to reach the IRB, the capstone Chair, or the investigator was provided. The

Collaborative Institutional Training Initiative (CITI) was completed and documentation of completion is included in Appendix I.

Project Initiation

Upon completion of the initial organization of the project, development, validation, and implementation of the measurement tool was undertaken. This process is illustrated in Figure 11.

Setting

This project was completed utilizing SurveyMonkey®, a popular web-based survey

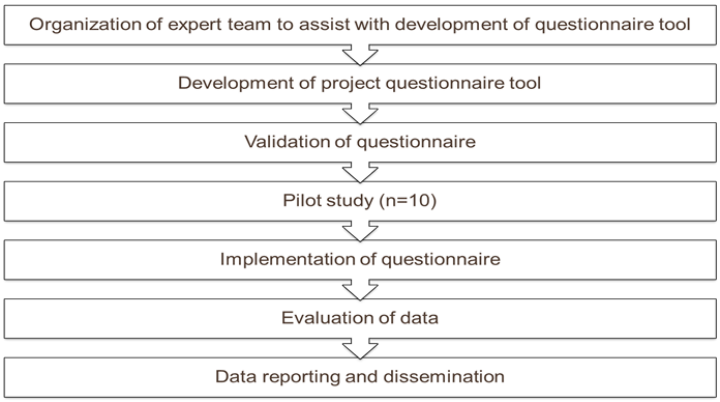

Figure 11. Process model for implementation of capstone project

software platform. The participants represented several advanced practice settings, illustrated in Figure 12 and APN subspecialties of Geriatric Nurse Practitioner, Adult Nurse Practitioner, Family Nurse Practitioner, and Clinical Nurse Specialist.

Methodology and Measurement

An exploratory, descriptive, quantitative quality improvement project utilizing an 18-item questionnaire study design was completed using a convenience sample of APNs who were members of AADE on January 1st, 2015. Consent to release their names and email addresses to researchers and industry vendors was given to AADE by the participants prior to the study.

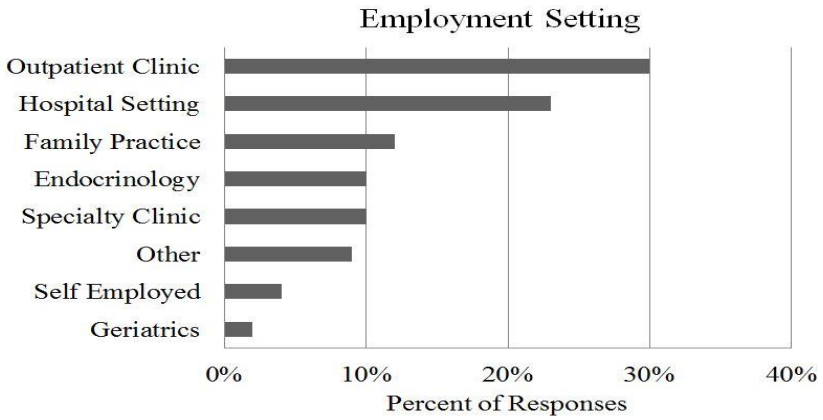

Figure 12. Employment settings of advanced practice nurse respondents

Study methodology utilized dichotomous structured questions. Analysis of dichotomous questions is efficient and allows for a quick summary of collected answers (Dillman, Smyth, & Christian, 2014).

A limitation of the use of structured questions was the potential compromise of a clear understanding of the respondent's choice of an answer. Closed-ended questions force an answer that may not necessarily represent the true feelings of the respondent. To allow for greater comprehension in data analysis of a participant's routine clinical practice, open-ended opportunities for respondents to complete each question were offered to describe answers that were not offered in the preset response item. Nominal data was evaluated using non-parametric, descriptive statistics (Cullen, 2011; Polit & Hungler, 2009). Bivariate analysis was used in order to determine the relationship between the two variables of certification and non-certification of the APRN respondents.

Power Analysis

A power analysis was performed. It assisted in determining the sample size required to distinguish an effect of a specified size, and increased the probability of demonstrating the effect of identified dependent variables (Polit & Hungler, 2009). A power analysis insures that every

aspect of the study and the statistical analysis has been thoroughly considered before data collection begins. A sample of 67 subjects per group was determined and had a power of 80%. There was 80% likelihood that the study would yield a statistically significant effect. This would allow for the conclusion that the percentage of subjects answering no to the question of whether they assess cognitive function differed for BC-ADM versus non BC-ADM APNs. Assumptions made during calculation included: the percentage of missing data estimated at 7%, the percentage responses to the questions regarding assessment behavior would be different for BC-ADM APNs compared to non BC-ADM APNs, an alpha of 0.05, and the use of a two-tailed test.

Measurement Tool Development

An extensive literature search was conducted to identify questionnaire tools that evaluated both APN practice behaviors related to assessment of cognition, and tests that measured knowledge of diabetes and MCI. A measurement tool for use in this project was created due to lack of an appropriate validated tool addressing the specific areas of interest. The process for tool development is illustrated in Appendix J. An example of the tool, *Questionnaire of Adult Advanced Practice Nurses with and without BC-ADM Credentials*©, is included in Appendix K. This tool included items that explored knowledge of MCI and its impact on diabetes therapy. Additionally, the survey explored the extent of APNs' adoption of the ADA Clinical Practice Recommendation for cognitive function assessment, as well as the process by which APNs utilize assessment findings.

Formal processes outlined by Burton and Mazerolle (2011), Dillman et al. (2014), and Polit and Beck (2006) guided the measurement tool design. A content expert panel consisting of a geriatric endocrinologist, a prominent thought leader specializing in the care and research of

MCI and Alzheimer's disease, and a geriatric NP assisted in identifying the three constructs for the measurement tool. The constructs were aimed at answering three specific areas of concern:

- What is the current level of knowledge and understanding of mild cognitive impairment (MCI), its influence on diabetes and symptom presentation requiring cognitive function screening?
- Is cognitive function currently being assessed? If so, what screening tool is being used? If not, what barriers for screening completion can be identified?
- When cognitive function screening is completed, what is done with the results or information obtained from the screening?

Instrument Reliability and Validity

Content validity. Validity is the extent to which scores generated by an instrument measure the characteristic or variable they are intended to measure for a specific population (Sullivan, 2011). Content-related validity is the extent to which items on an instrument represent the content being measured. Survey items were developed and repeatedly refined until agreement was achieved and content face validity was established by a content expert panel (Sullivan, 2011). Face validity is the extent to which the items appear relevant, important, and interesting to the respondent (Devon et al., 2007). A 10-member panel of experts in diabetes, nursing, and/or dementia reviewed the survey items and validated that appropriate indicators for the constructs of interest had been accomplished. Each panel member completed the survey and a content validity index (CVI) to demonstrate agreement with item inclusion in the survey (Lynn, 1986). CVI measures agreement on a Likert scale of perceived relevance for each item by the panel member. Fleiss' Kappa assesses the reliability of agreement between a fixed number of raters when assigning categorical ratings to a number of items. Using the CVI measures, the

Fleiss' Kappa result for 10 raters was = 0.2405, (Standard Error = 0.0345), 95% CI = 0.1728 to 0.3082. This indicated fair agreement among the raters (Viera & Garrett, 2005; Polit & Beck, 2006).

To maximize content-related validity, a survey pilot was completed with 10 randomly selected APNs who were representative of the larger sample population. The pilot was intended to confirm that instructions were clear and that each item provided the expected type of response (Terry, 2012). Cronbach's alpha, as discussed by Polit (2010), is used to determine internal consistency and focuses on variability. First, the test was calculated to determine internal consistency of the questionnaire item responses in the pilot of 10 APNs prior to the project implementation with the sample population, and again following the collection of data from the full set of respondents. Cronbach's $\alpha = .827$ for the pilot and .810 for the total sample population responses.

Procedure, Protocol, and Data Collection

Procedure. Participants who agreed to complete the questionnaire received a link within the SurveyMonkey® invitation. A cover page outlined the purpose of the questionnaire and expectations for participation. Completion of the questionnaire was estimated to take 15 minutes. Informed consent was assumed by submission of the completed questionnaire. SurveyMonkey® settings enabled anonymization of individual responses. Recognizing that discomfort might result from some of the questions, skipping or not answering some or all questions was acceptable. This resulted in some missing data, as not all questionnaires were entirely completed.

Data Collection. Data was collected over a four-week period. Participants received an email discussing the purpose of the questionnaire. Reminders to complete the questionnaire

were sent at the beginning of weeks two, three, and four. Parameters contained within the SurveyMonkey® tool avoided sending email reminders to those who had completed the survey. Additional invitations and reminders were sent from a Regis University email address to those individuals whose email address included their place of employment, and whose institutions blocked the SurveyMonkey® IP address. At the end of week four, all participants received an email notification of questionnaire closure, thanking them for their participation. The data collected via the SurveyMonkey® platform was exported, coded, and then imported into the SPS23 statistical software for analysis.

Project Findings and Results

The capstone project question was answered by the data collected and analyzed. A sample population (n=216) of APNs who care for elders with diabetes completed an 18-item questionnaire related to basic knowledge of the association of cognitive impairment and diabetes, and clinical practice behavior regarding cognitive function assessment. The project's response rate was 29%. Responses of BC-ADM APNs (n=58) were compared to the responses of APNs who did not hold the BC-ADM certification (n=158). Specifically, the project's question sought to determine if there was a difference in assessment behavior and knowledge of cognitive impairment in elders with diabetes between APNs with or without BC-ADM certification. The null hypothesis was $H0:\mu1 = \mu2$.

Four specific tests were used to analyze the data from the questionnaire, taking into consideration the characteristics of the data collected. Nominal data producing categorical variables were analyzed using chi square (X^2), chi square with Yates Continuity Correction, and Fisher's Exact test. Nominal data was coded to produce scores and analyzed using the paired samples t Test. The strength of the chi square statistic is its ability to understand the difference

between two or more independent groups of participants. This project's aim was to explore the similarities and differences between APNs who were board-certified in diabetes self-management and those who were not. Therefore, chi square goodness of fit was an appropriate test to complete in data analysis.

Chi-square provides a measure of "goodness of fit" which defines how well data that were expected from the hypothesis fit with what was actually observed in an experiment. Furthermore, chi square statistic for independence determines if there is an association between variables. Two limitations of chi square include its inability to completely analyze the data in a contingency table. Chi square can determine statistical significance of the observed cells under consideration; however, the resulting value does not indicate either the strength or degree of association among all cell contents. Additionally, it is suggested that sample size can influence the accuracy of results when chi square is used for analysis (GraphPad Statistics Guide, n.d.). A wide range of inadequate sample size for use of chi square has been reported in the literature and includes estimates less than 50, or less than 1000. The possibility that chi square would not provide accurate analysis due to a small sample size of 216 was considered.

The Fisher's Exact test is similar to the chi square test in that it is used to determine if there are nonrandom associations between two categorical variables. Unlike the chi square test, the Fisher's Exact test is not impacted by smaller sample size. Both chi square and the Fisher's Exact test were conducted to confirm analysis accuracy.

To measure central tendency, both mean and mode were calculated. The mode is the best measure of central tendency with nominal data; however the mean replaces this valued characteristic with non-skewed nominal data. As a normal distribution of the sample population

was anticipated and some questions were coded as scores indicating interval data, both mean and mode were analyzed.

Descriptive statistics were used to provide summaries concerning the sample population, and the measures that were used to describe the sample selected for study (Terry, 2012). Frequencies were also included in the analysis to determine the percentage of responses each group provided to any given answer in the questionnaire (Appendix L).

Objective One Findings

The first objective of this project was to assess APNs' basic knowledge regarding the association between diabetes and MCI through the completion of a five-item knowledge quiz. In the overall study population, no statistically significant difference was found in the level of knowledge between the groups. Chi-square goodness of fit was used to demonstrate how well the observed values of the APNs agreed with the values expected. It was projected that there would be no difference in knowledge level between groups. To insure identification of significant *p* values that may have gone unidentified in the chi square analysis, Fisher's Exact test was also completed. Results were similar for both chi square and Fisher's Exact test, and are illustrated in Table 4. All *p* values exceeded 0.05, indicating no significant differences between groups. Correlations between how APNs answered questions related to executive function symptoms, situations indicating unrecognized MCI, and awareness of the ADA Clinical Practice Recommendations for cognitive function assessment, were statistically significant; however, it is unclear what this difference is between the two groups. This difference is illustrated in Table 5.

Response rates for all five questions by each group are illustrated in Table 6. Future education opportunities were identified from respondents' answers to questions where a correlation was appreciated. Improved understanding of the symptoms related to executive

function decline and unrecognized MCI could result in clinical intervention that would reduce the vulnerability of elders with diabetes. This is particularly true in patients who are treated with medical therapies that place them at risk of hypoglycemia, falls, and loss of consciousness (Munshi et al., 2012).

The majority in both APN groups (74%, Appendix L) answered identification of executive function difficulty in Question 11 correctly. This illustrated the APNs' ability to appreciate the negative impact of MCI on an individual's ability to perform self-management instructions essential to the correct calculation of an insulin dose. It also demonstrated the respondent's ability to separate tasks that do not involve executive function from tasks that are the result of other chronic complications associated with diabetes.

Disorientation requiring redirection was an incorrect response to Question 12. This symptom is not part of the clinical picture of unrecognized MCI. As illustrated in Appendix L, 59% of the respondents incorrectly selected this answer. In the absence of the symptom of disorientation, timely assessment for MCI might be eliminated. Furthermore, cognitive impairment could be missed and safety compromised if an APN relies on disorientation in assessing cognition.

Awareness of the expectation of the ADA practice recommendation for cognitive assessment was absent in 40% of the respondents. Although the majority of APNs answered this question correctly (Appendix L), data indicating adherence to the guideline by either group is lacking.

Knowledge deficits. A high percentage of incorrect answers was observed on questions relating to symptoms seen in elders with diabetes and unrecognized MCI. The responses

Table 4

Differences Between APNs with and without BC-ADM Certification Related to Knowledge Level of the Association of Mild Cognitive Impairment and Diabetes

Question	Pearson's chi-square result	Fisher's Exact test
9. Peterson's original criteria for MCI	X^2 (1, N=178) =.565, *p*=.452	*p*=.597
10. Drugs shown to be effective in slowing progression of MCI	X^2 (1, N=182) =.826, *p*=.363	*p*=.489
11. Executive function symptom	X^2 (1, N=180) =1.763, *p*=.184	*p*=.204
12. Situations indicating unrecognized MCI	X^2 (1, N=181) =.240, *p*=.624	*p*=.589
13. American Diabetes Association Clinical Practice Recommendation for cognitive function screening	X^2 (1, N=180) =.164, *p*=.686	*p*=.744

Note: p <0.05 indicates significance.

obtained may suggest that APNs are expecting to observe disorientation and/or impediment of independence in patients with MCI. Neither symptom is seen in MCI. The absence of these symptoms is the distinguishing factor between MCI and dementia or Alzheimer's disease. Use of informal assessment and observation in this situation can potentially result in MCI going unrecognized in elders with diabetes.

Finally, both groups selected an incorrect answer to Question 10, regarding pharmacologic therapies that slow progression of MCI (Appendix L). Currently, there is not a drug therapy that either improves the executive dysfunction issues seen in MCI or slows any progression of the disease. Responses to this question comprised 82% of APNs without BC-ADM selecting the answer "unsure" as to whether there was a drug that diminished progression, while 91% of BC-ADMs answered the question incorrectly. This was illustrated by the selection of the answer

Table 5

Correlation Between Certification Status and Knowledge Level

Question	Certification Status	M (SD)	95% CI LL	95% CI UL	*t*
9. Peterson's original criteria for MCI	BC-ADM Non BC-ADM	.63 (.963) .764 (.061)	-.092,	-.462	1.325 *p*=.189
10. Drugs shown to be effective in slowing progression of MCI	BC-ADM Non BC-ADM	1.02 (3.05) 1.22 (3.28)	-1.17,	.769	.409 *p*=.683
11. Executive function symptom identification	BC-ADM Non BC-ADM	7.47 (4.36) 5.60 (4.97)	.505	3.25	2.71 *p*=< .05
12. Situations indicating unrecognized MCI	BC-ADM Non BC-ADM	3.07 (1.32) 2.53 (1.68)	.103	.969	2.45 *p*=.016
13. American Diabetes Association Clinical Practice Recommendation for cognitive function screening	BC-ADM Non-BC-ADM	6.27 (4.88) 4.74 (5.01)	.039	3.02	2.034 *p*=.044

Note: M= mean; SD= standard deviation; LL= lower limit, UL= upper limit.

Table 6

APN Response Rate to Knowledge Questions

	Question 9	Question 10	Question 11	Question 12	Question 13
BC-ADM Correct	3.4%	10.3%	80.4%	10.3%	63.8%
BC-ADM Incorrect	96.6%	89.7%	19.6%	89.7%	36.2%
Non BC-ADM Correct	1.7%	15.3%	71.0%	8.1%	60.7%
Non BC-ADM Incorrect	98.3%	84.7%	29.0%	91.9%	39.3%

Note: Only one correct answer for Questions 10, 11 and 13. Questions 9 and 12 had 3 total correct responses.

identifying a cholinesterase inhibitor as effective in slowing the progression of MCI to dementia or Alzheimer's disease. Donepezil (Aricept) was selected by 60% of BC-ADM APNs and 51% of non-certified APNs. This is of clinical concern because of the potential for an APN who has

recognized mild issues with cognition to prescribe a drug therapy they anticipate will improve cognitive capability. This could lead to sustained risk of hypoglycemia to elders who use either insulin or an antihyperglycemic oral medication, do not have the cognitive capability to use the treatment safely, and have been prescribed a drug treatment that is ineffective in improving their cognitive capability.

Objective Two Findings

The second objective of the project was to ascertain current practices related to MCI assessment in older adults with diabetes through the completion of an eight-item questionnaire on clinical practice behavior.

Assessments completed during Medicare Annual Well Visit (AWV) exams demonstrated a weak statistical significance ($X^2(1, n=181) = 2.98$, $p=0.88$ CI 90%) between groups. Statistical significance was demonstrated between the groups in regards to cognitive function assessment at times other than AWV (X^2 (2, n=181) =11.34, $p=.003$ CI 95%). While it was anticipated that the APNs with BC-ADM certification would more consistently assess cognitive function in either routine follow-up appointments or during AWVs, the opposite was discovered. APNs without BC-ADM certification assessed cognition more frequently than those with BC-ADM status (AWVs 40.7% vs 27.6%; cognitive function screening 66.7% vs 41.4 % respectively), as illustrated by Figure 27.

Objective Three Findings

The final objective of the project was to determine if BC-ADM certification influenced knowledge or practice compared to APNs without the certification through statistical comparison of test scores and practice behavior responses.

Despite a lack of statistical significance, question responses generated several clinically

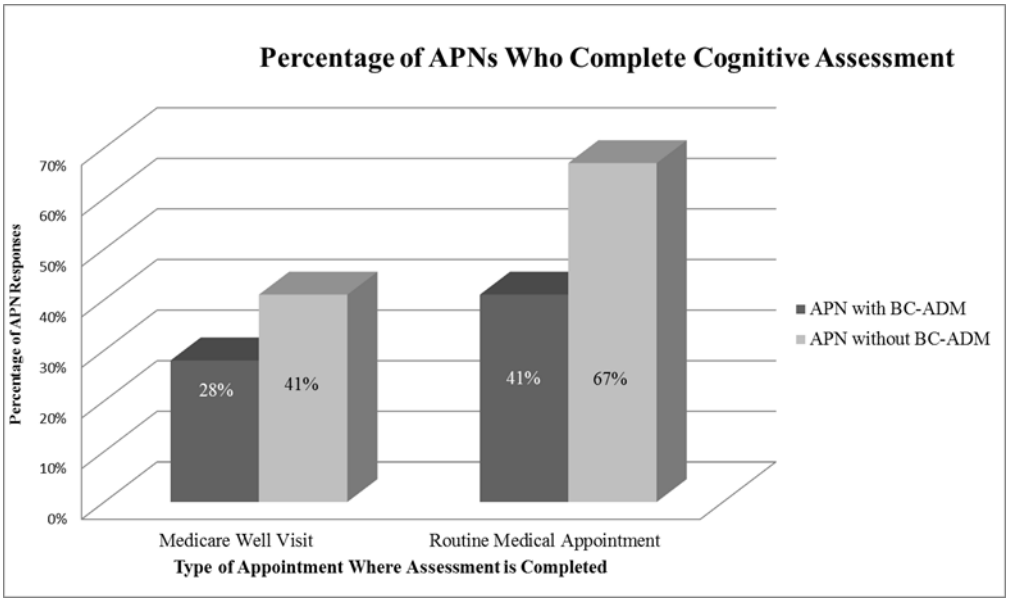

Figure 27. APN assessment frequency of cognitive function in elders with diabetes during Medicare Well visits or clinical appointments.

relevant insights. Those who conducted assessments relied heavily on one cognitive assessment tool. Regardless of the area of specialty or certification status, APNs utilized the Mini Mental State Exam (MMSE) tool when completing assessments for cognitive function (Appendix L) This finding is relevant because research has demonstrated low specificity and sensitivity of the MMSE compared to the Montreal Cognitive Assessment (MoCA) tool (Koski, 2013, Nasreddine et al., 2005).

Alagiakrishnan, Zhao, Mereu, Senior, and Senthilselvan (2013) conducted a prospective, observational pilot study in 30 individuals with type 2 diabetes and known MCI to compare the sensitivity and specificity of MoCA to MMSE. The results demonstrated both parameters were higher with the MoCA tool. The positive ratio for MoCA was 9.5 while the MMSE was 1.8. Consensus is growing among experts in the field of MCI that the risk of missing early cognitive changes and deterioration in executive function skills associated with MCI is high when MMS is used in the screening of individuals with type 2 diabetes (R.C. Petersen and R.O. Roberts,

personal communication, April 15, 2014). This is due to the low sensitivity of the tool. A list of the sensitivity and specificity of each assessment tool respondents could choose as an answer can be found in Appendix M.

Additional observations related to practice behaviors included the following, and are illustrated in Appendix L. Fewer CNSs (6%) always use a formal, validated assessment tool when assessing for cognitive function when compared to FNPs (40%) or ANPs (26%). Use of a formal tool was low among all responders who assess cognitive function. Across all APN specialty areas, the most common explanation for not using a formal assessment tool was their satisfaction with their own informal assessment processes (85-90% of respondents who did not use a formal tool). This practice behavior is problematic, as APNs did not demonstrate an appreciation of the symptom differences between MCI and dementia on the portion of the questionnaire assessing knowledge.

APN specialty area. Several sub-groups of APN specialties were represented in the project population. Family Nurse Practitioner (FNP), Geriatric Nurse Practitioner (GNP), Adult Nurse Practitioner (ANP), and Clinical Nurse Specialist (CNS) were identified in the demographics (Figure 28).

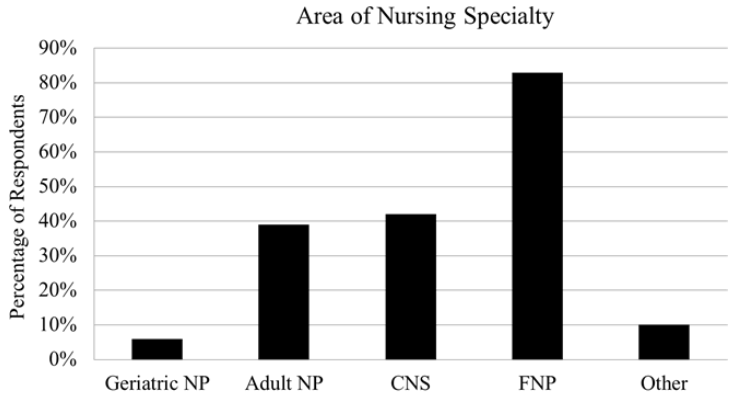

Figure 28. Percentage of APN respondents according to nursing practice subspecialty.

Sub-analysis of data to determine if APN specialty area influenced either knowledge or assessment frequencies did not demonstrate a correlation between BC-ADM certification and no certification for AWV (p= .183) or for cognitive function assessment (p=.08). A correlation between the APN specialty area and which answer they selected for questions related to knowledge was found in several responses and included: Q9A t=32.8, p<.001, (CI: 24.89 – 28.07); Q9B t= 32.763, p<.001, (CI: 24.80-27.98); Q11 t=18.051, p<.001, (CI: 7.362-9.167); Q12E t=32.84, p< .001, (CI: 25.08-28.29); and Q13 t=7.87, p< .001, (CI: 2.538-4.233).

Less than half of Nurse Practitioners held BC-ADM certification. The greatest number of BC-ADM certified individuals were Clinical Nurse Specialists, but this subspecialty also gave the fewest responses indicating completion of cognitive function assessment, and use of a formal assessment tool. Although only five individuals identified their specialty as a Geriatric Nurse Practitioner, this group represented the highest completion rate for cognitive assessment outside of Medicare Annual Well Visits. Response rates for certification status, practice assessment, and knowledge are represented in Table 7.

Table 7

Influence of Specialty Area on Certification Rate and Response to Questionnaire

Specialty Area	BC-ADM certified	Completes Medicare Well Visit	Completes Cognitive Assessment	Use of Formal Tool (Always)	Correct Answer to Drug Question	Incorrect or Unsure Answer to Symptom Recognition		
						1	2	3
FNP n=74	32%	57%	66%	40%	15%	59%	24%	54%
CNS n=40	49%	5%	43%	6%	5%	51%	20%	65%
ANP n=80	26%	33%	59%	26%	15%	61%	16%	62%
GNP n= 5	20%	40%	80%	25%	20%	60%	25%	0%

Note: Percentage of responses by Family Nurse Practitioners (FNP), Clinical Nurse Specialists (CNS), Adult Nurse Practitioners (ANP), and Geriatric Nurse Practitioners (GNP). Symptom recognition included (1) Disorientation; (2) Independence; (3) Respondent is Unsure.

Limitations, Recommendations, Implications for Change

Limitations

Several limitations were acknowledged with this project. The small sample size did not reach power. The ability to generalize the findings of this project is limited to the study population. The response rate for the 749 APNs who were sent invitations to participate was 29% (n=216). In a discussion regarding response rate expectations, Denscombe (2014) offered that a standard acceptable response rate for survey or questionnaire research does not exist. Instead, it is recommended that the questionnaire be designed to result in a high response outcome. Non-response bias is a threat in survey research and should be addressed throughout the time of data collection by asking the question "Do the non-responders differ in any systematic and relevant fashion from those who have responded?" (Denscombe, 2014, p. 28). Although the non-responders were provided with email reminders to complete the questionnaire, it is unknown as to the reason behind lack of response. Lack of endorsement from AADE prior to the deployment of the questionnaire may have influenced the low response rate.

Use of an original questionnaire for use in this project is another limitation. Although face and content validity were established, construct validity was not, and may have impacted the reliability of participant responses. Question two specifically identified Medicare insured patients as the recipients of cognitive function screening. While it was the intent of the question to determine if elders aged 65 or older were being assessed for cognitive function by the APN, use of the term *Medicare-insured* may have indicated patients younger than age 65 who are insured by Medicare for other medical conditions. This also could have led APNs who see elders without Medicare as their primary insurance to provide a negative response, despite assessing for elders for cognitive function.

Recommendations

Recommendations are discussed related to both future actions and future research. This was an exploratory study. The intent was to generate a deeper appreciation for the facilitators and barriers related to differences in knowledge level and clinical practice behaviors of assessing for cognitive function between APNs who hold a board certification in diabetes management and those APNs who do not. Findings from the analysis demonstrated the need for future research that would test specific interventions aimed at increasing APNs' knowledge of the comorbidity of mild cognitive impairment in elders with diabetes. Moreover, future actions are focused on the continued collaboration with AADE as the organization that administers this board certification, which could potentially lead to the development of new resources to improve APNs' knowledge and assessment of MCI in their clinical settings.

Future study possibilities include:

- study replication to strengthen construct validity,
- additional quantitative research with randomization to evaluate effectiveness of specific education and training aimed at improving cognitive impairment recognition, assessment, and treatment,
- expansion of the cohort to include APNs outside the AADE organization to increase the understanding of knowledge level and practice behavior of APNs who do not specialize in diabetes care but care for elders within other health care settings, and
- expansion of research to clarify APN understanding of the effects of executive function impairment on chronic self-managed health conditions.

Future actions following the completion of this project involve both the dissemination of the project's results to appropriate audiences, as well as participation in activities that will increase knowledge of MCI and its potential impact on diabetes self-management. Actions include but are not limited to:

- formal presentation of results to leadership at AADE (e.g. BC-ADM Credentialing Oversight Committee),
- collaboration with AADE to develop continuing education resources that would lead to improved understanding of this comorbidity,
- collaboration with AADE to present data at their national conference to improve awareness of the impact of unrecognized MCI in elders with diabetes, and
- publication of project results in relevant journals (e.g. The Diabetes Educator, Clinical Diabetes, The Journal of the American Association of Nurse Practitioners, or Clinical Nurse Specialist: The Journal for Advanced Nursing Practice).

Implications for Change

This capstone project asked the question: "What is the knowledge level and completion rate of cognitive function assessment of older adults with diabetes, by advanced practice nurses (APN) who are board certified in advanced diabetes management (BC-ADM), compared to APNs who are not-board certified in diabetes management?" Data from an 18-item questionnaire completed by APN members of the national organization for diabetes educators were evaluated for both knowledge level and practices regarding cognitive function assessment. APNs without BC-ADM certification completed cognitive assessment more often than APNs with advanced diabetes management certification. There was no statistical difference between

the groups related to knowledge of MCI and its implication on care provision to elders with diabetes. Overall knowledge regarding MCI and its impact on diabetes care was inadequate in the population studied. Several clinical concerns arose as the result of data analysis. The potential to prescribe treatment beyond individuals' cognitive capabilities places elders with diabetes at higher risk for injury and negative outcomes.

Mild cognitive impairment incidence and prevalence in elders with diabetes are predicted to continue to escalate. It is a matter of urgency for healthcare providers overseeing diabetes care to be knowledgeable about the association between the two comorbidities, and specific actions necessary to reduce risk to patients. Primary care providers, who have acknowledged falling short of adopting diabetes self-management guidelines, identified the use of nurses, specially trained in diabetes, as a solution to enhance the implementation of guidelines into their practices (Appiah et al., 2013).

Thoun (2011) offered that certification exams lead to increased recognition of professional mastery, independence, and autonomy in nursing. To many, certification in a specialty implies professional mastery and care provision above that which is provided within the general scope of practice (Drenkard, 2010). Certification exemplifies more than another acronym acquisition (Stromborg et al., 2005). Employment of APNs with BC-ADM certification is a feasible solution in clinical settings where care is provided for elders with diabetes. However, it is imperative that APNs certified in advanced diabetes management and caring for elders, possess a comprehensive understanding of the risks of diabetes and unrecognized cognitive impairment. This has the best possibility of resulting in actions that diminish the vulnerability of this population. Specific areas for knowledge improvement have been identified as: 1) the discrimination between MCI and dementia or Alzheimer's disease; 2)

improved appreciation of normal executive function and the impact of dysfunction on diabetes self-management capability; 3) appropriate selection of cognitive assessment tools; and 4) the development of a consistent process of cognitive evaluation in line with the ADA Clinical Practice Recommendations for cognitive function assessment.

Summary

Dr. Betty Neuman's system model encourages nurses to identify patterns of stress within a person's life, and develop effective plans of prevention or intervention that ultimately lead to restoration of stability (Newman, Smith, Pharris, & Jones, 2008). Quinn, Toms, Anderson, and Clare (2015) have advocated early intervention for individuals with MCI that could potentially result in stabilizing functioning, promoting adjustment, and improving self-efficacy. Improving APNs' knowledge and practice behavior for this comorbidity in diabetes is the next logical step for improving the lives of elders living with diabetes and MCI.

Florence Nightingale once addressed the influence nurses have upon change when she remarked, "I never lose an opportunity of urging a practical beginning, however small, for it is wonderful how often in such matters the mustard-seed germinates and roots itself" (Valle, 2007, p. 390). The hope of this Capstone project was to identify the beginnings she encouraged as they relate to the delivery of care to elders living with diabetes. Through the generous participation of APNs caring for older adults with diabetes, who participated in this questionnaire, clear next steps have been illuminated for a practical beginning.

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Appendices

Appendix A

Neuman's System Model

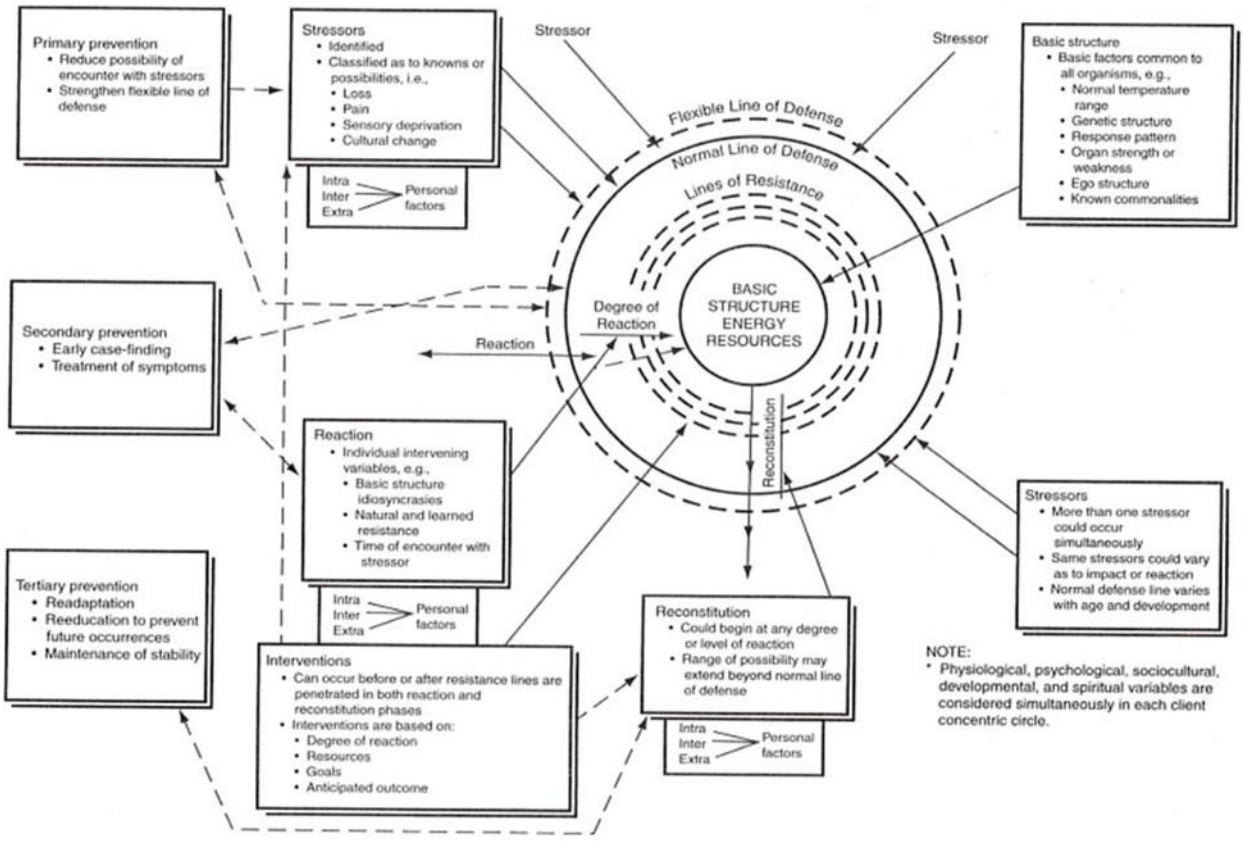


Figure 3. The Neuman Systems Model. (Original diagram copyright ©1970 by Betty Neuman). Retrieved from http://www.neumansystemsmodel.org/

Appendix B

Gillespie Situated Clinical Decision Making framework

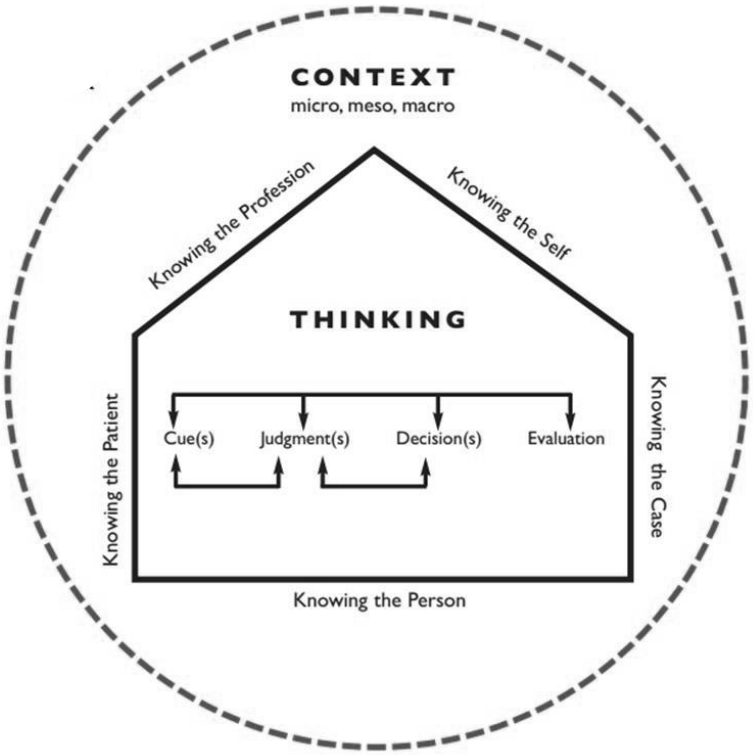


Figure 4. Schematic representation of the Situated Clinical Decision-Making framework. Source Gillespie, M. & Peterson, B.L. (2009). Helping novice nurses make effective clinical decisions: The situated clinical decision-making framework. *Nursing Education Perspectives, 30*(3), pg. 165.

Appendix C

Example of Systematic Review of Literature Process

Article Title and Journal	**1. What do nurse practitioners do? Analysis of a skills survey of nurse practitioners** **Journal of the American Association of Nurse Practitioners,**
Author/Year	**Lausten, G.**
Database and Keywords	EBSCO Nurse practitioners, scope of practice; clinical skills; clinical procedure; education; rural practice; research
Research Design	Descriptive survey
Level of Evidence	6 (Houser & Orman, 2011).
Study Aim/Purpose	Report findings from a survey analysis and evaluation of the frequency and criticality of APRN CSPs (clinical skills and procedures)
Population Studied/Sample Size/Criteria/ Power	Convenience Sample of NPs N=452 Response rate: 31% Criteria: FNP, ANP, GNP and PNP; Excluded: Acute care NP; School or College NP; psychiatric/mental health NP; CNS; CNM and CRNA. Able to read English
Methods/Study Appraisal/ Synthesis Methods	Study Appraisal: review of the literature limited by minimal published studies or information on NP CSPs. Reviewed key terms in CINAHL and Medline (OVID) confirmed general lack of literature for review. Reviewed similar research done with Nurse practitioners. Study initiates process for understanding actual CSP vs those taught in school prior to practice. OHSU IRB approval of minimal risk descriptive study; survey instrument was designed (vetted through a review process expert NP panel) and distributed to a convenience sample of NPs in Oregon by US mail.
Primary Outcome Measures and Results	Skill/procedure completed and frequency of completion. 23 CPS were identified as being used by > 50% with Cerumen impaction the most frequently completed. There was no screening or assessments for depression or cognition listed.
Author Conclusions/ Implications of Key Findings	Implications of Key findings: may influence and inform administrators; reimbursement; licensure and certification Lack of evidence for guiding educational activities demonstrates the need for more informed processes. Evaluation of self-reported CPS by NPs by colleges and universities could assist in re-evaluating the skills taught vs. the skills routinely used in practice.

Strengths/Limitations	Inherent survey limitations; potential for inadequate representation of NPs due to convenience sampling; subjective interpretation; No formal psychometric evaluation of validity/reliability of survey instrument. Limited generalizability
Funding Source	In part: Oregon Health and Science University Betty Gray Rural Health Development Fund.
Comments	Supports the process of query of NPs in regards to clinical practice activities and comfort of procedures since this is what my PICO is considering doing, however there is nothing with the article that will be used to demonstrate ability or frequency of involvement with this type of assessment. Good to see that there was limited research to review as well.

Appendix D

Capstone Project Budget

Table 2. Anticipated Costs Associated with Project Implementation.

Anticipated Costs Associated with Project Implementation

Resources	Projected Cost
Office Space w/internet service (45 days)	$2,250.00
Computer with Wi-Fi capability	$250.00
Email list purchase	$2,700.00
Annual Survey Monkey® subscription fee	$300.00
Miscellaneous supplies	$100.00
Staff	Projected Costs
Project manager (CNS/NP) time ~150 hours	$7,500.00
Statistician time ~15 hours	$750.00
Coder/Administrator Assistant time ~24 hours	$240.00
Total Projected Cost	**$13,990.00**

Note. Minimum estimated costs of resources and staff necessary to replicate current project without changes. Costs do not include the cost associated with refining or enhancing the measurement questionnaire. Cost associated with purchase of email list must be determined for discipline specific groups and may vary from quoted price (http://www.redidata.com/healthcare-lists)

Appendix E

DNP Project Process Model

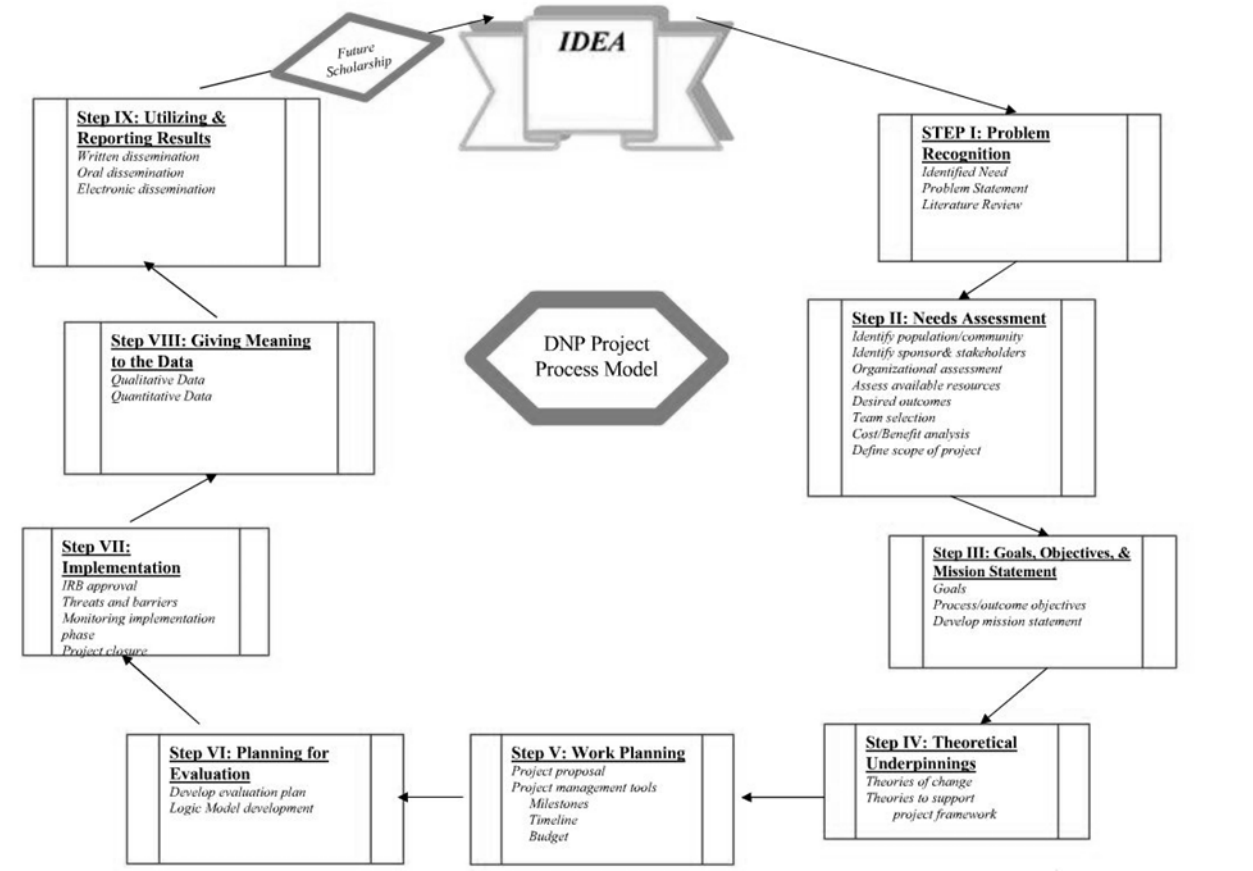


Figure 7. DNP Project Process Model. Adapted from Zaccagnini, M.E. & White, K.W. (2014). The doctor of nursing practice essentials: A new model for advanced practice nursing. (2nd ed.). Sudbury, MA: Jones and Bartlett, p. 424.

Appendix F

Capstone Project Timeline

Table 1. Capstone Project Timeline.

Project Step	Date
Survey tool content completion	October 2014
Faculty presentation	October 2014
Proposal acceptance	October 2014
IRB application submission	November 2014
IRB approval	December 2014
Pilot and analysis	April 2015
Finalized planning	November-December 2014
Data Collection	May-June 2015
Data Analysis	July-August 2015
Capstone Defense/Acceptance	August 13, 2015
Final written submission	April, 2016
Publication	December 2016

Appendix G

Logic Model

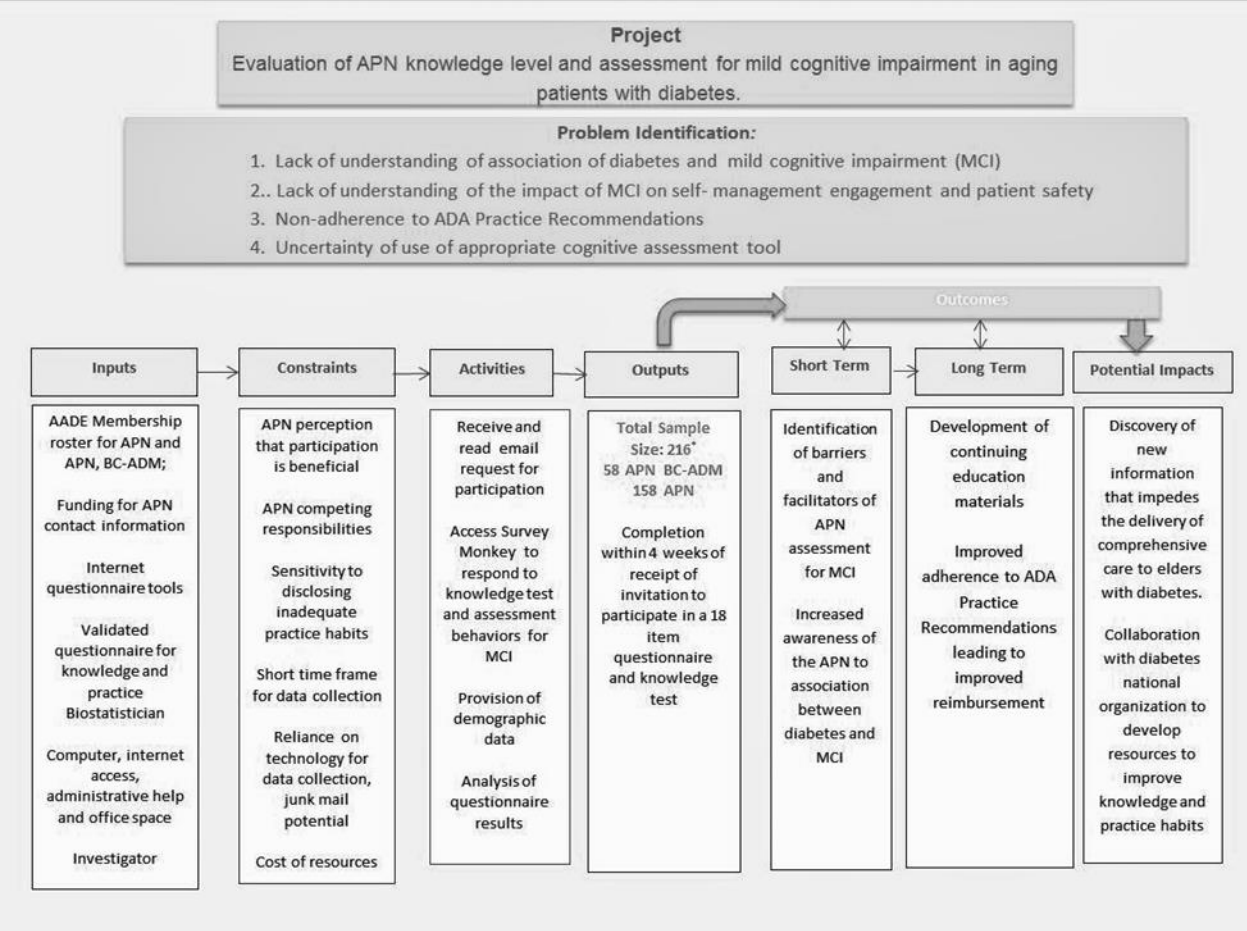
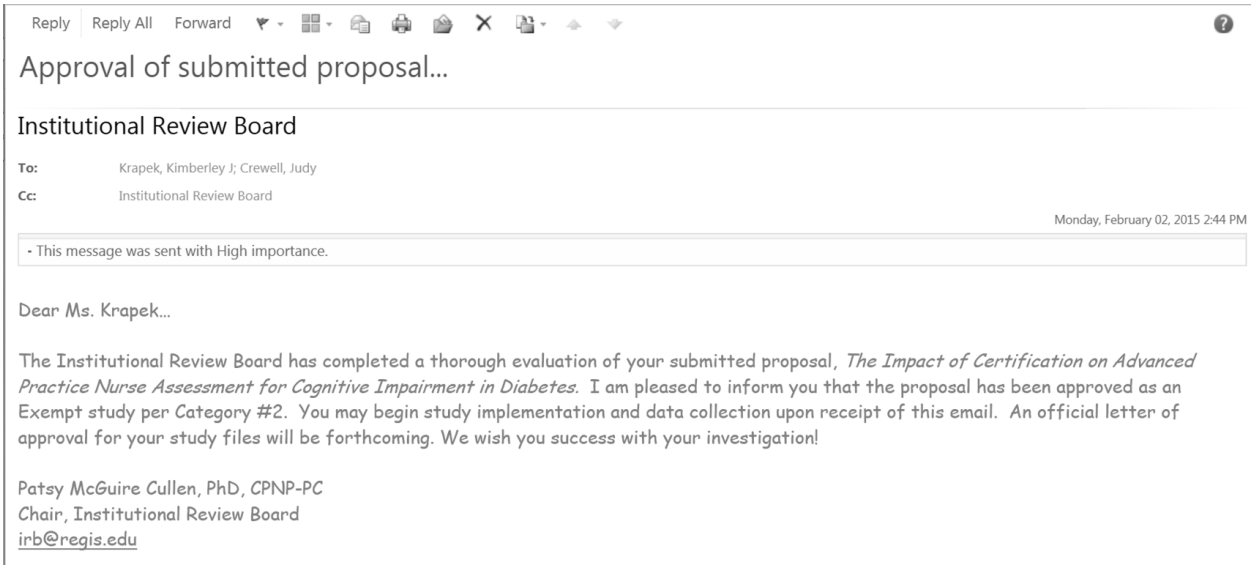


Figure 8. Logic Model. Adapted from Kellogg Foundation. (2004). Logic model development guide: Logic models to bring together planning, evaluation & action. Battle Creek, MI: W.K. Kellogg Foundation. Retrieved from http://www.smartgivers.org/uploads/logicmodelguidepdf.pdf

Appendix H

Regis University IRB Approval for Capstone Project Completion



Reply Reply All Forward

Approval of submitted proposal...

Institutional Review Board

To: Krapek, Kimberley J; Crewell, Judy

Cc: Institutional Review Board

Monday, February 02, 2015 2:44 PM

- This message was sent with High importance.

Dear Ms. Krapek...

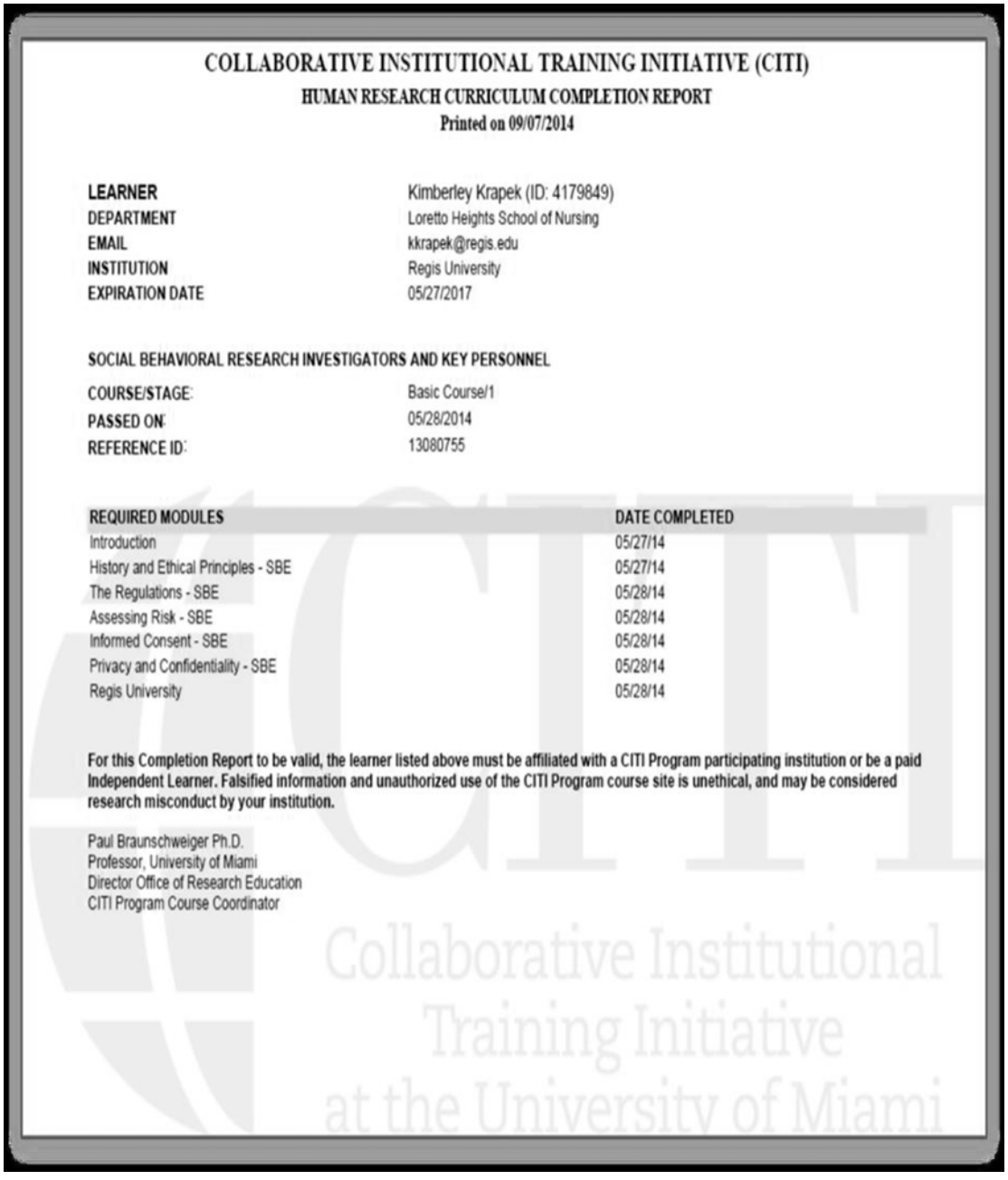
The Institutional Review Board has completed a thorough evaluation of your submitted proposal, *The Impact of Certification on Advanced Practice Nurse Assessment for Cognitive Impairment in Diabetes*. I am pleased to inform you that the proposal has been approved as an Exempt study per Category #2. You may begin study implementation and data collection upon receipt of this email. An official letter of approval for your study files will be forthcoming. We wish you success with your investigation!

Patsy McGuire Cullen, PhD, CPNP-PC
Chair, Institutional Review Board
irb@regis.edu

Figure 9. Regis University IRB approval.

Appendix I

CITI Documentation



COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI)

HUMAN RESEARCH CURRICULUM COMPLETION REPORT

Printed on 09/07/2014

LEARNER	Kimberley Krapek (ID: 4179849)
DEPARTMENT	Loretto Heights School of Nursing
EMAIL	kkrapek@regis.edu
INSTITUTION	Regis University
EXPIRATION DATE	05/27/2017

SOCIAL BEHAVIORAL RESEARCH INVESTIGATORS AND KEY PERSONNEL

COURSE/STAGE:	Basic Course/1
PASSED ON:	05/28/2014
REFERENCE ID:	13080755

REQUIRED MODULES	DATE COMPLETED
Introduction	05/27/14
History and Ethical Principles - SBE	05/27/14
The Regulations - SBE	05/28/14
Assessing Risk - SBE	05/28/14
Informed Consent - SBE	05/28/14
Privacy and Confidentiality - SBE	05/28/14
Regis University	05/28/14

For this Completion Report to be valid, the learner listed above must be affiliated with a CITI Program participating institution or be a paid Independent Learner. Falsified information and unauthorized use of the CITI Program course site is unethical, and may be considered research misconduct by your institution.

Paul Braunschweiger Ph.D.
Professor, University of Miami
Director Office of Research Education
CITI Program Course Coordinator

Collaborative Institutional Training Initiative at the University of Miami

Figure 10. Documentation of CITI completion.

Appendix J

Questionnaire Development Process

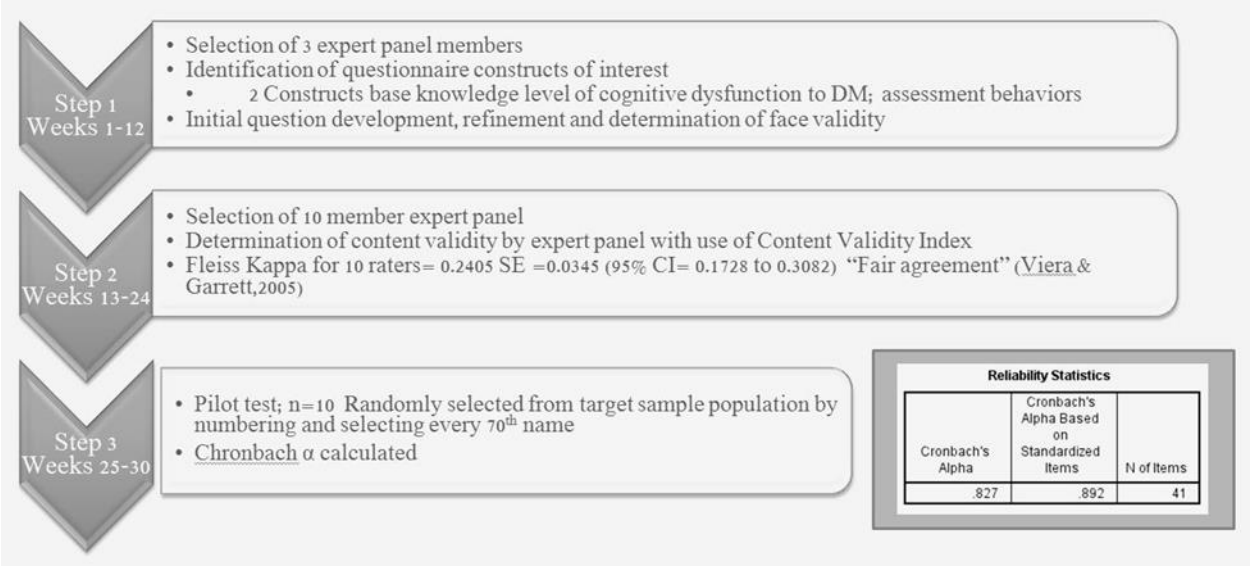


Figure 13. Process of the development of Capstone original tool.

Appendix K

Original Capstone Study Questionnaire of Adult Advanced Practice Nurses with and without BC-ADM Credentials©2015

DNP Capstone Study Questionnaire of Adult Advanced Practice Nurses with and without BC-ADM Credentia Edit

1. DNP Capstone Project

17%

Regis University, Kimberley Krapek, DNP-c, RN, MS CNS, CDE

This project's aim is 1) to assess advanced practice nurses' current knowledge level regarding the association between diabetes and mild cognitive impairment and 2) to understand current practice related to assessing for mild cognitive impairment in older adults with diabetes. The initial step in understanding both of these concepts is to query advanced practice nurses who care for older adults with diabetes and who can share actual practice information.

Thank you for your participation in this 18 item questionnaire. Completion of the questions should take approximately 15 minutes. Your participation is completely voluntary and there is no compensation to complete the questionnaire. You will not be identified by name, personal information, or answers you give. All information is kept confidential. Answering the following questions indicates your consent to utilize the data collected for analysis and reporting. Only project staff will have access to the questionnaire data collected. Your name will not be used when reporting results of the questionnaire and the information collected from you will be combined with information from the other participants to assist in developing the final report.

You may feel uncomfortable with some of the questions asked. You can refuse to answer any question or skip questions you do not want to answer. You can stop your participation at any time. Your answers or participation will not impact your current employment or membership within AADE. The benefits of your participation are minimal, however the overall impact for the community of advanced practice nurses caring for older adults with diabetes may benefit from new information collected related to resource and education opportunities.

If you have questions or concerns regarding your participation or the questionnaire please contact Kimberley Krapek at kkrapek@regis.edu or at 720-355-3548. You may also contact Dr. Patricia Cullen, PNP-BC, IRB Chair and Director of DNP program, Loretto Heights School of Nursing, Rueckert-Hartman College for Health Professionals, Regis University, Denver, CO. at 303-964-5132/pcullen@regis.edu or Dr. Judy Crewell, Associate Professor, Capstone Chair at 303-458-4365/jcrewell@regis.edu

Questions 1-8 explore your current, routine clinical practice. Please select the answer that best describes the care you provide on routine basis with older adults with type 2 diabetes who may exhibit symptoms of cognitive impairment.

1. Do you conduct Annual Wellness Visits (AWV) and Health Risk Assessments (HRA) for Medicare beneficiaries?

- ◯ Yes
- ◯ No

2. Do you assess for cognitive impairment in patients with diabetes who are insured by Medicare?

- ◯ Yes
- ◯ No

Prev Next

3. When do you *typically* complete an assessment for cognitive function in your patients who are Medicare beneficiaries?

- [ ] At all annual follow up appointments for people aged 65 and older
- [ ] Only when I suspect an issue with memory or memory issues are mentioned to me during a clinic visit
- [ ] If a patient exhibits disengagement from self –management following a history of involvement with care
- [ ] When time allows in the appointment
- [ ] Other (please specify)

4. How often do you use a formal Cognitive Assessment tool?

- ◯ Always
- ◯ Sometimes
- ◯ Rarely
- ◯ Never

5. Which cognitive assessment tool do you *most routinely* use?

- ◯ General Practitioner Assessment of Cognition (GPCOG)
- ◯ Mini-Cog
- ◯ Memory Impairment Screen (MIS)
- ◯ Mini-Mental State Exam (MMSE)
- ◯ Cognitive Abilities Screening Instrument (CASI)
- ◯ Clock Drawing Test (CDT)
- ◯ Montreal Cognitive Assessment (MoCA)
- ◯ Trails
- ◯ I do not use a formal assessment tool
- ◯ Other (please specify)

Prev Next

6. If you do not use a formal tool, what is the *primary* reason you do not currently use formal cognitive assessment tools

- [ ] I do not find the tools beneficial
- [ ] I am not familiar with formal cognitive assessment screening tools
- [ ] The tools are too time consuming
- [ ] Lack of reimbursement for a formal assessment
- [ ] My informal assessment works satisfactorily for me
- [ ] Other (please specify)

7. If results from the assessment indicate there may be a problem with cognition, what do you do next?

- [ ] Share the information with the patient's primary care physician
- [ ] Provide results to patient and/or support system and then provide education/direction
- [ ] Refer to a specialist (e.g.: neurologist, cardiologist, psychologist, psychiatrist)
- [ ] Adjust or discontinue insulin or oral diabetes medication that may cause potential serious hypoglycemia
- [ ] Other (please specify)

8. If you do not routinely assess for cognitive impairment, what prevents you from doing so?

- [ ] Lack of reimbursement for my time to do a formal assessment
- [ ] I am not familiar with screening for cognitive impairment
- [ ] Not enough time during clinic visits
- [ ] I refer my patients who I suspect have dementia to the appropriate care giver
- [ ] Uncomfortable with the process
- [ ] Do not know what to do with results that indicate there may be a problem with cognition
- [ ] Other (please specify)

Prev Next

Next, questions 9-13 assess your current knowledge of five areas related to mild cognitive impairment. Please select the **best answer(s)** to the following questions and avoid using references to assist with your selections.

9. Peterson's original classification criteria for mild cognitive impairment includes which of the following? (Select all that apply).

- [ ] Self or informant reported cognitive complaints
- [ ] Disrupted independence in functional abilities
- [ ] Objective memory impairment
- [ ] Normal general cognitive function
- [ ] Unsure

10. Which of the following cholinesterase inhibitor drugs have been shown to be effective in slowing the progression of mild cognitive impairment to dementia and/or Alzheimer 's disease?

- ( ) Donepezil (Aricept)
- ( ) Galantamine (Razadyne, Reminyl, Nivalin)
- ( ) Rivastigmine (Exelon)
- ( ) None, there is no pharmacological treatment currently recommended for treatment of mild cognitive impairment
- ( ) Unsure

11. Which of the following would occur during a diabetes self-management task in a patient who exhibits executive function difficulty?

- ( ) Pain resulting from the reuse of dull lancets during self-blood glucose monitoring
- ( ) Difficulty applying details of a food label to determine carbohydrate content of the amount of breakfast cereal routinely eaten
- ( ) Inability to clearly hear and/or see an alarm from either an insulin pump or continuous glucose monitor.
- ( ) Inability to engage in an exercise program due to gait instability
- ( ) Unsure

Prev Next

12. Choose all of the situations observed in a clinical visit that could potentially indicate unrecognized mild cognitive impairment in a patient with diabetes

- [ ] Inconsistently taking prescribed medications
- [ ] Repeated missed appointments
- [ ] Difficulty learning and remembering new information
- [ ] Apathy or disengagement in self-management tasks
- [ ] Disorientation requiring redirection

13. According to the American Diabetes Association Clinical Practice Recommendations, screening for cognitive function

- ◯ should be conducted by a Neurologist or Psychologists when you suspect forgetfulness in anyone over the age of 65.
- ◯ occurs anytime an assessment is completed for depression.
- ◯ should routinely be part of the screening for psychosocial problems or when the patient experiences poor glycemic outcomes.
- ◯ there is no specific ADA recommendation for screening for cognitive function.

Prev Next

The final 5 items ask about your education, area of specialty and employment.

14. My area of nursing specialty is

- ◯ Geriatric Nurse Practitioner
- ◯ Adult Nurse Practitioner
- ◯ Clinical Nurse Specialist
- ◯ Family Nurse Practitioner
- ◯ Other (please specify)

15. How many years have you been a Master's or Doctoral prepared Advanced Practice Nurse (CNS or NP)

16. How many years have you been credentialed as an Certified Diabetes Educator?

17. How many years have you been a board certified–advanced diabetes manager (BC-ADM)?

18. My primary place of employment is:

- ◯ In a primary care outpatient clinic
- ◯ In a family practice outpatient clinic
- ◯ In a geriatric outpatient practice
- ◯ In the hospital
- ◯ Self-employed
- ◯ Other (please specify)

Prev Done

Appendix L

Frequencies of Responses to Questions related to Assessment and Knowledge

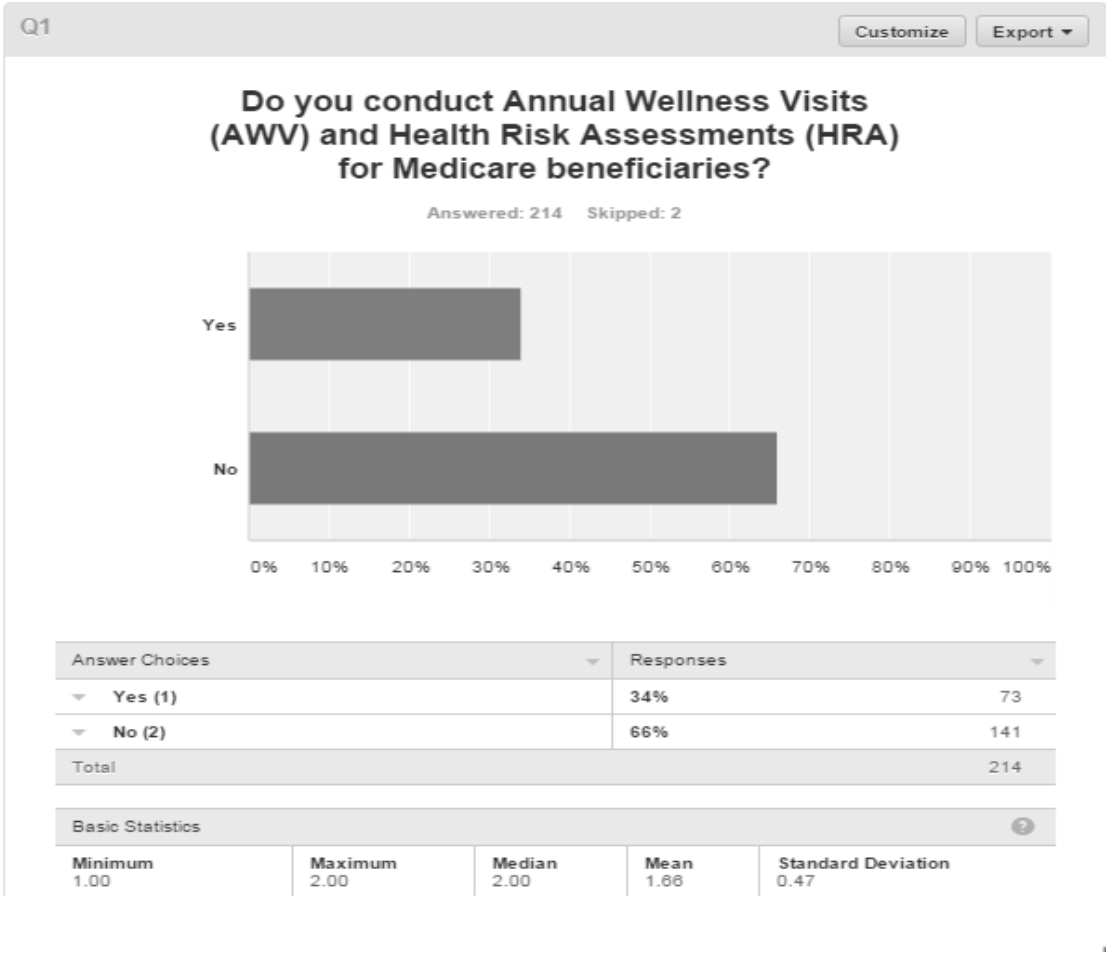


Figure 14. Responses to Question 1.

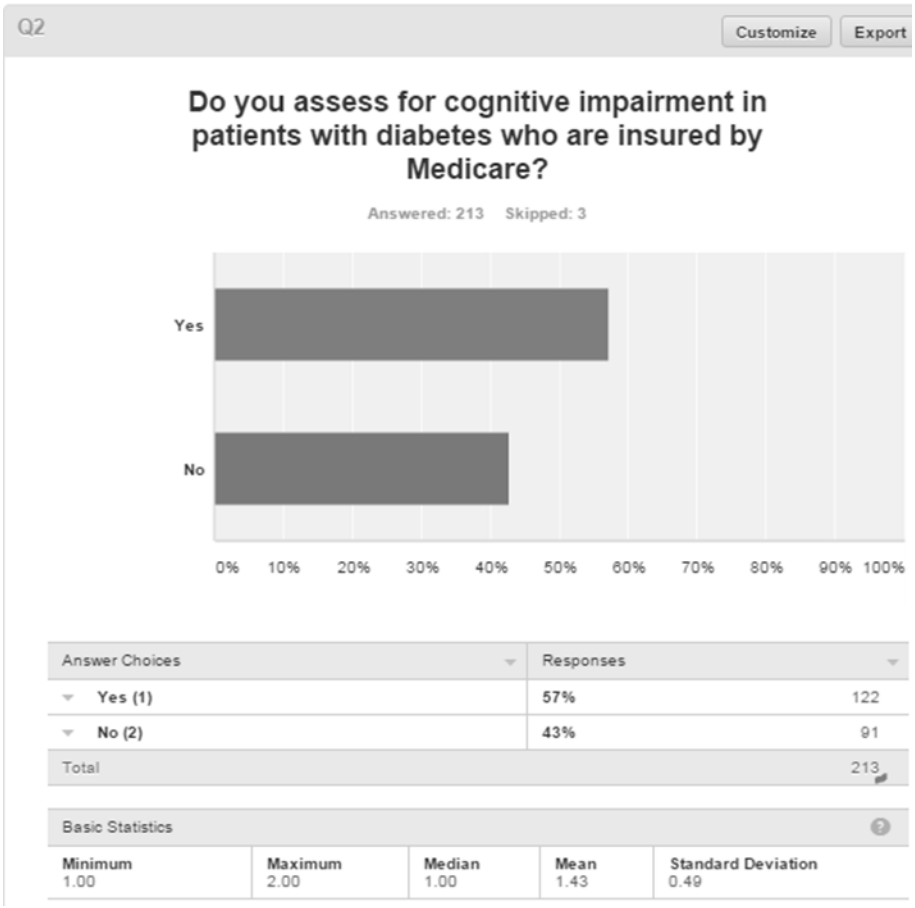
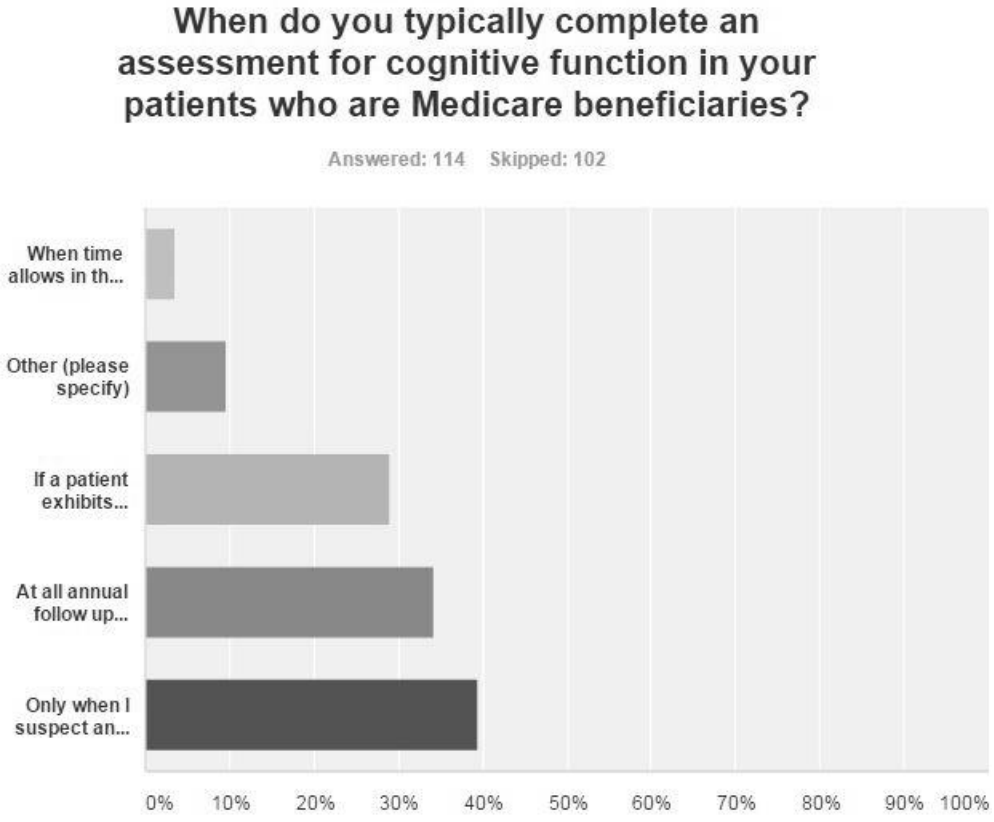
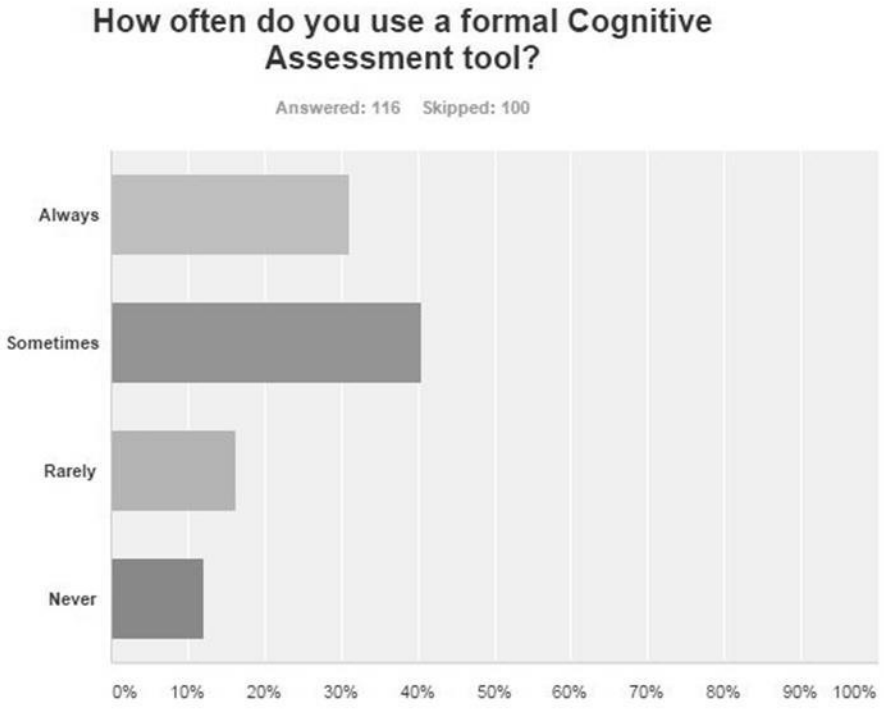


Figure 15. Responses to Question 2.



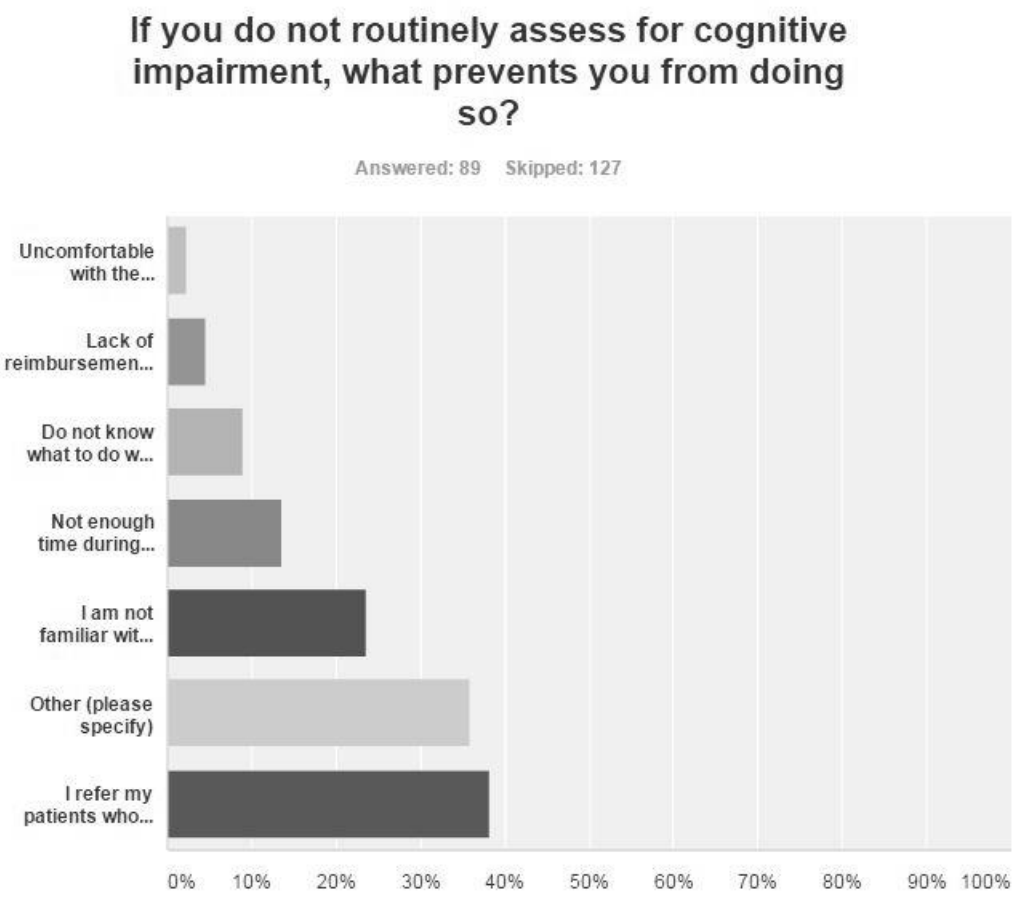
Answer Choices	Responses	
When time allows in the appointment	3.51%	4
Other (please specify) Responses	9.65%	11
If a patient exhibits disengagement from self –management following a history of involvement with care	28.95%	33
At all annual follow up appointments for people aged 65 and older	34.21%	39
Only when I suspect an issue with memory or memory issues are mentioned to me during a clinic visit	39.47%	45
Total Respondents: 114		

Figure 16. Typical timing for cognitive function screening for elders with diabetes by APNs.



Answer Choices	Responses	
Always	31.03%	36
Sometimes	40.52%	47
Rarely	16.38%	19
Never	12.07%	14
Total		116

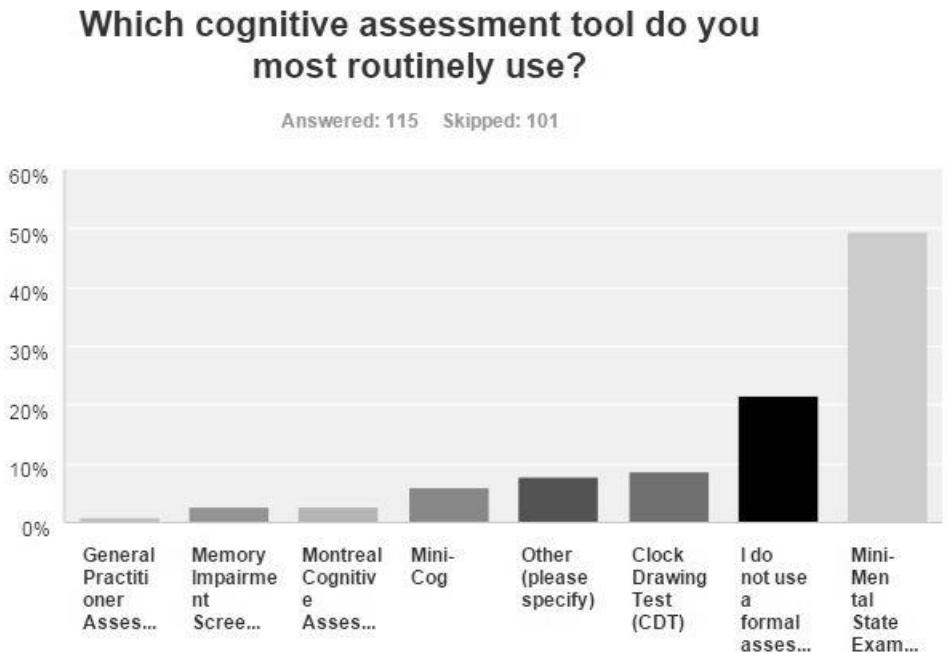
Figure 17. Responses to Question 4.



Answer Choices	Responses	
Uncomfortable with the process (5)	2%	2
Lack of reimbursement for my time to do a formal assessment (1)	4%	4
Do not know what to do with results that indicate there may be a problem with cognition (6)	9%	8
Not enough time during clinic visits (3)	13%	12
I am not familiar with screening for cognitive impairment (2)	24%	21
Other (please specify) (7) Responses	36%	32
I refer my patients who I suspect have dementia to the appropriate care giver (4)	38%	34
Total Respondents: 89		

Basic Statistics				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	7.00	4.00	4.42	1.96

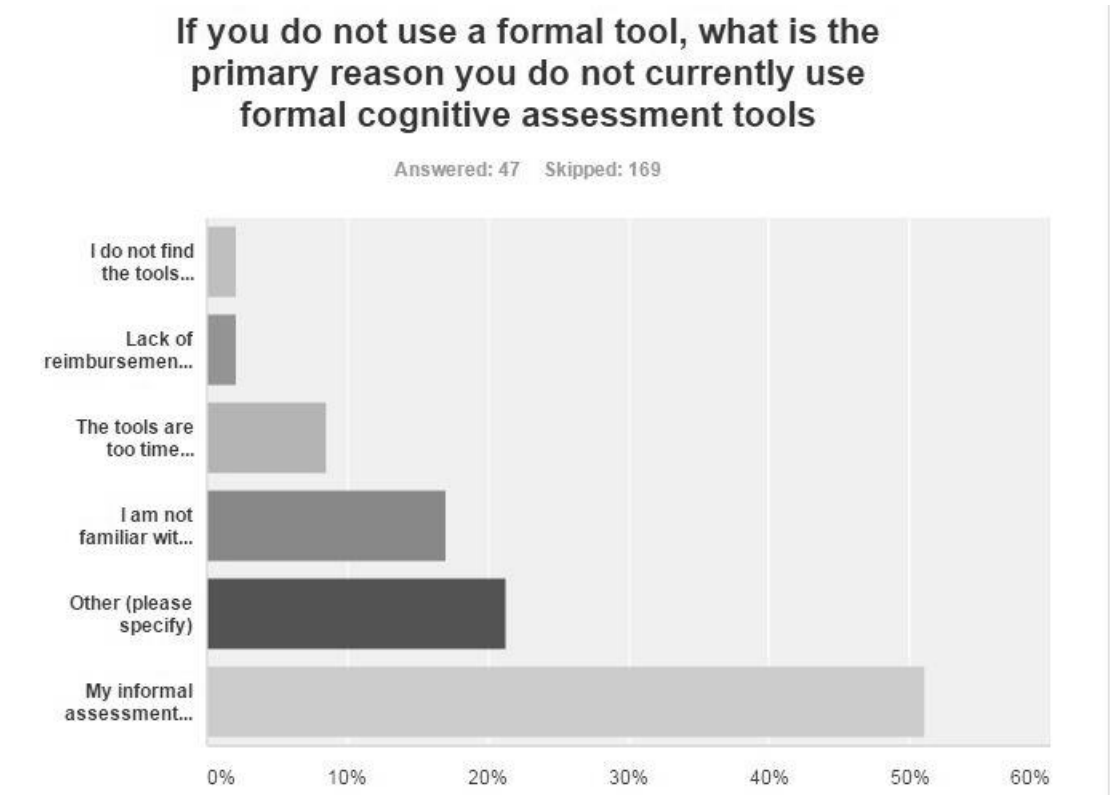
Figure 18. Responses to Question 6.



Answer Choices	Responses	
General Practitioner Assessment of Cognition (GPCOG)	1%	1
Memory Impairment Screen (MIS)	3%	3
Montreal Cognitive Assessment (MoCA)	3%	3
Mini-Cog	6%	7
Other (please specify) Responses	8%	9
Clock Drawing Test (CDT)	9%	10
I do not use a formal assessment tool	22%	25
Mini-Mental State Exam (MMSE)	50%	57
Total		115

Basic Statistics				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	10.00	4.00	5.63	2.55

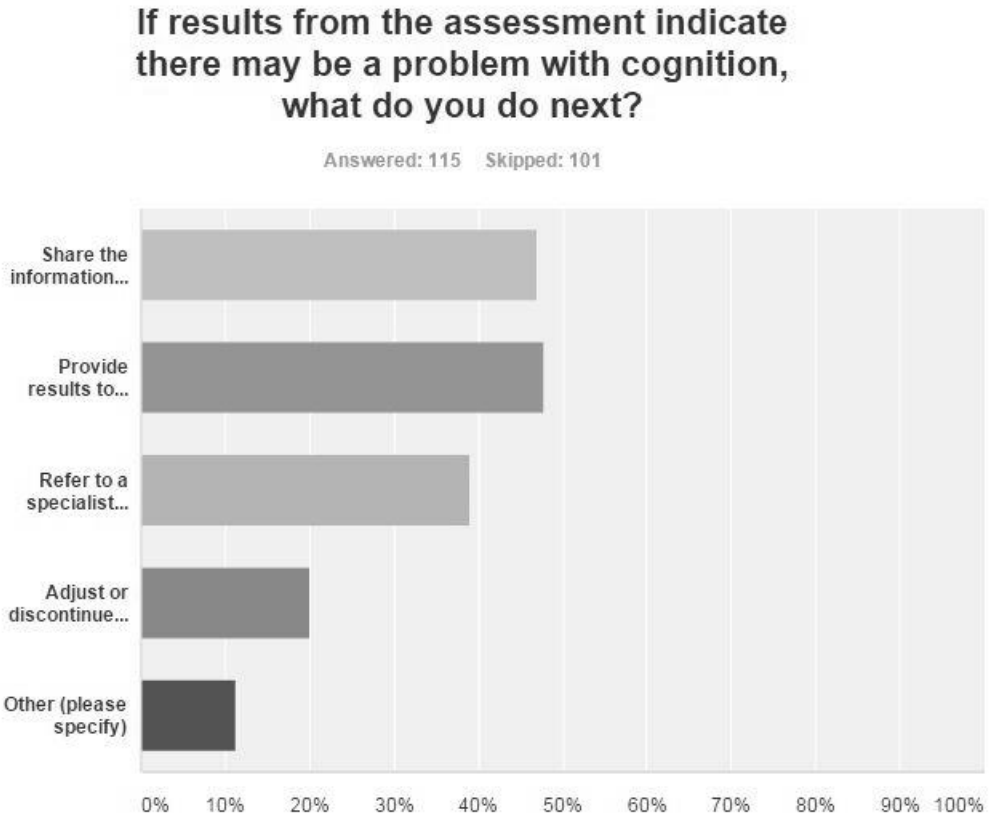
Figure 19. Routinely used formal cognitive function assessment tools by APNs during evaluation of elders with diabetes.



Answer Choices		Responses	
I do not find the tools beneficial (1)		2%	1
Lack of reimbursement for a formal assessment (4)		2%	1
The tools are too time consuming (3)		9%	4
I am not familiar with formal cognitive assessment screening tools (2)		17%	8
Other (please specify) (6)	Responses	21%	10
My informal assessment works satisfactorily for me (5)		51%	24
Total Respondents: 47			

Basic Statistics				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	6.00	5.00	4.44	1.44

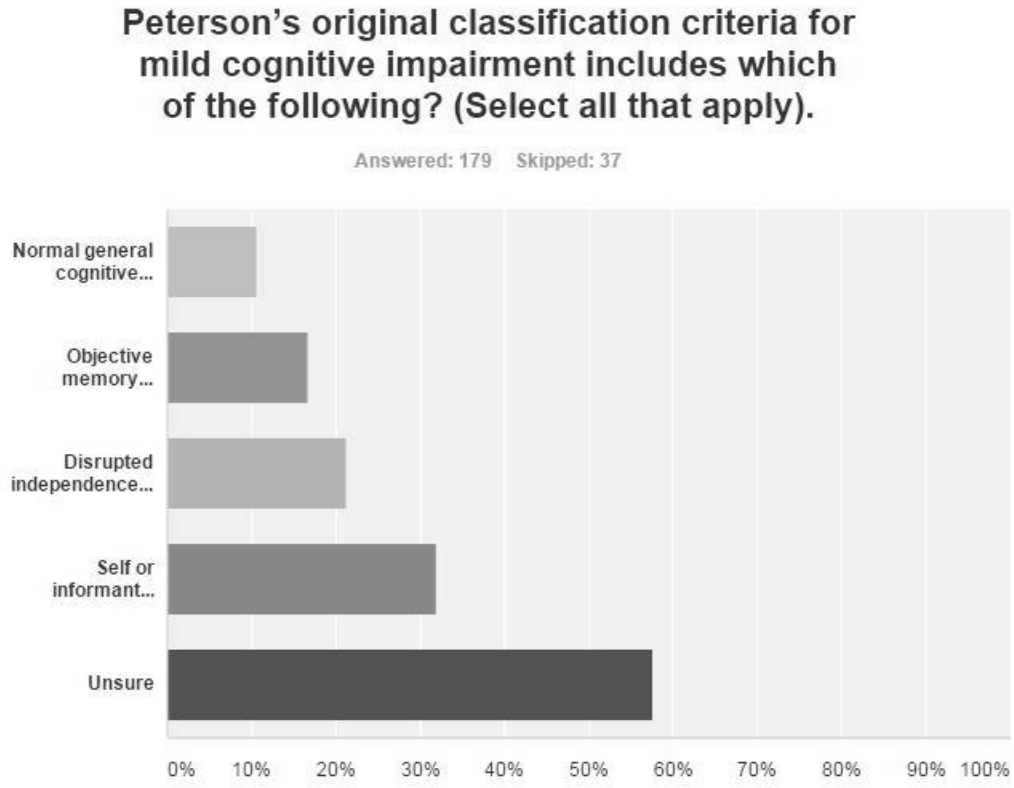
Figure 20. APN rationale for not using formal cognitive assessment tools during evaluation of elders with diabetes.



Answer Choices	Responses	
Share the information with the patient's primary care physician (1)	47%	54
Provide results to patient and/or support system and then provide education/direction (2)	48%	55
Refer to a specialist (e.g.: neurologist, cardiologist, psychologist, psychiatrist) (3)	39%	45
Adjust or discontinue insulin or oral diabetes medication that may cause potential serious hypoglycemia (4)	20%	23
Other (please specify) (5) Responses	11%	13
Total Respondents: 115		

Basic Statistics				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	5.00	2.00	2.40	1.21

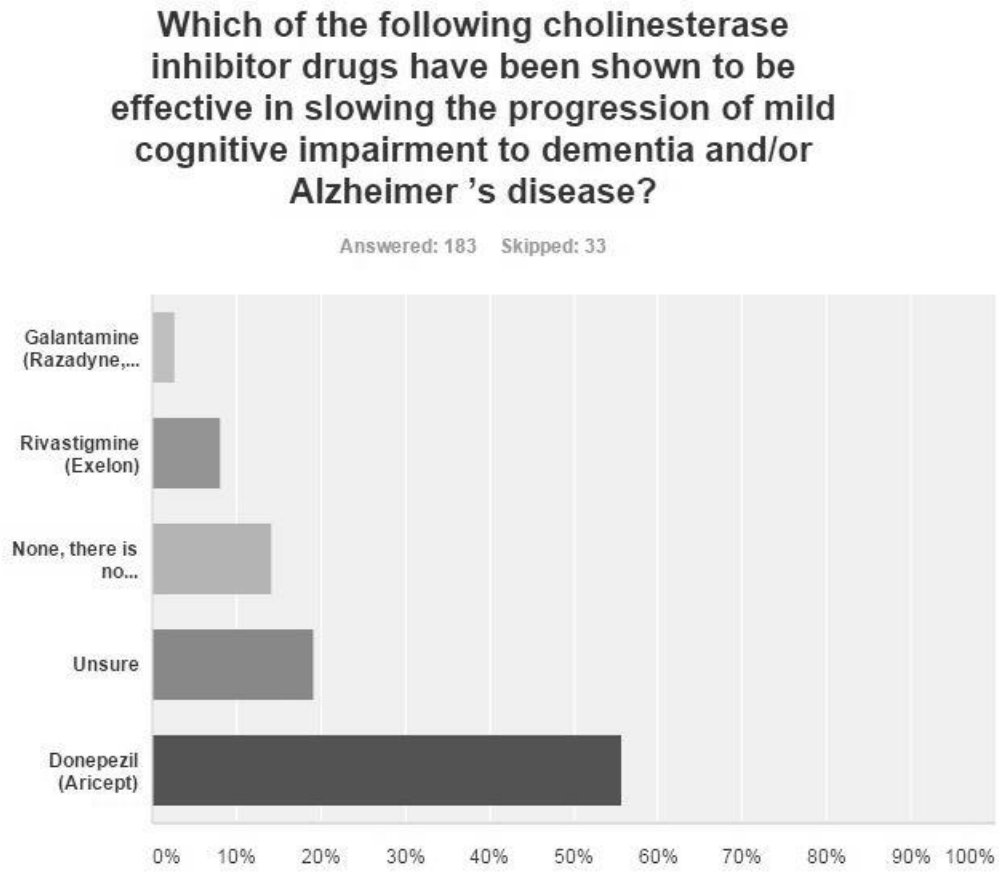
Figure 21. Actions taken by APNs following a positive finding during cognitive function screening of elders with diabetes.



Answer Choices	Responses	
Normal general cognitive function (4)	11%	19
Objective memory impairment (3)	17%	30
Disrupted independence in functional abilities (2)	21%	38
Self or informant reported cognitive complaints (1)	32%	57
Unsure (5)	58%	103
Total Respondents: 179		

Basic Statistics				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	5.00	3.00	3.30	1.65

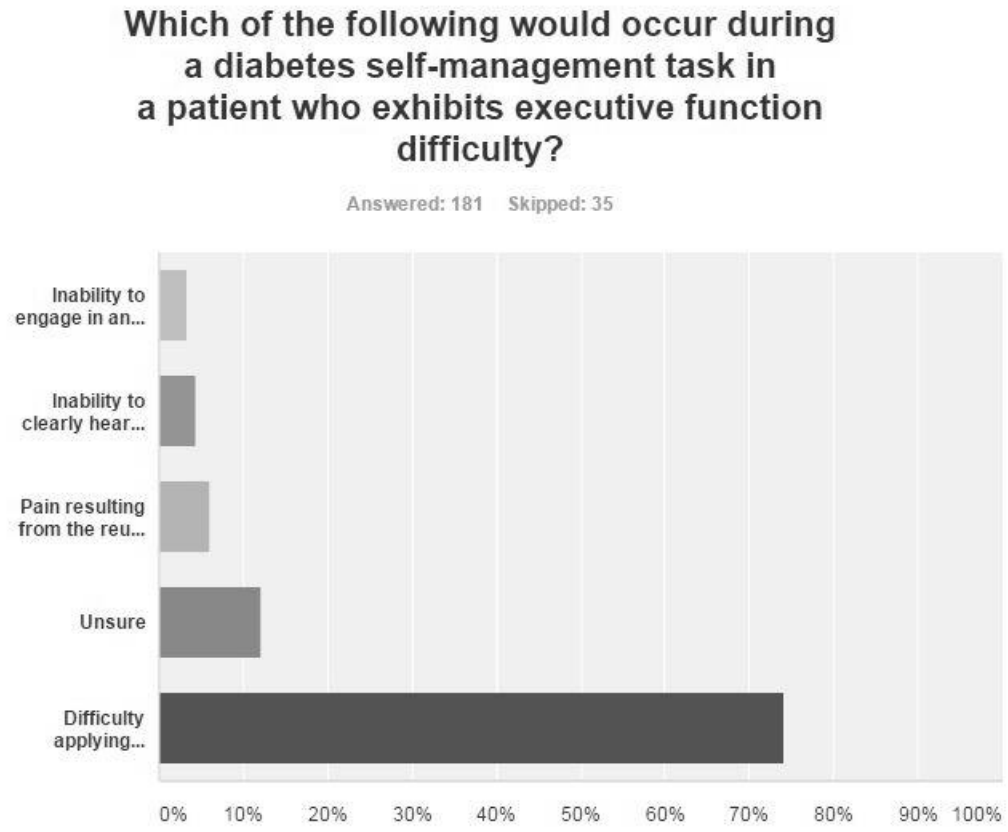
Figure 22. Knowledge test item results for Peterson's classification of mild cognitive impairment.



Answer Choices	Responses	
Galantamine (Razadyne, Reminyl, Nivalin) (2)	3%	5
Rivastigmine (Exelon) (3)	8%	15
None, there is no pharmacological treatment currently recommended for treatment of mild cognitive impairment (4)	14%	26
Unsure (5)	19%	35
Donepezil (Aricept) (1)	56%	102
Total		183

Basic Statistics				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	5.00	1.00	2.38	1.67

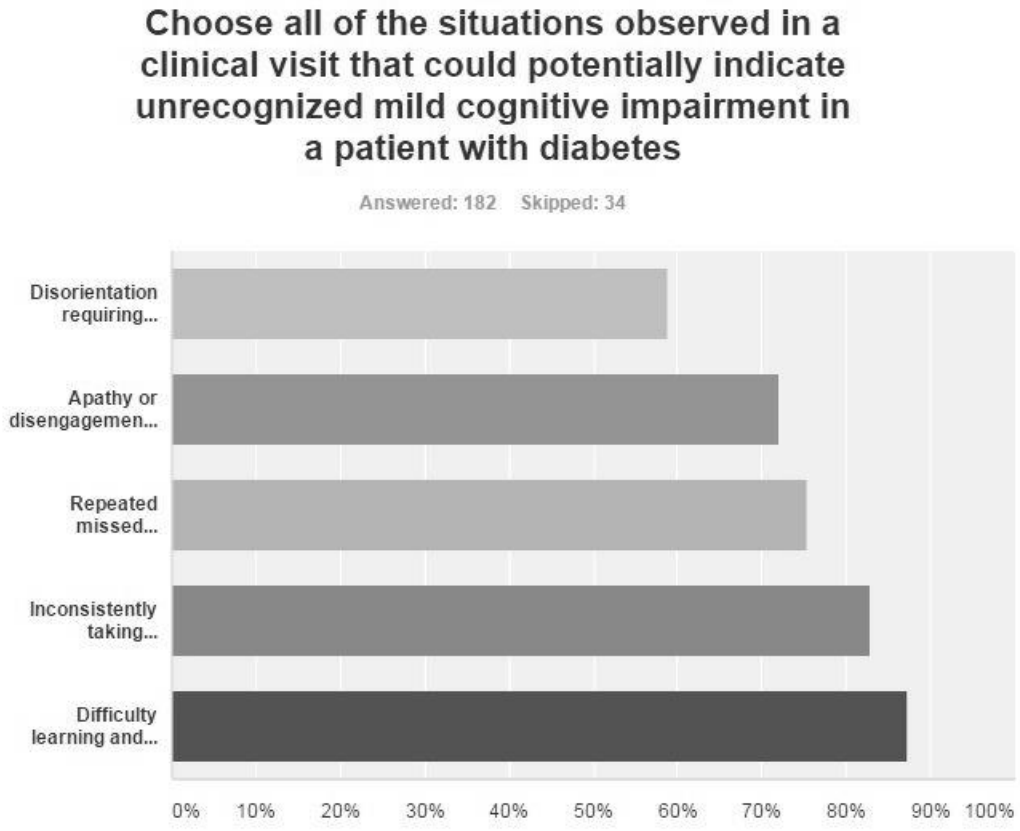
Figure 23. APN response to drug knowledge test item.



Answer Choices	Responses	
Inability to engage in an exercise program due to gait instability (4)	3%	6
Inability to clearly hear and/or see an alarm from either an insulin pump or continuous glucose monitor. (3)	4%	8
Pain resulting from the reuse of dull lancets during self-blood glucose monitoring (1)	6%	11
Unsure (5)	12%	22
Difficulty applying details of a food label to determine carbohydrate content of the amount of breakfast cereal routinely eaten (2)	74%	134
Total		181

Basic Statistics				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	5.00	2.00	2.41	1.08

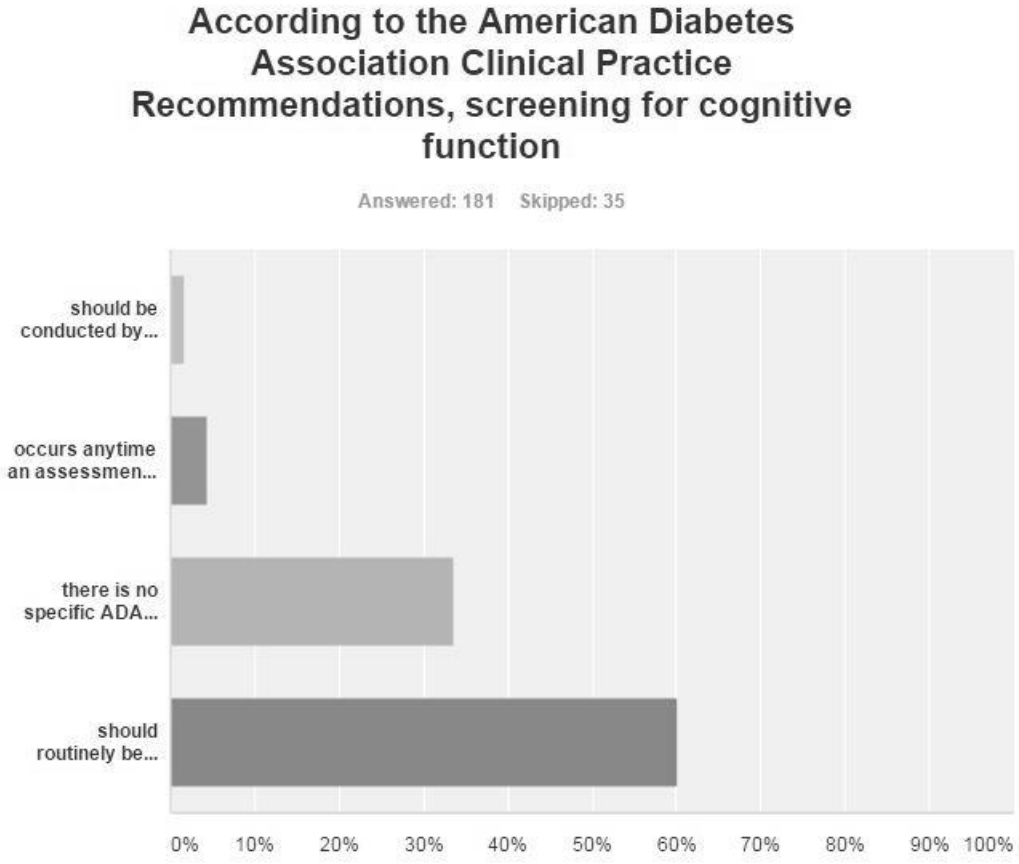
Figure 24. APN responses to question regarding executive dysfunction in diabetes self-management skills.



Answer Choices	Responses	
Disorientation requiring redirection (5)	59%	107
Apathy or disengagement in self-management tasks (4)	72%	131
Repeated missed appointments (2)	75%	137
Inconsistently taking prescribed medications (1)	83%	151
Difficulty learning and remembering new information (3)	87%	159
Total Respondents: 182		

Basic Statistics				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	5.00	3.00	2.86	1.37

Figure 25. APN responses for observed symptoms of unrecognized MCI in elders with diabetes.



Answer Choices	Responses	
should be conducted by a Neurologist or Psychologists when you suspect forgetfulness in anyone over the age of 65. (1)	2%	3
occurs anytime an assessment is completed for depression. (2)	4%	8
there is no specific ADA recommendation for screening for cognitive function. (4)	34%	61
should routinely be part of the screening for psychosocial problems or when the patient experiences poor glycemic outcomes. (3)	60%	109
Total		181

Basic Statistics				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	4.00	3.00	3.26	0.62

Figure 26. APN response to ADA Practice Recommendation for cognitive function screening in individuals with diabetes.

Appendix M

Commonly Used Cognitive Assessment Tools

Table 8. Sensitivity, Specificity and Minutes to Perform Commonly Used Cognitive Assessment Tools.

Test	Sensitivity (%)	Specificity (%)	Minutes to Perform
General Practitioner Assessment of Cognition (GPCOG)	85	86	6
Memory Impairment Screen (MIS)	86	97	4
Montreal Cognitive Assessment (MoCA)	100	87	10
Mini-Cog	76-99	89-93	3
Clock Drawing Test (CDT)	45-77	81-91	1-2
Mini-Mental State Exam (MMSE)	83	82	8

Note: Adapted from Butler, N. (2013). Dementia screening in the elderly. https://www.healthcare.uiowa.edu/igec/resources-educators-professionals/2013-midwestern-conference-on-aging/assets/Dementia-Screening-in-the-Elderly-Butler-FullPage.pdf