# SELF EFFICACY, SELF RELIANCE, ADHERENCE TO SELF CARE, AND GLYCEMIC CONTROL AMONG CHEROKEE WITH TYPE 2 DIABETES

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ABSTRACT

*Background:* Type 2 diabetes is responsible for disability and shortened life span among Native Americans. Adherence to recommendations for diet, exercise and medication is essential to optimizing outcomes. Few studies of self care have included Native American participants.

*Specific Aims:* Among Cherokee adults, aims are to (a) describe self efficacy, Cherokee self reliance, adherence to self care recommendations and glycemic control; (b) explore the relationship between self efficacy and Cherokee self reliance; and (c) predict glycemic control from self efficacy, Cherokee self reliance, adherence to self care recommendations, and personal characteristics.

*Methods:* The design was observational and cross-sectional. A convenience sample of 164 female and 136 male Cherokee adults with type 2 diabetes receiving care at three Cherokee Nation clinics participated. Subjects completed the Diabetes Self Efficacy Scale, Cherokee Self Reliance Questionnaire, and Summary of Diabetes Self Care Activities. Glycemic control was indexed using the most recent A1C value.

*Results:* The average age of participants was 58.29 (*SD* = 12.07); they had had type 2 diabetes for an average of 9.06 years (*SD* = 7.85). Using exploratory maximum likelihood factor analysis with orthogonal rotation, items from self efficacy and self reliance measures loaded on separate factors. Self efficacy, years since diagnosis, age and clinic (C compared with B) were significant predictors of A1C.

*Conclusions:* Glycemic control was only partly explained. Diabetes self care is complex. Continued research on psychosocial and educational aspects of self care is needed to better understand diabetes management and outcomes among Cherokee adults.

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# CHAPTER I

## THE RESEARCH PROBLEM

Type 2 diabetes is the most common form of a group of metabolic disorders that is characterized by high blood glucose levels resulting from defects in the body's ability to produce or use insulin. The body either does not produce enough insulin or is unable to efficiently utilize insulin to convert the sugars and starches consumed in food into energy. The chronic hyperglycemia associated with type 2 diabetes can lead to serious complications and premature death, but people who are affected can take steps through diet, exercise, and medication to control the disease (American Diabetes Association [ADA], 2012, Diabetes Basics, Type 2, para. 1). In the United States today, approximately 25.8 million adults over the age of 20 have diabetes (Centers for Disease Control [CDC], 2011, National Diabetes Fact Sheet).

Type 2 diabetes is associated with older age, obesity, family history of diabetes, history of gestational diabetes, impaired glucose metabolism, physical inactivity and ethnicity. The prevalence of diabetes has risen and in 2010, an additional 1.9 million new cases of diabetes were diagnosed in adults aged 20 years and older in the United States. The direct and indirect estimated cost of this epidemic of type 2 diabetes totals more than $116 billion dollars per year (CDC, 2011, para. 11).

## Self Care

**Key clinical trials.** The Diabetes Control and Complications Trial (DCCT), a 10 year prospective clinical trial conducted between 1983 and 1993, demonstrated the importance of tight blood glucose control in type 1 diabetes and concluded that maintaining near normal blood glucose levels slows the onset and progression of eye, kidney, and nerve disease caused by the hyperglycemia of diabetes (DCCT Research Group, 1993, p. 977). The United Kingdom Prospective Diabetes Study (UKPDS), another landmark study, extended these results and showed that the life threatening complications of type 2 diabetes can also be reduced by intensive management (UKPDS Group, 1998, p. 837).

If not adherent to diet, exercise, and medication recommendations, individuals with type 2 diabetes who also have cardiovascular disease are two to four times more likely to die of heart disease and stroke than adults without diabetes (Goff, Jr. et al., 2007, p. S4). The Action to Control Cardiovascular Risk in Diabetes (ACCORD) Trial examined blood glucose control in adults with type 2 diabetes who also have cardiovascular disease who were randomized to standard therapy with a glycosylated hemoglobin (A1C) in the range of less than or equal to 7.0% versus intensive therapy with an A1C target of less than 6.0%. Intensive therapy was associated with higher mortality from a variety of causes. The unexpected association between intensive therapy for obtaining normal A1C with the target of less than 6.2%, and mortality (in patients with advanced type 2 diabetes) introduced caution, but did not change the longstanding A1C target of less than or equal to 7% or self care recommendations

(Action to Control Cardiovascular Risk in Diabetes, 2012; ADA, 2008, Statement Related to the ACCORD Trial, para. 3). Subsequent analysis of ACCORD Trial data implicated factors associated with sustained higher A1C within the intensive therapy group as possible explanations for the unexpected clinical trial finding (Riddle et al., 2010, p. 989).

**Recommendations for self care.** Based on clinical trial research, current recommendations regarding the management of type 2 diabetes address being active, healthy eating, taking medications, self monitoring of blood glucose levels, problem solving, reducing risks, and healthy coping (American Association of Diabetes Educators, 2011; Mertig, 2007, p. 11). The treatment goal in type 2 diabetes is to prevent or delay long-term complications by maintaining blood glucose levels at or near the normal fasting level of 70 to 110 mg/dl. Blood glucose can also be measured through a glycosylated hemoglobin A1C blood test which reflects the average blood glucose level over the previous two to three months; a typical goal is 7% or less. Changes in diet influence type 2 diabetes outcomes through impact on blood pressure, weight, and the body's ability to produce and utilize insulin. Exercise decreases insulin resistance. Some oral diabetes medications such as metformin decrease insulin resistance. Other oral medications such as sulfonylureas increase the amount of insulin the body produces. When lifestyle changes in diet and exercise alone are insufficient to reach blood glucose control goals, insulin injections can be used in type 2 diabetes to improve overall diabetes control (ADA, 2012; Mertig, 2007).

"Because diabetes is largely a self-managed chronic illness that requires multiple decisions and behaviors each day in order for it to be effectively managed, ongoing diabetes education is considered an essential service for people with diabetes" (American Nurses Association and American Association of Diabetes Educators, 2003, p. 11). The diabetes management team includes not only the person diagnosed with diabetes, but also the endocrinologist, diabetes educator, registered dietician, optometrist or ophthalmologist, podiatrist, dentist, and nurse. The nurse's role includes developing a therapeutic relationship, tailoring the management plan, and dispelling myths about diabetes while educating both the patient and their family in use of a glucometer and insulin injection technique. The knowledge of the professional nurse must be both current and culturally sensitive to encourage trust and successful self care.

Among health conditions requiring adherence for continual self-management, diabetes is an extremely challenging one. Self efficacy, the belief an individual possesses in their personal ability to act (engage in a specific behavior such as selecting healthy foods) in a variety of situations, may be important to adherence. The concept of self efficacy is based on Bandura's (1997) social cognitive theory. This theory describes interactions among behavioral, personal, and environmental factors impacting human behavior in general, and can be applied to human behavior in relation to health and chronic disease.

Adherence is behavior specific and can be described as self efficacy translated into psychomotor action. Individuals with diabetes vary in their self efficacy beliefs that they can demonstrate adequate control over and adhere to the dietary, exercise, and

medication aspects of their self care regimen. Interventions designed to promote self-management of diabetes can be structured in ways that build the efficacy beliefs to support adherence to the arduous regimen (Bandura, 1997, p. 420). Type 2 diabetes lasts a lifetime, so adults with type 2 diabetes may require frequent reinforcement that their adherence to diet, exercise, and medication recommendations is a demonstration of growing self efficacy; that they are in control of their type 2 diabetes rather than it being in control of them.

Because diabetes self-management incorporates behavioral, personal, and environmental factors into daily performance of recommended activities, the concept of self efficacy may be relevant for improving self-management (Sarkar, Fisher, & Schillinger, 2006, p. 823). These factors suggest the notion that increasing self efficacy may be critical to improved adherence and it is this adherence that promotes increased self efficacy. In Native American communities, through acknowledging and respecting that which is viewed as culturally appropriate, self efficacy can be reflected in improved adherence to diabetes self care recommendations (Griffin, Gilliland, Perez, Helitzer, & Carter, 1999, p. 352).

**Type 2 Diabetes among Native Americans**

Native Americans are disproportionately affected by type 2 diabetes (CDC, 2011, para. 2; Looker et al., 2010). The increasingly significant health disparity of type 2 diabetes demands attention; at nearly 17%, American Indians and Alaska Natives have the highest age-adjusted prevalence of diabetes among all U.S. racial and ethnic groups (ADA, 2012, Native American Programs, para. 1). Among the 1.9 million American

Indians and Alaska Natives aged 20 years or older receiving care from Indian Health Services (IHS) in 2009, 14.2% had diagnosed diabetes (CDC, 2011, para. 3). The prevalence of diagnosed diabetes in Oklahoma among Non-Hispanic Native Americans is 14.7% (CDC, 2011, Diabetes in Oklahoma Fact Sheet).

Although the prevalence and increasing incidence of type 2 diabetes among Native Americans has been well documented, less is known of Native American perceptions regarding treatment of type 2 diabetes or how those perceptions differ from tribe to tribe (Berry, Samos, Storti, & Grey, 2009, p. 57). There are major differences in cultural and dietary practices among the many Native American tribes. The influence of self efficacy and adherence on glycemic control is also worthy of investigation. Across ethnicities, men and women may exhibit differing health behaviors; potential gender differences in diabetes self care in Native Americans bear investigation.

**Cherokee Nation**

Cherokee Nation is one of 565 federally recognized Native American Tribes and one of a group of tribes historically referred to as the Five Civilized Tribes (U.S. Department of the Interior, Bureau of Indian Affairs, 2011, What We Do section). There are three federally recognized Cherokee tribes. Cherokee Nation and the United Keetowah Band of Cherokee Indians are both located in Oklahoma, and the Eastern Band Cherokee Indians are located in North Carolina. With over 300,000 tribal citizens, Cherokee Nation is one of the largest federally recognized tribes in the United States.

Cherokee, also referred to as Tsalagi, are known for a long standing Cherokee tradition of survival and perseverance. They are also known for Sequoyah, the creator of

the Cherokee written language or syllabary. "It [the Cherokee syllabary] had an immediate and enormous effect upon learning among the Cherokees. Many adults and children were taught to read and write in their own Cherokee language within a period of only a few months" (Hoig, 1998, p. 122).

The management of type 2 diabetes is complex and challenging (Atak, Gurkan, & Kose, 2008, p. 66). Adherence to self care in the areas of diet, exercise, and medications is essential to glycemic control and prevention of complications. Self efficacy and self reliance are thought to be essential to adherence, but many questions remain regarding how it applies to minority populations. While not specific to Cherokee, glycemic control was reported as poor among diabetic American Indians participating in the Strong Heart Study (Hu et al., 1999, p. 1802). Poverty, lack of education, and lack of transportation are likely barriers to adherence among minority populations, but little is known about self efficacy, self reliance, adherence to self care recommendations, and glycemic control among Cherokee men and women.

**Purpose**

The purpose of this study was threefold. The aims were to (a) describe self efficacy, Cherokee self reliance, adherence to self care recommendations for diet, exercise, and medications, and glycemic control in adult Cherokee men and women; (b) explore the relationship between self efficacy and Cherokee self reliance; and (c) examine relationships among self efficacy and Cherokee self reliance, adherence to self care recommendations, and glycemic control as measured by A1C. The author, a lifelong citizen and resident of Cherokee Nation, descendant of a graduate of the Cherokee

Female Seminary, and a Northeastern State University nursing faculty member with decades of both nursing experience and firsthand experience living with type 2 diabetes, was particularly suited to studying this health disparity.

# CHAPTER II

# LITERATURE REVIEW

The literature review is arranged as follows. Pertinent background information about Cherokee Nation, its history, and present day health care delivery system is provided. Implications for Cherokee citizens living with type 2 diabetes, and the need for the current study, are also identified. Diabetes pathophysiology, epidemiology, complications, and standard treatment are highlighted. Self efficacy, Cherokee self reliance, adherence, ethnicity, gender and how these variables are used in this study are then explored. The gap in the current literature and the need for better understanding of self efficacy, adherence, Cherokee self reliance and glycemic control among Cherokee men and women, is demonstrated.

## Cherokee Nation

### Historical Roots

The status of the Cherokee Nation is unique in that they were not placed on a federal reservation, but given individual ownership of land by federal treaty. The Cherokee government is a tripartite system with the Principal Chief and the Cabinet being the executive branch, the Tribal Council the legislative branch, and the Cherokee Supreme Court the judicial branch. Today, nearly 80,000 Cherokee citizens live within the 14-county jurisdictional area in eastern Oklahoma that is the sovereign Cherokee

Nation (Cherokee Nation, 2011, para. 6). To be eligible for Cherokee Nation citizenship, documentation is required showing one is directly descended from an individual listed on the Dawes Roll of 1893 leading to a Certificate of Degree of Indian Blood card.

The Cherokee are traditionally a matrilineal society. Membership in one of seven clans is determined through the mother's ancestral line. The seven clans are Long Hair, Blue, Wolf, Wild Potato, Bird, Deer, and Paint. Members of the same clan are seen as "brothers and sisters;" therefore intermarriage within a clan is frowned upon. Seating at stomp dances is by clan at seven arbors around a sacred fire. The stomp dance is considered a holy event for worshiping The Creator and remains a central part of many traditional Cherokee families to this day. The importance of the matrilineal aspect of Cherokee society is evidenced by female "shell shakers," participants who dance wearing pebbles in tortoise shells tied to their ankles. Many Cherokee today worship through the Indian Baptist Church, sometimes in conjunction with more traditional ceremonies.

**Cultural Traditions**

Historically, food has been an inextricable part of Cherokee tradition as a way of expressing hospitality. The Cherokee are known to have raised corn hand celebrated a thanksgiving ceremony long before contact with white settlers (Cherokee Nation, 2011). Traditionally, six annual religious festivals were observed. The Green Corn Festival and other similar festivals were and continue to be celebrated with feasting, stickball (similar to and the precursor of lacrosse), cornstalk shooting (archery), traditional Cherokee marbles, a game played with billiard ball sized hand-made marbles, and ceremonial

tobacco. Chunkey is a traditional Cherokee wagering game involving throwing spears at a rolling stone disk.

In traditional Cherokee beliefs, the numbers four and seven, representing the four directions, and the seven clans, are considered sacred (Cherokee Nation, 2011). The owl, the cougar, cedar wood and the circle are also honored. Cherokee maternal grandmothers select Cherokee names for their granddaughters. The traditional Cherokee female garment is a floor length, long sleeved calico "tear dress" with diamond shapes appliquéd to the bodice and skirt. Cherokee men wore no feathered headdresses as did the Plains Indians, but rather turbans and English smoking jackets popularly adopted after a delegation of Cherokee traveled to Great Britain prior to the American Revolution (Cherokee Nation, 2011; Mankiller & Wallis, 1993, p. 260). Ribbon shirts are now worn by many Cherokee men at celebrations and other special occasions. Crafts for which the Cherokee are known include copper rather than silver jewelry and baskets made of cane, white oak, hickory bark or honeysuckle. Occasionally these were dyed with black walnut and blood root or other naturally-occurring substances.

After gold was discovered near Echota, Georgia in the early 1800s, President Andrew Jackson signed the Indian Removal Act of 1830. In 1838, the Cherokee began a forced migration, often at gunpoint, from their homelands. They were loaded onto boats that traveled the Tennessee, Ohio, Mississippi and Arkansas Rivers into Indian Territory. Many were held in prison camps awaiting their fate. An estimated 4,000 Cherokee men, women and children died from hunger, exposure and disease (Cherokee Nation, 2011; Hoig, 1998, p. 124). The journey became a cultural memory as the "trail where they

cried" for the Cherokee and other removed tribes. Today it is widely remembered by the general public as the "Trail of Tears" (Cherokee Nation, 2011, A Brief History of the Trail of Tears; Mankiller & Wallis, 1993, p. 95).

Upon arrival in Indian Territory, now Oklahoma, the Cherokee were themselves divided and nearly torn asunder by the "War Between the States." Cherokee fought on both sides, but serving the Confederacy, Stand Watie became the only Native American to achieve the rank of general in either the Union or Confederate armies. Watie was the last Confederate General to surrender to Union forces after the end of the war (Hoig, 1998, p. 231; Oklahoma Historical Society, 2009, para 1; Woodward, 1988, p. 289).

Education has long been important to Cherokee citizens. In 1846, the tribal government established the Cherokee Male and Female Seminaries. These boarding schools were among the earliest formal high school education west of the Mississippi, and accounted for Cherokee being more literate even than the surrounding settlers who paid to send their children to these schools for formal education in Greek, Latin, German, French, chemistry, botany, geology, astronomy, and zoology; geography, U.S. and English history, political economy, and philosophy (Oklahoma Historical Society, 2007; Mankiller & Wallis, 1993). Today, Seminary Hall is still the historic centerpiece on the campus of Northeastern State University (Northeastern State University, 2011, NSU's Heritage).

The Cherokee National Holiday commemorates the original signing of the 1839 Cherokee Constitution and has been celebrated annually since 1953. Featuring entertainment, cultural and athletic events, the Cherokee National Holiday is one of the

largest annual festivals in Oklahoma, bringing approximately 100,000 visitors to the area (Cherokee Nation, 2011; Woodward, 1988, p. 10). This annual event is a celebration of spiritual, mental and physical well-being. It is a focal point emphasizing a strong Cherokee heritage, cultural awareness and the reuniting of families. Thousands of Cherokees and visitors from across the United States and abroad make the pilgrimage to the historic Cherokee Nation capital in Tahlequah each September to renew friendships and celebrate the Cherokee spirit (Cherokee Nation, 2011).

Many Cherokee still consult with medicine people regarding problems, both mental and physical, but some will not see a medicine man or woman for any reason and refuse to acknowledge any "powers" traditionally ascribed to them. Some use both Cherokee medicine and licensed medical doctors and the health care systems. The knowledge held by the medicine men or women is very broad, covering many areas. Traditional Cherokee medicine includes blackberry, used to soothe stomach ailments and tea made from black gum bark for the relief of chest pain, or red sassafras for "hardening of the arteries" (Rogers, 1965, p. 8).

**Present Day Cherokee Nation**

Today, the Cherokee Nation is one of the largest employers in the state of Oklahoma and exercises Native American preference in hiring. Its impact on the economy of the region is far reaching. The Cherokee Nation is diversified with global business interests including aerospace, information technology, federal defense contracts, gaming, and entertainment.

Whether of Cherokee heritage or not, all Cherokee Nation employees are required to take a 40 hour Cherokee History Course and a 40 hour Cherokee Language Course. According to Dixon and Iron (2006), the outcomes of the history class include providing a deeper understanding of Cherokee history and culture, changing the way health care providers view the Cherokee people, and providing a shared experience that creates a greater sense of belonging for employees (p. 31). Approximately 80% of Cherokee Nation employees are tribal members and of those 35% are employed in tribal health services (Dixon & Iron, 2006, p. 39). With a budget of nearly $700 million, Cherokee Nation spends nearly half of that amount providing direct health care to its citizens.

**Cherokee Nation Health Services**

Cherokee Nation Health Services is an integrated health system of eight ambulatory health centers, various programs and a hospital which makes the system multi-faceted, providing strategically planned care and services. It is the largest and most comprehensive, tribally run healthcare system in the United States (Personal Communication, B. Lance, August 31, 2011). There are clinics in Muskogee, Bartlesville, Nowata, Jay, Salina, Sallisaw, Stilwell, and Tahlequah with another under construction in Vinita. There were nearly one quarter of a million patient visits in 2010, and Cherokee Nation spent $223 million on direct tribal health services.

Initiated in 2004, the Cherokee Nation Diabetes Prevention Program addresses the increased prevalence of diabetes in Cherokee communities. The Cherokee Nation Diabetes Program reports the overall prevalence of diabetes in the Cherokee Nation

health system is 10.2% of the entire patient population (Chavez, 2011, para. 4). In the Cherokee Nation health system, 24% of patients 50 to 60 years old and 31% of patients 60 to 80 years old have diabetes, according to Chadoin, the program director (personal communication, June 1, 2011).

American Diabetes Association statistics indicate that American Indians, African Americans, Hispanic/Latino Americans, and some Asian Americans and Native Hawaiians or Other Pacific Islanders are at particularly high risk for type 2 diabetes and its complications. American Indians and Alaska Natives at 16.1%, have the highest age adjusted prevalence of diabetes among all U.S. racial and ethnic groups (ADA, 2012, In My Community, para.1). The Pima Indians in Arizona have been noted to have the highest prevalence of type 2 diabetes in the world at 50% and have participated in numerous longitudinal research studies that have provided cultural perspective and information about the prevention of diabetes and its complications as well as why and how diabetes develops (Kim et al., 2008; Looker et al., 2010; NIDDK, 2006; Nelson, Pavkov, Hanson, & Knowler, 2008; Pavkov, Knowler, Hanson, & Nelson, 2008).

Modern day Native Americans live in metropolitan areas as well as reservations, and are often socioeconomically disadvantaged. Prevalence rates of diabetes among Native Americans are difficult to ascertain as those living on reservations are not part of U.S. national health surveys and are generally obtained from Indian Health Service and tribal health care facilities where care is provided to Native Americans without cost (Gohdes, n.d, para. 2). To address diabetes and other health issues among Native American, in 1955, the Indian Health Service was created as part of the Public Health

Service in attempt to honor federal treaty obligations granting health services to members of federally recognized American Indian and Alaska Native tribes (Sequist, Cullen, & Acton, 2011, p. 1965).

Type 2 diabetes is increasing among Native Americans and has reached epidemic proportions during the previous 50 years. Decreased physical activity and increased body weight have occurred as "traditional lifestyles have been abandoned in favor of westernization" (Gohdes, n. d., para 1). Less agriculture and traditional hunting among modern Native Americans have given way to a more contemporary American high fat, high carbohydrate, and high calorie diet.

### Adapt, Survive, Prosper, and Excel

Throughout history, Cherokee Nation has repeatedly overcome challenges to its very existence through a formula of discovering ways to adapt, survive, prosper, and excel. While poverty and lack of transportation are still major barriers, the goal is for the Cherokee to become a "Healthy, Happy Nation," a tribal mandate wherein no citizen need travel more than 30 minutes to access healthcare (Cherokee Nation Annual Report to the People, 2011). The mission of the Cherokee Nation Diabetes Program is to prevent and treat diabetes and its complications. The plan is to accomplish this through "ga du gi" working together to educate individuals, their families, and communities.

## Diabetes

### Diabetes Definition and Pathophysiology

**"**Diabetes is a disorder of metabolism-the way the body uses food for growth and energy" (National Institute of Diabetes and Digestive and Kidney Diseases, 2008, What

is Diabetes?). The majority of food consumed is transformed into glucose, or blood sugar, to provide fuel for the human body. Insulin is the hormone produced by the pancreas, which is necessary for glucose to move from the blood into the body's cells. In people with diabetes, the pancreas produces insufficient insulin or the cells are resistant to the insulin. The high levels of glucose in the blood then spill over into the urine to exit the body. Despite a high level of glucose, the body loses its main source of fuel.

According to the American Diabetes Association (2012), there are actually three main types of diabetes. Type 1 diabetes is caused by an autoimmune disorder in which the immune system destroys the insulin producing beta cells of the pancreas. A person with type 1 diabetes requires daily insulin injections to live. Diabetic ketoacidosis, a life threatening coma, and even death can result when a person with type 1 diabetes is without insulin. Type 1 diabetes generally occurs earlier in life. Type 2 diabetes, the focus of this study and accounting for approximately 90% of those with diabetes, is the most common form of the disease and is not an autoimmune disease. In the case of type 2 diabetes, for unknown reasons, the body slowly becomes resistant to insulin. Type 2 diabetes occurs more commonly in adulthood, but is increasingly being seen in adolescence. The result is the same build up of blood glucose and the body being deprived of a primary source of fuel. The symptoms of type 2 diabetes develop more gradually than in type 1 diabetes, and include hunger, frequent thirst, frequent urination, blurry vision, and slow healing wounds that are more prone to infection. The third major type of diabetes, gestational diabetes, develops during the later stages of pregnancy, may

disappear after delivery, and is thought to be related to the hormonal changes of pregnancy.

**Diagnostic Criteria for Diabetes Types**

The diagnosis of type 1 and type 2 diabetes is based on blood glucose levels. In 1997, the first Expert Committee on the Diagnosis and Classification of Diabetes revised the diagnostic criteria and established the finding of (a) blood glucose of $\geq$ 126 mg/dl after 8 hours of fasting, (b) a hemoglobin A1C $\geq$ 6.5%, (c) a 2 hour blood glucose of $\geq$ 200 mg/dl during an oral glucose tolerance test, or (d) a random blood glucose of $\geq$ 200 mg/dl with classic symptoms of hyperglycemia including constant hunger, extreme thirst, frequent urination, fatigue, agitation, and blurry vision (American Diabetes Association, 2010, p. S67).

Type 1 diabetes is primarily an autoimmune disease of insulin deficiency as a result of β cell destruction as the body attacks its own pancreas. Type 2 diabetes is a progressive disease that results from defects in insulin action (insulin resistance) and insulin secretion (insulin deficiency). Type 2 diabetes differs from type 1 diabetes in that it is not an autoimmune disease. Instead, in type 2 diabetes, the pancreas over time produces insufficient quantities of insulin; the body develops resistance to the insulin produced, or both (ADA, 2012, p. S11). Although there is little that can be done to prevent type 1 diabetes, lifestyle plays a major role in the prevention and management of type 2 diabetes.

**Complications**

Complications of diabetes develop so slowly that people affected are often unaware of the damage. The chronic high blood glucose levels associated with type 1 or type 2 diabetes eventually damage the endothelial cells lining the small blood vessels of the eyes, heart, kidneys, nerves, and feet (ADA, 2012; Becker, 2001; Boutati & Raptis, 2009; Franz et al, 2010; O'Gorman & Krook, 2011; Umpierre et al., 2011). It can also lead to wounds that are slow to heal and prone to infection which may ultimately result in amputation. People with diabetes are more likely to develop glaucoma, cataracts, and diabetic retinopathy and should have an annual dilated eye exam. When high blood glucose damages the kidneys, protein spills into the urine. Diabetes increases the risk of heart disease and stroke. It also causes numbness and tingling in the nerves of the hands and feet which is why individuals with diabetes should have an annual monofilament foot exam, keep their feet clean and dry, and wear proper fitting shoes (AADE, 2011). Lower-extremity amputation is itself a potent predictor of all-cause and cardiovascular disease mortality in Native Americans with diabetes and is more common in men than women (Resnick et al., 2004).

**Diabetes Epidemiology**

The International Diabetes Federation (2011) reports the global burden of diabetes stating that 366 million people currently have diabetes and by 2030 the number is projected to reach 552 million, or one in ten people. The number of people with type 2 diabetes is steadily rising in every country and it is one of the most common non-communicable diseases. Diabetes is the fourth or fifth leading cause of death in most

high-income countries, and has reached epidemic proportions in many economically developing countries. The number of studies describing the possible causes and distribution of diabetes over the last 20 years has been noteworthy and these studies indicate that low and middle-income countries carry the greatest burden of diabetes (International Diabetes Federation, 2011, Global Burden, para. 1). While diabetes led to 4.6 million deaths worldwide in 2011, many governments and public health agencies are overwhelmed by or unaware of the current magnitude and likelihood of increases in diabetes within their own national borders.

In the United States, 25.8 million children and adults (8.3% of the population) have either type 1 or type 2 diabetes. Type 2 diabetes is by far the most common form and is associated with older age, obesity, family history of diabetes, history of gestational diabetes, impaired glucose metabolism, physical inactivity, and ethnicity. In the United States, of adults aged 20 years and older, 19.6 million have type 2 diabetes (ADA, 2012, Statistics, para. 1).

With new medications to control blood pressure, reduce hyperglycemia, and protect the kidneys from the long term complications of diabetes, progress is being made in fighting the epidemic of type 2 diabetes (Nelson et al., 2008). Information technology, telemedicine, and locally tailored programs are being used creatively through the IHS and tribal programs. The life expectancy gap between American Indian and Alaska Natives and Whites has narrowed from eight years to five years (Sequist et al., 2011, p. 1965). A recent trend in type 2 diabetes is the increasing prevalence among adolescents and

younger adults under age 25. This trend threatens to reverse current progress (Nelson et al., 2008, p. S 12).

The Strong Heart Study is the "largest epidemiologic study of American Indians ever undertaken" (SHS, 2012, para. 3) and examined cardiovascular risk factors among 13 Native American groups in Arizona, North and South Dakota, and southeast Oklahoma. Diabetes was found to be the most important contributing factor to the high incidence of heart disease among Native Americans. The prevalence of diabetes was higher among these Native American groups than in the general population. The rates of diabetes were also higher among women than men in all three centers and were highest in Arizona (U.S. Dept Health and Human Services, SHS Data Book, Section 5, p. 27). A study by Lee et al. (2004) was identified addressing diabetes among Cherokee. While it included type 1 and type 2 diabetes and focused on the increasing problem of this health disparity among children and adolescents, it revealed that the prevalence of type 2 diabetes and impaired fasting glucose (IFG) increased with age, number of parents with diabetes, obesity, degree of Indian heritage, high triglyceride value, and low HDL cholesterol (p. 696). Another study (Farrell, Quiggins, Eller, Owle, Miner, & Walkingstick, 1993) specifically examined Eastern Band Cherokee and found the age-adjusted prevalence of diabetes in 1988 was 105.6/1000 people, four times the U.S. rate and that rates of diabetes were highest in the groups with the greatest degree of Indian blood.

Important qualitative findings in another study (Hamrick, 2007) showed results that suggested certain aspects of the Cherokee culture influence diabetes health

outcomes: (a) traditional Cherokee world view, (b) traditional Cherokee medicine, (c) role of family and generational concerns, (d) humor, (e) respect, and (f) trust. Core changes in lifestyle among Cherokee were also reported by participants as contributing to the cause of health issues including diabetes. "Cherokee culture engenders a sense of responsibility and obligation to future generations" was another important qualitative finding in this same study.

**Standard Diabetes Treatment**

Diabetes care is complex and requires that many issues impacting glycemic control be addressed. A large body of evidence exists that supports a range of interventions to improve diabetes outcomes (ADA, 2012, p. S11). The aim of treatment in type 2 diabetes is to maintain blood glucose at levels as nearly normal as possible through medications, diet, and exercise. Balancing nutritional intake, daily energy expenditure, and even the dose and timing of insulin or oral antidiabetic medications is paramount. Healthful food choices as part of a balanced diet, and not delaying or skipping meals aids in preventing episodes of hypoglycemia or long term damage from hyperglycemia. Exercise decreases blood glucose levels by increasing glucose use by the muscles, lowers cholesterol decreasing cardiovascular risk, and is extremely important for a person with type 2 diabetes. The specific type of exercise is not as important as making it enjoyable and participating regularly for life. Medications are often required in type 2 diabetes to decrease insulin resistance or supplement the body's insulin production.

Self monitoring of blood glucose (SMBG) through finger sticks and use of a glucometer or blood glucose measuring machine is the means used for tracking metabolic control. SMBG is often recommended four times daily; before meals and at bedtime. This type of monitoring has replaced urine testing for glucose. Diabetes management is incomplete and less than ideal without attention to each of these facets of self care.

**Diet.** Basically, individuals with diabetes and those without have the same nutritional requirements; dietary recommendations to promote health and well-being in the general public—lose weight if overweight; eat less saturated fat and cholesterol; eat more fiber and less sodium—are also appropriate for individuals with diabetes (ADA, 2012; Dudek, 2006, p. 569). Because heart disease ranks as a leading cause of death among people with diabetes, the American Diabetes Association's recommendation to prevent and treat diabetes are very similar to those for preventing heart disease. While a "diabetic diet" is a healthy diet for the general public, it is also important to note that diet is only one component of the management of type 2 diabetes, along with exercise, medication, and SMBG. Franz et al. (2010) reviewed evidence and nutrition practice guidelines for individuals with diabetes and reported support for dietary lifestyle interventions including consistency in carbohydrate intake, adjusting insulin dosage to match carbohydrate intake, substitution of sucrose-containing foods, usual protein intake, cardioprotective nutrition interventions, weight management strategies, regular physical activity, and use of SMBG (p. 1852).

**Exercise. "**People with diabetes are encouraged to do the same amount of exercise as the general population" (ADA, 20012; Anan, 2011, p. 18). The intensity and

duration of the exercise will determine the benefit, especially to cardiovascular health. Weight loss, improved psychological wellbeing, and improved blood glucose control are the goals of exercise for the person with type 2 diabetes. Umpierre et al. (2011) reviewed over 4,000 studies indicating that 150 minutes per week of structured aerobic exercise, resistance training, or a combination thereof, was associated with lower A1C. Exercise combined with lifestyle modification, education, dietary awareness, and social support can increase insulin sensitivity (O'Gorman, & Krook, 2011, p. 953). Individuals with diabetes should monitor their blood glucose levels to prevent hypoglycemic episodes related to exercise.

**Medication.** Medications common in the treatment of type 2 diabetes often include sulfonylureas to stimulate the release of insulin, thiazolidinediones to help improve insulin sensitivity, and even insulin itself. Insulin should be used in conjunction with and not as a replacement for diet and exercise aimed at maintaining glucose levels and managing type 2 diabetes. In a review of 21 studies, Lindenmeyer et al. (2006) concluded there is potential benefit of pharmacist intervention to improve medication adherence in diabetes, especially in providing patient education (p. 409). The role of both pharmacists and nurses in encouraging adherence to medication recommendation is an important one.

**Self monitoring of blood glucose.** Assuming the responsibility for regularly checking blood glucose levels, usually with a portable device called a glucometer, is one of the most important steps in managing diabetes. Testing allows one to respond to episodes of low blood sugar or hypoglycemia and adjust exercise or diet accordingly. A

normal blood glucose level is 70-110 mg/dl. It is up to the individual with diabetes to monitor the blood glucose levels at home as directed by healthcare providers in order to develop a personalized blood glucose profile. SMBG represents real time blood glucose levels and is important along with A1C results to track fasting and postprandial hyperglycemia, glycemic excursions, and hypoglycemia. SMBG provides instant information regarding food choices, physical activity, and medication on glycemic control (Boutati & Raptis, 2009, p. S205).

**Self efficacy, Cherokee Self reliance, and Adherence**

The purpose of the next portion of the literature review was to evaluate the relationship between self efficacy and adherence in diabetes self care. First, the approach to this section of the literature search is described. Second, characteristics of the studies reviewed are tabulated and discussed. Then, information about key issues in the conceptualization and measurement of self efficacy, the related notion of Cherokee self reliance and adherence to diabetes self care actions (diet, exercise, and medication) are addressed. Empirical relationships among self efficacy, Cherokee Self reliance, and adherence are described. Considerations related to ethnicity and gender are also addressed.

A strong sense of self efficacy may enhance human accomplishment, health and personal well-being. The ethnicity of research participants was tallied to determine whether adequate information is available in the scientific literature to ascertain whether ethnicity moderates the relationship between self efficacy and diet, exercise, and medication adherence. Bandura's social cognitive theory was used as a synthesizing

framework for this part of the literature review. The state of the science was identified including gaps in the literature and the need for further research regarding the possible relationship between self efficacy and adherence among adults with type 2 diabetes.

**Literature Searched**

This portion of the literature review dealt with self efficacy and adherence to recommended self care among adults with type 2 diabetes from all ethnic groups. Inclusion criteria were: (a) adults aged 18 years or older with type 2 diabetes, (b) both self efficacy and adherence were measured, (c) any setting, including urban, rural, public, or government facilities, (d) primary qualitative and quantitative studies published in English in peer reviewed journals, and (e) published since 1997. An American Diabetes Association expert panel recommended that health care providers use the fasting plasma glucose test to screen their patients for diabetes beginning in 1997, because the test is better tolerated by patients and less costly than the oral glucose tolerance test. While the rising number of adolescents with type 2 diabetes is an important trend, it was not included in the scope of this review. Studies of people with type 1 diabetes or gestational diabetes were likewise not included.

By eliminating duplicate articles from multiple databases, and those which failed to meet the scope criteria, a total of 316 articles initially emerged using the above search strategy. Commentaries and review articles were then eliminated. Relevant primary studies were identified next, based on title and abstract. Finally, articles which addressed type 1 diabetes, combined type 1 and type 2 diabetes, or didn't measure both self efficacy and adherence were removed. A total of 18 studies remained and were selected for

review. Reference lists of the 18 reviewed articles were examined for additional relevant studies. Most articles selected cited theoretical support from Bandura's (1997) social cognitive theory. Two articles (Hill-Briggs, Gary, Bone, Hill, Levine, & Brancati, 2005; Skaff, Mullin, Fisher, & Chesla, 2003) specified ethnic groups in their titles, and two (Nagelkerk, Reick, & Meengs, 2006; Savoca & Miller, 2001) were qualitative studies.

**Literature Description**

Findings reported in Table 1 summarize sample characteristics such as location, size, gender, mean age, and ethnicity. Three of the studies were conducted outside of the United States. The largest sample size was 717. Seven of the studies reported a gender distribution of less than 50% female, or did not report gender. Only two of the studies reported a sample with a mean age of less than 50 years. Only 4% of the samples across all 18 studies were Native American. These last factors are particularly significant as type 2 diabetes is more common among women, is increasingly being diagnosed at a younger age, and is notably most prevalent among Native Americans.

Table 2 documents the area of adherence on which each study focused. Fourteen studies addressed diet, 13 addressed exercise, six addressed medication adherence, and one addressed adherence to foot care. Only four studies combined diet, exercise, and medication adherence, and two of those were the qualitative studies.

A comparison of the studies grouped by research design and indicating method of measurement of self efficacy; method of measurement of adherence, and the outcome of reported relationship of self efficacy and adherence is provided in Table 3. Noteworthy

is that the majority of the studies are cross-sectional and correlational. Self report was heavily relied on for measurement of adherence.

Table 1
*Description of Studies: Self efficacy and Adherence*

| Study | Location | *N* | % Female | Age Range | Ethnic Group (% in Sample) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | AIAN/FN | White | Black | Hispanic | Asian | Unspecified | N/A |
| Aljasem, 2001 | U.S. | 309 | 60.7 | 50-59 | | 50.4 | 49.3 | | | | |
| Clark, 2004 | U.K. | 100 | 42 | 40-70 | | | | | | | 100 |
| Gleeson-Kreig, 2006 | U.S. | 55 | 51 | 40-65 | | 100 | | | | | |
| Heisler, 2003 | U.S. | 127 | 19 | 64 | | 88 | | | | 12 | |
| Hill-Briggs, 2005 | U.S. | 181 | 75.7 | 35-77 | | | 100 | | | | |
| Maddigan, 2005 | Can | 372 | 58.4 | 62.27(12.53) | 25.3 | 74.7 | | | | | |
| Miller, 2006 | U.S. | 108 | 42.6 | 21-75 | | 92.3 | | | | 7.7 | |
| Nagelkerk, 2006 | U.S. | 24 | 50 | 26-78 | | 100 | | | | | |
| Neder, 2003 | U.S. | 40 | N/A | $\geq$21 | | | | | | | 100 |
| Nelson, 2007 | U.S. | 717 | 4 | 55-64 | | | | | | | 100 |
| Sacco, 2005 | U.S. | 56 | 55 | 18-65 | | 82 | 7 | 9 | 2 | | |
| Sacco, 2007 | U.S. | 99 | 54 | 18-65 | | 78 | 13 | 8 | 1 | | |
| Sarkar, 2006 | U.S. | 408 | N/A | 58.1(11.4) | 2 | 15 | 25 | 40 | 18 | | |
| Savoca, 2001 | U.S. | 45 | 58 | 40-65 | 1 | 60 | 36 | 1 | | | |
| Skaff, 2003 | U.S. | 189 | N/A | 25-62 | | 39 | | 61 | | | |
| Sturt, 2006 | U.K. | 8 | 50 | $\geq$65 | | | | | | | 100 |
| Vickers, 2006 | U.S. | 207 | 51.7 | 63(12) | 1 | 95 | 1 | 1 | 1 | 1 | |
| Whittemore, 2005 | U.S. | 53 | 100 | 30-70 | | 89 | | 11 | | | |

*Note*. First Nation status = AIAN= American Indian, Alaska Native or Canadian First Nation status.

Table 2
*Areas of Adherence*

| Study | Adherence | | |
|---|---|---|---|
| | Diet | Exercise | Medication |
| Aljasem (2001) | x | x | x |
| Clark (2004) | x | x | |
| Gleeson-Kreig (2006) | | x | |
| Heisler (2003) | x | x | x |
| Hill-Briggs (2005) | | | x |
| Maddigan (2005) | x | x | |
| Miller (2006) | x | | |
| Nagelkerk (2006) | x | | x |
| Neder (2003) | | | |
| Nelson (2007) | x | x | |
| Sacco (2005) | x | x | |
| Sacco (2007) | x | x | |
| Sarkar (2006) | x | x | x |
| Savoca (2001) | x | | |
| Skaff (2003) | x | x | |
| Sturt (2006) | x | x | x |

*Note*. Neder (2003) focused on adherence to foot care practices.

Table 3
*Design, Measurement Tools, Outcome: Self efficacy and Adherence*

| Study | Design | Measurement of SE | Measurement of Adherence | Outcome: SE and Adherence |
|---|---|---|---|---|
| Nagelkerk, 2006 | Focus groups | Focus group collaborative relationship with healthcare provider, positive attitude prompts proactive learning, social support, group education | Focus group-maintaining routine medication administration times and routines. Maintaining adequate resources for self-management | Data highlight the importance of barrier and strategy identification in developing and implementing realistic self-management plans and a collaborative alliance between patients and practitioners. |
| Savoca, 2001 | Semistructured, in-depth interviews | Interviews about emotional reaction to the diabetes diagnosis belief about relationship among diabetes, food, and social support | Interviews-meal planning, healthy ways of eating for life—not a diet | Dietary SE, social support, and time management were identified as mediating variables that can influence dietary behaviors |
| Nelson, 2007 | Descriptive, cross sectional mailed survey | Perceived Competence in Diabetes Scale | Diet, exercise, nutrition, and smoking cessation<br>Summary of Diabetes Self care Activities Questionnaire (SDSCA), Physical Activity Scale for the Elderly (PASE), Diet Habits Questionnaire (DHQ) | Individuals with higher SE scores or who reported provider advice were more likely to be adherent to medication, walk for exercise, follow a diabetic meal plan, and eat a low fat diet |
| Heisler, 2003 | Descriptive cross sectional mailed survey | Validated scale as part of three survey instruments | Self care activities in the prior seven day on Summary of Diabetes Self Care Activities | Patients sharing their provider's top treatment strategy had higher SE and rated diabetes self-management more positively than those who agreed on fewer goals |
| Aljasem, 2001 | Correlational, cross sectional | Modified version of Gossman Self Efficacy for Diabetes Scale | Author developed health belief instrument self report questionnaire | Correlation between perceived barriers and diet, exercise, medication, and SMBG |
| Hill-Briggs, 2005 | Correlational, cross sectional oral surveys from a larger randomized controlled trial | Center for Epidemiologic Studies Depression CES-D<br>Diabetes Health Belief Scale | Medication Adherence Scale (MAS), A1C, blood pressure and cholesterol levels | Medication adherence is a diabetes regimen behavior that tends to be more easily followed as compared with regimen behaviors that require a lifestyle change. |
| Miller, 2006 | Correlational, cross sectional mailed survey | Researcher developed tool designed to measure confidence in using the GI to make healthy food choices | Outcome expectation questionnaire on barriers to dietary change, glycaemic control and family support | The two instruments adequately assessed outcome expectations and SE for adopting a lower GL diet |
| Sacco, 2005 | Correlational, cross sectional | Multidimensional Diabetes Questionnaire, SE subscale | Summary of Diabetes Self care Activities Questionnaire (SCSCA) | Adherence, BMI, and SE were correlated with each other and with depression |

(continued)

| Study | Design | Measurement of SE | Measurement of Adherence | Outcome: SE and Adherence |
|---|---|---|---|---|
| Sacco, 2007 | Correlational, cross-sectional | Multidimensional Diabetes Questionnaire, Self efficacy subscale | Summary of Diabetes Self care Activities Questionnaire (SDSCA) | Both causal directions are supported. Higher BMI and adherence are mediated by lower SE perceptions. The effect of higher BMI on depression is mediated by increased diabetes symptoms |
| Sarkar, 2006 | Correlational, cross sectional oral questionnaire | Diabetes Self efficacy Scale | Summary of Diabetes Self care Activities Questionnaire (SDSCA) | Found association between increasing SE and self-management in regard to diet, exercise, SMBG, and foot care but not with medication adherence |
| Skaff, 2003 | Correlational, cross sectional | Diabetes Self efficacy scale | 3 day food record and modified Paffenbarger Physical Activity Questionnaire, 3 day food record, A1C | SE was related to management behaviors among Caucasians but not among Hispanics |
| Vickers, 2006 | Correlational, cross sectional using mailed survey | Center for Epidemiologic Studies Depression CES-D 5 item self report measures of SE specific to physical activity | Community Healthy Activities Model Program for Seniors (CHAMPS), Self report measure of goal setting, relapse prevention, and maintenance of behavior change | Higher depressive scores associated with lower exercise frequency, less use of relapse prevention behavior, and lower exercise SE |
| Whittemore, 2005 | Correlational, cross sectional | Problem Areas in Diabetes Survey (PAID), The Diabetes subscale Questionnaire (TDQ), Diabetes Self Management Assessment Tool (DSMART) subscale<br>Social Functioning Scale (SF 36) | Summary of Diabetes Self care Activities Questionnaire (SDSCA)<br>Modified Paffenbarger Physical Activity Questionnaire | Additional evidence regarding the relationship of perceived self confidence and social support to the outcomes of metabolic control, self-management and psychosocial adjustment in women with type 2 diabetes |
| Maddigan, 2005 | Model tested using structural equation modeling | Diabetes Lifestyle Form (DLF) with a modified self efficacy subscale | Diet and Exercise only<br>Summary of Diabetes Self Care Activities (SDSCA) | Positive relationship between exercise adherence and Health Related Quality of Life (HRQL) |
| Gleeson-Kreig, 2006 | Intervention study daily activity record | Self efficacy for Exercise Scale (SEE) | Physical Activity Index (HPAI) | Significant difference with intervention group showing greater SE than control group |
| Neder, 2003 | Individualized education intervention study | Questionnaire to determine confidence in performing seven different self care aspects of foot care | Self reported foot care practices | Individualized education led to improved foot care knowledge, self care practices and confidence performing foot self care |

(continued)

| Study | Design | Measurement of SE | Measurement of Adherence | Outcome: SE and Adherence |
|---|---|---|---|---|
| Sturt, 2006 | Phase 1 clinical trial, longitudinal (3 months) | Diabetes Management Self efficacy Scale , Diabetes psychosocial self efficacy measured by the Diabetes Empowerment Scale | Measured HgA1C only | Modest increase in diabetes SE warrants research progressing to randomized control trial. Anecdotal qualitative data show increasing patient confidence and goal attainment |
| Clark, 2004 | Randomized controlled trial, longitudinal (1 year) | Barriers to Healthy Eating (BHE) and Barriers to Physical Activity (BPE) | Food Habits Questionnaire (FHQ) Physical Activity Scale for the Elderly (PASE) and HbA1C | No significant results for SE possibly explained by baseline high SE scores |

*Note*. SE = self efficacy, A1C = hemoglobin A1C (glycosolated hemoglobin) as measure of 3 month average blood glucose, GI= glycemic index, GL = glycemic load, BMI = body mass index, SMBG = self monitoring of blood glucose. The Sturt study examined HgA1C as a measure of self efficacy rather than adherence

.

## Self efficacy

**Striving for control.** Among numerous chronic health conditions requiring self efficacy for self care, diabetes is an extremely complex one. The concept of self efficacy is based on Bandura's (1997) social cognitive theory. This theory starts with the premise that human beings desire to control events impacting their lives. "The striving for control over life circumstances permeates almost everything people do throughout the life course because it provides immeasurable personal and social benefits" (Bandura, 1997, p. 1). Social cognitive theory proposes people desire predictability and seek this through improving their life not only through individual efforts, but through the assistance of others. The goal may be to control motivation, thoughts, mood, behaviors, or it may involve changing the surrounding situation.

Social cognitive theory describes interactions between behavioral, personal, and environmental factors impacting human behavior in relation to health and chronic disease. Self efficacy is the psychosocial belief or confidence possessed in the ability to act (engage in a specific behavior) in a variety of situations (Bandura, 1997). Bandura even indicates that a strong sense of self efficacy is associated with good self-management of diabetes regimens, adherence to glucose testing, dieting, and exercise; it can also predict level of glycemic control (pp. 258, 420). Bandura's social cognitive theory suggests that people learn from one another, through observation, and imitation. People also learn through observing others' behavior, attitudes, and results of those behaviors. Social learning theory explains human behavior in terms of continuous reciprocal interaction between cognitive, behavioral, and environmental influences.

**Overcoming barriers.** Multiple authors defined self efficacy as the ability to overcome barriers to adherence (Aljasem, Peyrot, Wissow, & Ruben, 2001; Clark, Hampson, Avery, & Simpson, 2004; Nagelkerk et al., 2006) and the presence of clear communication between persons with type 2 diabetes and their providers regarding self-management goals (Heisler et al., 2003; Maddigan, Majumdar & Johnson, 2005). Group education and social support were additionally discussed as important interventions to promote self efficacy (Nagelkerk et al., 2006; Savoca & Miller, 2001). The relationship of depression and diabetes is rarely addressed, particularly in studies including Native Americans and other minorities (Singh et al., 2004). Affect or mood is part of the theory network surrounding self efficacy since in a small cross sectional sample; authors concluded that self efficacy mediated the relationship between depression and adherence (Hill-Briggs et al., 2005; Sacco et al., 2005). The individual is the one who controls their behavior, but the social and cultural environment around them is also a major contributor to the causes of the ethnic disparity in type 2 diabetes (Carnethon, 2008). Self efficacy is a belief or perception of capability, but it is necessary to consistently specify the area of perceived capability if conclusions across studies are to be drawn.

**Confidence in diabetes self-management tasks.** Self efficacy was conceptually defined as a sense of self confidence in the ability to perform specific diabetes self-management tasks, which is consistent with Bandura's (1997) social cognitive theory (Aljasem, Peyrot, Wissow, & Rubin, 2001; Nelson, McFarland, & Reiber, 2007). Self efficacy was also defined as increased confidence influencing the choice to perform more challenging tasks (Clark, et al., 2004). It was also identified as confidence in one's own

ability to perform a designated task or attain a desired goal (Van der Ven et al., 2003). Several authors conceptually defined self efficacy in relation to a specific diabetes self-management task such as self efficacy for exercise (Gleeson-Kreig, 2006; Vickers, Nies, Patten, Dierkhising, & Smith, 2006), dietary self efficacy, (Miller, Gutschall, & Lawrence, 2006; Nelson et al., 2007) and even foot care self efficacy (Neder & Nadash, 2003).

**Measurement of self efficacy.** The most common tool for operationally measuring self efficacy for diabetes self care was the Multidimensional Diabetes Questionnaire (MDQ) with a four item self efficacy subscale (Sacco et al., 2005; Sacco et al., 2007; Sarkar et al., 2006). Two studies (Hill-Briggs et al., 2005; Vickers et al., 2006) used a depression tool in combination with self efficacy measures. A variety of behavior specific measures of self efficacy such as the Barriers to Healthy Eating (BHE), Barriers to Physical Activity (BPA), and the Self efficacy for Exercise Scale (SEE) were utilized by other authors (Clark et al., 2004; Gleeson-Kreig, 2006). The number of items measuring self efficacy was not reported for all tools. Table 4 provides the number of self efficacy items, ranging from 4 to 66, documented in each study. Reliability being similar between two scales, the shorter scale places less demand on respondents.

Four studies (Heisler et al., 2003; Maddigan et al., 2005; Nelson et al., 2007, Saaco et al., 2005) based the measurement of self efficacy on five items or less and this +may be inadequate for such a complex construct. One study (Vickers et al., 2006) measured self efficacy with as many as 66 items. This study was of an older adult population who may not have tolerated this many items well. Studies often did not report

Table 4
*Number of Self efficacy Items, Number of Adherence Items, and Reliability in 16 Quantitative Studies*

| Study | Number of SE Items | Reliability of SE | Number of Adherence Items | Reliability of Adherence |
|---|---|---|---|---|
| Aljasem (2001) | 25 | .91 | 11 items diet, exercise, medication SMBG | .66 |
| Clark (2004) | 37 | .64-.85 | 2 items, BMI, A1C | |
| Gleeson-Kreig (2006) | 9 | .92 | 30 items exercise | .76 |
| Heisler (2003) | 4 | .88 | Not reported diet, exercise, SBGM, foot care, smoking | .64-.96 |
| Hill-Briggs (2005) | 20 | .61 | 4 medication adherence items and A1C, BP, Cholesterol | |
| Maddigan (2005) | 5 | .82 | 7 DE | |
| Miller (2006) | 20 | Content validity experts .85 | 18 Items diet, SMBG | .85 |
| Neder (2003) | | | Not reported | |
| Nelson (2003) | 4 | | 21+ items diet, exercise, mediation, SMBG and BMI | |
| Saaco (2005) | 4 | .89 | 8 items, diet, exercise, medication, SMBG, and Paffenbarger | |
| Saaco (2007) | 23+ | .88-.91 | 8 items Diet, Exercise, and BMI, | .82 |
| Sarkar (2006) | 8 | .78 | Not reported | |
| Skaff (2003) | 11 | .59-.75 | Diet, Exercise, Medication, SMBG, Paffenbarger, A1C, and 3 day food record | |
| Sturt (2006) | 20 | | A1C | |
| Vickers (2006) | 66 | | 41 items exercise | .52-.95 |
| Whittemore (2005) | 38+ | .94 | 5 item, diet, exercise, BMI, A1C | .80 |

*Note.* SE = self efficacy, A1C = hemoglobin A1C (glycosolated hemoglobin) as measure of 3 month average blood glucose, BMI, = body mass index, SMBG = self monitoring of blood glucose.

validity of the tool when utilized with minority, rural or low health literacy populations. Most studies were correlational and cross sectional in design, so building toward more robust designs would be desirable.

**Specificity in defining self efficacy.** The literature indicated that a more refined conceptual definition of self efficacy is desirable. Self efficacy is a belief or perception of capability, but it is necessary to consistently specify the area of perceived capability if conclusions across studies are to be drawn. It is also important to examine how self reliance differs across the lifespan from young adulthood to older adulthood, among ethnic minorities, in rural settings, and among those with limited health literacy. No tool for measuring self efficacy specifically among Native Americans was identified. Self efficacy among Cherokee adults with type 2 diabetes was measured specifically with items related to diet, exercise, medication, and confidence that diabetes could be managed without interfering with what participants wished to accomplish in life.

**Cherokee Self reliance**

Self efficacy is defined in a general way, with a presumed universality relevant across cultures. The purpose of this subsection of the literature review is to introduce a conceptually related construct, self reliance, as derived from traditional Cherokee values about being responsible, disciplined, and confident. Self reliance is defined in a culturally specific way by the Cherokee Nation. "Self reliance is a concept within the Cherokee holistic world view where all things are believed to come together to form a whole" (Mankiller, 1991, p. 5). Self reliance is an integral part of the Cherokee way of

life and is included in the mission statement of the Cherokee Nation: "The mission of the government of the Cherokee Nation is to promote and sustain the self reliance of its members" (Resolution No. 28-85, 1976).

**Conceptualization.** Lowe (2002) further identified a cultural description of self reliance emerging from his research regarding prevention of substance abuse among Cherokee adolescents. In Figure 1, he defined Cherokee self reliance as being responsible, being disciplined, and being confident (p. 290). The connection of these categories demonstrates the holistic Cherokee world view. A lack of self reliance following historical trauma such as the Trail of Tears has been cited by Cherokee tribal leaders and members as a major negative influence on health and wellness, especially in the high incidence of substance abuse, diabetes, cardiovascular disease, accident and suicide fatalities, unemployment, poverty, and low education levels (Lowe, 2002, p. 287; 2005; 2006).

**Measurement.** In Lowe's (2003, 2009) studies, Cherokee self reliance was measured using the Cherokee Self Reliance Questionnaire which is a 24 item, 5 point Likert scale. Cherokee Self reliance was related to being respectful of others, representing family well, participating in traditional ceremonies, and believing in Cherokee ways. The self efficacy literature did not recommended using any culture specific measures to complement the measurement of self efficacy. Among Cherokee, information about self reliance may contribute to better understanding of how strengths of this culture might best be utilized for managing type 2 diabetes.

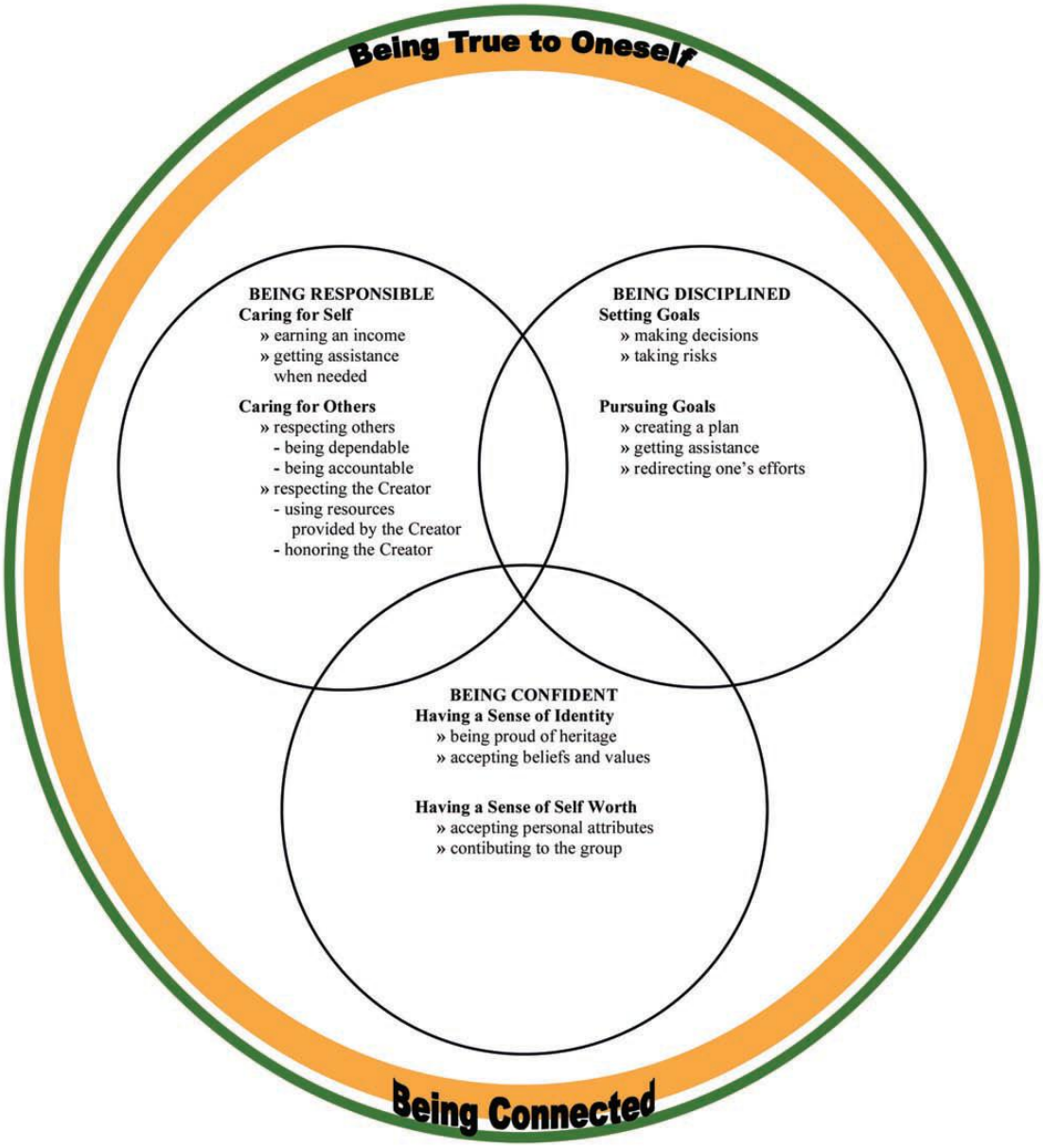


*Figure 1*. The model of Cherokee Self Reliance is a circle indicating the holistic world view of Cherokee culture. The outside circle is green, which symbolizes an oak wreath. The orange inner circle symbolizes the sacred eternal fire. The live oak, the traditional principal hardwood timber of Cherokee people, was used to kindle the sacred fire. In connection with this fire, the oak was a symbol of strength and everlasting life. These colors are used in the seal of the Cherokee Nation. The three interlocking circles in the center of the model depict the interrelatedness, intertwining, and interlacing of all of the categories and subcategories of the cultural domain of Cherokee Self Reliance. **Source:** Lowe, 2002.

## Adherence

To adhere is to stick fast. In the case of type 2 diabetes, it means to consistently follow recommendations in the areas of diet, exercise, and medication. Adherence is individualized, behavior specific and can be described as self efficacy translated into psychomotor action to maintain health (Bandura, 1997). Individuals with diabetes vary in their adherence to the dietary, exercise, and medication aspects of their recommended self care regimen (Atak et al., 2008; Clark et al., 2004; Whittemore, Melkus, & Grey, 2005).

**Behavior specific.** Adherence is defined in relation to behavior specific diabetes self care and self-management activities. Three studies defined adherence specific to diet (Clark et al., 2004; Maddigan et al., 2005; Miller et al., 2006). Multiple studies conceptualize adherence related to exercise (Clark et al., 2004; Gleeson-Kreig, 2006; Maddigan et al., 2005). Three studies (Clark et al., 2004; Hill-Briggs et al., 2005; Whittemore et al., 2005) measured adherence in one, two, or multiple areas of diabetes self-management using a variety of tools. An integrative literature review of 26 studies (Utz, 2008) described barriers of adherence to self care including cultural beliefs, costs, transportation, access to care in areas other than urban, complications by age and minority status, and incidence of diabetes being higher in rural areas. Hayes, McCahon, Panahi, Hamre, & Pohlman (2008) discussed interventions such as lifestyle change and coaching to promote self care.

Table 4 documents research design, and the number of adherence items in the reviewed studies, where reported, which ranged from 3-41. Three studies (Clark et al.,

2004; Hill-Briggs et al., 2005; & Whittemore et al., 2005) reported using five or fewer items to measure adherence. These studies indicated that adherence was measured in one, two, or multiple areas of diabetes self-management using a variety of tools.

**Self report.** Many studies used self report as the operational measure of adherence and appropriately cited this as a limitation of their work. Table 3 displays how diet, exercise, and medication adherence were measured by self report in multiple studies, A1C was said to be utilized to measure adherence in two studies, (Hill-Briggs et al., 2005; Sturt, Whitlock, & Hearnshaw, 2006) but A1C is more appropriately utilized as a measure of glycemic control. The Summary of Diabetes Self Care Activities (SDSCA) was the measurement tool of choice in multiple studies (Maddigan et al., 2005; Nelson et al., 2007; Sacco et al., 2005; Sacco et al., 2007; Whittemore et al., 2005). The SDSCA was first used by Toobert, Hampson, and Glasgow (2000).

Adherence is a complex construct to operationally define. It is very behavior specific. While the tools utilized to measure it were cited as having a sufficient degree of reliability, researcher identified validity was seldom reported. Future studies should still exercise caution in determining for which diabetes self-management activities they wish to measure adherence. Ethnic variations in conceptually and operationally defining adherence should also be considered. Minorities and those with limited health literacy may have culturally influenced definitions of adherence.

**Ethnicity**

In 18 additional studies of the relationships among self efficacy and adherence (Mashburn, 2008), ethnicity of the samples was not reported at all in four studies of self

efficacy and adherence among those with type 2 diabetes (Clark et al., 2004; Neder & Nadash, 2003; Nelson et al., 2007; Sturt, Whitlock, & Hearnshaw, 2006). Only three studies included 49% or greater of any minority in the samples (Aljasem et al., 2001; Hill-Briggs et al., 2005; Skaff et al., 2003). Only three reported Native Americans among their sample (Sacco et al., 2005; Sarkar et al., 2006; Savoca & Miller, 2001). Only 4% of the samples across 18 studies were Native American, and none specified tribal affiliation. Only one study (Sarkar et al., 2006) discussed rural populations. Two studies (Heisler et al., 2003; Nelson et al., 2007) included samples of veterans which would be a unique population of any ethnicity; Cherokee who are veterans have the option of receiving care through the Cherokee Nation or the Veterans Administration.

**Gender**

Societal and cultural differences have been associated with the way men and women experience type 2 diabetes. Grant et al. (2009) found that men and women face different challenges in diabetes management (p. 1). Work and family roles impacting diet and exercise were cited as examples.

In areas as specific as foot care, gender differences were also noted as "A higher degree of self efficacy was demonstrated in women, who tried to adapt to the situation and were more prone to use preventive measures and active self care, in contrast to men who expressed fears for the future, a passive attitude and mobilized their social networks to obtain additional care" (Hjelm, Nyberg, & Appleqvist, 2002, p. 683). Three studies (Ponzo et al., 2006; Wong, Gucciardi, Li, & Grace, 2005; Nilsson, Theobald, Journath, & Fritz, 2004) presented findings among the general population indicating that women were

more likely than men to have poorer diabetes self-management related to perceived differences in levels of depression, family or spousal support, illness severity, responsibility for grocery shopping, meal preparation, household activities, resulting in gender differences in A1C, cholesterol level, and blood pressure control. Table 3 highlights the need for collaboration between patients and healthcare providers to personalize a diabetes management plan that addresses lifestyle changes in diet, exercise, and medication. The importance of social support is also emphasized in this literature.

**Relationship between Self efficacy and Adherence**

A review of the concept analysis of self care and associated concepts including self-management, self monitoring, symptom management, and self efficacy for self care concluded that a better "understanding of the overlap, differences, and relationships among these concepts can provide clarity, direction and specificity to nurse researcher, policy makers, and clinicians in addressing their goals for health delivery" (Richard & Shea, 2011, p. 255). The majority of the studies identified addressing both self efficacy and adherence were cross sectional and two (Nagelkerk et al., 2006; Savoca & Miller, 2001) were qualitative as shown in Table 3. The need for social support, the importance of overcoming barriers, and examining self efficacy's multifaceted impact on adherence in areas of diet, exercise, medication, and self monitoring of blood glucose were all emphasized. Self efficacy and adherence are both complex constructs and behavior specific. One might easily encounter individuals with type 2 diabetes who have a sense of exercise self efficacy today but do not adhere to diet, then tomorrow adhere to diet but

forget their medications. Individuals may be adherent to oral medication recommendations, but resist subcutaneous insulin administration.

Only two studies (Clark et al., 2004; Sturt et al., 2006) were author identified as longitudinal. More longitudinal studies are desirable to further evaluate the impact of self efficacy on adherence prospectively to specific diet, exercise and medication regimens recommended for self care among adults with type 2 diabetes. The reviewed studies supported a reciprocal relationship indicating self efficacy leads to adherence, but additional research is needed to adequately determine whether adherence also fosters continued self efficacy. Limitations of research designs prevented the entangling of directionality of effect (self efficacy and adherence). It could be self efficacy leads to adherence, adherence leads to self efficacy, or there could be a reciprocal relationship. It is important to note that there were no additional identified studies connecting Cherokee self reliance and adherence.

**Literature Review Summary**

This review of the literature prepares the foundation for this research study on self efficacy, self reliance, adherence to self care, and glycemic control among Cherokee with type 2 diabetes. The identified gap in the literature is that relatively little is currently known about type 2 diabetes specifically among Cherokee adults and how it is impacted by self efficacy, Cherokee self reliance, and adherence to recommended self care, it is only through improved understanding of these variables and improved diabetes management on a daily basis that devastating diabetes complications can be delayed or decreased.

In light of the increasing incidence and prevalence of type 2 diabetes, and the growing burden of disease among Cherokee that is now well documented, this literature review emphasizes the need for further research on self efficacy and adherence to recommended self care. "Nurses use self reflection and transcultural care knowledge to function effectively and meaningfully with individuals or groups of diverse cultures" (Leininger, 2000, p. 312). The pathophysiology of Type 2 diabetes is complex and its management likewise multifaceted. The literature review also supports the threefold purpose of this study which is to (a) describe self efficacy, Cherokee self reliance, adherence to self care recommendations for diet, exercise, and medications, and glycemic control in adult Cherokee men and women; (b) explore the relationship between self efficacy and Cherokee self reliance; and (c) examine relationships among self efficacy and Cherokee self reliance, adherence to self care recommendations, and glycemic control as measured by A1C.

# CHAPTER III

# METHOD

Chapter III presents the research methodology used in this study. The research design, setting, population, sample, and sampling plan are outlined. Details of the procedure for data collection, as well as operational definitions of the variables and their measurement, are provided. Issues in the protection of human subjects and data analysis are also discussed.

## Design

A non-experimental, descriptive, cross-sectional, correlational design surveying a convenience sample was used for this study.

## Setting

The setting for this study was three Cherokee Nation diabetes clinics in northeastern Oklahoma. Cherokee Nation jurisdictional area includes eight entire counties and portions of six others in northeastern Oklahoma. Tahlequah is the capitol of Cherokee Nation and according to the U.S. Census Bureau had a population of 16,623. Figure 2 is a map indicating the geographic location of the three diabetes clinics.

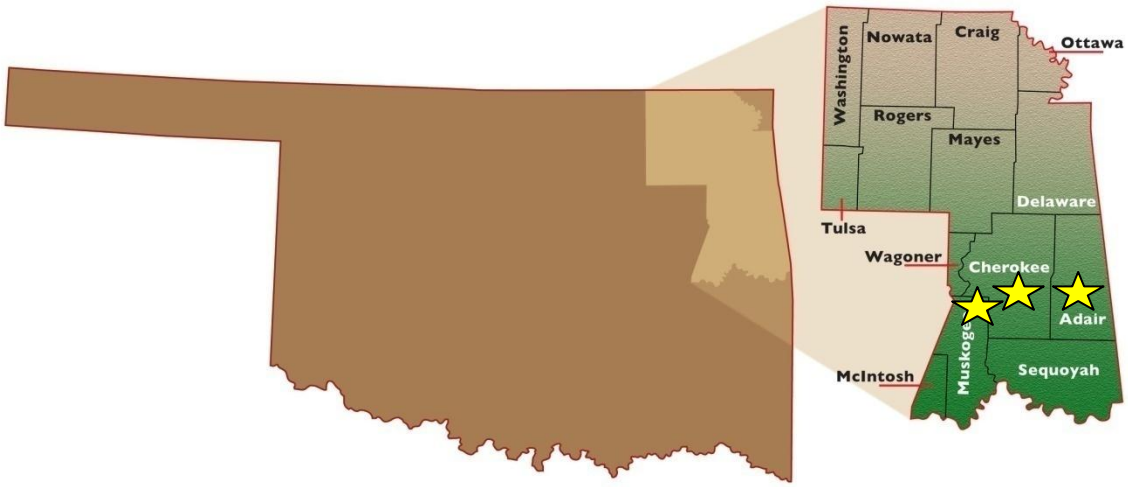


*Figure 2*. Map of Cherokee Nation with yellow stars indicating geographic location of three clinic sites utilized for data collection.

**Population, Sample, and Sampling Plan**

The population of interest was adult Cherokee with type 2 diabetes. According to the Cherokee Nation (2011), there were approximately 254,000 Native Americans receiving health care through Cherokee Nation. The majority of those receiving care at Cherokee Nation health clinics are Cherokee, but members of any federally recognized Native American tribe who have a CDIB card also qualify for the same services. The accessible population for this study was about 8,700 Cherokee with type 2 diabetes in all 14 counties served by Cherokee Nation.

A convenience sample was used. The majority of potential participants were living within 50 miles of the Cherokee Nation clinic where they received care, and were accustomed to coming to the clinic for diabetes care. Participants included those who self identified as Cherokee adults age 18 and older, diagnosed with type 2 diabetes for more than one year, and receiving care at one of 3 Cherokee Nation clinics in northeastern Oklahoma. Anyone not meeting the inclusion criteria or not able to understand English sufficiently to complete the surveys without an interpreter was excluded.

**Procedure**

Recruitment of subjects was completed with the assistance of clinic staff. Staff at the participating clinics reviewed lists of patients scheduled for visits and identified those who met inclusion criteria. Clinic staff initially approached participants at clinic visits while obtaining weight and vital signs and escorting them to the examination room. If eligible and willing, participants were then introduced to the principal investigator (PI). Informed consent and permission to access the medical record for the A1C values were then obtained.

The survey packet began with a 12 item Background Information Sheet (see Appendix A). Data on this demographic tool included age, gender, educational level, marital status, and length of time since type 2 diabetes diagnosis. The Diabetes Self Efficacy Scale (DSES) (Stanford Patient Education Research Center, n.d.) is an eight item survey addressing diet, exercise, and management of blood glucose. The Cherokee Self Reliance Questionnaire (CSRQ) is a 24 item survey of Cherokee beliefs. The Summary of Diabetes Self care Activities (SDCA) is a 26 item survey addressing adherence in the areas of diet, exercise, medications, self blood glucose monitoring, foot care, and smoking. The surveys used Likert-type scales. More detail is provided in the variables and measurement section.

Most participants read the questions and were able to complete the 70 items in 15 minutes or less while waiting in the examination room to see the primary care provider or dietician during a regularly scheduled diabetes clinic appointment. When requested, surveys were read to participants with the assistance of family or the principal investigator. The procedure was designed to minimize any interference with the flow of normal clinic activities.

**Variables and Measurement**

**Self efficacy.** Self efficacy was defined as a sense of competence and self confidence in the ability to perform specific diabetes self-management tasks, which was consistent with Bandura's (1997) social cognitive theory (Aljasem, Peyrot, Wissow, & Rubin, 2001; Nelson, McFarland, & Reiber, 2007). Self efficacy was further defined as increased confidence influencing the choice to perform more challenging tasks (Clark,

Hampson, Avery, & Simpson, 2004). Self efficacy in diabetes self care is domain-specific in relation to diabetes self-management tasks including self efficacy for exercise (Gleeson-Kreig, 2006; Vickers et al., 2006), dietary self efficacy, (Miller et al., 2006; Nelson et al., 2007) and foot care self efficacy (Neder & Nadash, 2003).

Self efficacy was measured using The Diabetes Self Efficacy Scale. It contained 8 items on a 10 point Likert scale (See Appendix B for Diabetes Self Efficacy Scale). The score for each item was the number circled. If two consecutive numbers were circled, the lower number (less self efficacy) was coded. If the numbers were not consecutive, the item was not scored. The score for the scale was the mean of the six items. If more than two items were missing, the scale was not scored. Higher numbers indicated higher self efficacy. Items assessed the participant's perceived self confidence in their ability to manage their type 2 diabetes by following diet and exercise self care recommendations. Specific items asked if the participant was confident they could follow their diet when sharing meals with people who did not have diabetes, exercise 15 to 30 minutes 4 times per week, and if they knew what to do when their blood sugar was too high or too low.

**Cherokee self reliance.** Cherokee self reliance was defined as a combination of three categories which were being responsible, being disciplined, and being confident. These three categories formed a whole reflecting the holistic Cherokee worldview. Encompassing the three categories were the cultural themes of being true to oneself and being connected. "When one is being self reliant, that is, being responsible, being

disciplined, and being confident, balance is occurring and harmony will result" (Lowe, 2002, p. 291).

The Cherokee Self Reliance Questionnaire is a 24-item scale with 5 point Likert type response options for examining the presence of Cherokee self reliance (See Appendix C for Cherokee Self Reliance Questionnaire). "This instrument had a test-retest reliability coefficient alpha of .84. Cherokee self reliance (Lowe, 2002, 2003) related to the Cherokee life-way and was a composite of three major components of cultural beliefs and values". Content-related validity for the concept of Cherokee self reliance was confirmed in discussions with members of the National Alaska Native American Indian Nurses Association (J. Lowe & B. Patchell, personal communication, August 7, 2009). Item content ascertained the degree to which the participant speaks Cherokee, believes in Cherokee ways, and is proud of their Cherokee heritage.

**Adherence.** Adherence was the concept of following recommended self care, because that term implied that patients were intelligent, independent, autonomous individuals capable of taking an active role in maintaining their own health (Lutfey & Wishner, 1999, p. 635). Adherence goes beyond passive compliance. Because adherence in individuals with type 2 diabetes self care can vary across domains related to diet, exercise, and medication, it was important to include all areas.

Adherence can also vary from day to day or across the lifespan. One could adhere to a 1200 calorie ADA diet and take oral medication and insulin as prescribed today, or this week while not exercising. The next week or the next year, one might be faithful to exercise 30 minutes per day a minimum of 5 days per week, but not adhere to diet or

medications. It was essential that a tool measuring adherence to diabetes self care recommendations address temporality.

The Summary of Diabetes Self Care Activities (see Appendix D) is a 24 item scale with 7 point Likert-type response options measuring frequency of performing diabetes self care tasks including diet, exercise, medication administration, blood glucose monitoring, and foot care during previous seven days. Scores were calculated for each of the five regimen areas assessed by the SDCA: diet, exercise, self monitoring of blood glucose, foot-care, and smoking status. The SDCA questionnaire was reported to be a brief yet reliable and valid self report measure of diabetes self management and adherence that was useful both for research and practice (Toobert et al., p. 943).

**Glycemic control.** Glycemic control is maintaining a blood glucose level near the normal and target range of 70-110 mg/dl. The A1C value is generally thought to reflect adherence to treatment during the three to four month period of time prior to the test. A1C levels lower than 6% reflected consistent normal blood sugars over the four months prior to measurement (Becker, 2001, p. 311). A1C results, routinely drawn at diabetic clinic appointments by clinic staff through laboratory and point of care testing, were collected.

According to Szymezak, Leroy, Lavalard and Gillery (2008), point of care testing devices for hemoglobin A1C have significantly improved the quality and timeliness of follow-up of patients with type 2 diabetes. The DCA2000+ Analyzer system used at point of care for A1C provided results in as little as six minutes and has exhibited intra-

and inter-assay coefficients of variation lower than 2.6% and 4.0%, respectively, and good correlation with the comparison laboratory

($r^2$ = .9776) (p. 1195).

**Gender.** Gender was obtained by self report. The following codes were used (0 = *female*, 1 = *male*).

**Protection of Human Subjects**

Institutional Review board approval was obtained from both the University of Minnesota and Cherokee Nation. Copies of the approvals are located in Appendix E. Informed consent was obtained from all participants. The risks to participants were minimal. All data held by the PI were de-identified. The data was kept in locked cabinets in the PI's locked office. Only the researcher and academic advisors had access. A1C was collected separately and de-identified at data entry. All data stored on the computer required secure user identification and password. Paper copies will be maintained for three years after the completion of the study and then shredded. Results will be shared only as summary data with no individual participants indentified.

The study did not involve new or additional invasive medical procedures. The benefits expected to be gained by participants included increased personal insight into their own self efficacy, Cherokee self reliance, adherence to recommended self care and glycemic control status. The Cherokee term "ga du gi," or the community working together for the common good, and the Cherokee way of life came to mind. Participants may have felt cultural connection gained through helping "the sixth generation," meaning that what Cherokees do to improve their health today benefits many future generations.

**Data Analysis**

For demographic data, descriptive statistics were calculated and reflected in frequency tables and measures of central tendency. Using SPSS version 19, the analysis was to: (a) describe self efficacy, Cherokee self reliance, adherence and hemoglobin A1C values in men and women using graphic and numeric summaries; (b) examine the relationship between SE and CSR using exploratory factor analysis of item responses; and (c) predict glycemic control (A1C) from individual factors (age, years since diagnosis, gender, adherence, self efficacy, Cherokee self reliance) and one contextual factor (clinic) using multiple regression.

# CHAPTER IV

# RESULTS

The purpose of Chapter IV is to describe the sample and to present the results of data analyses addressing each of the study aims. The specific aims of the study were to: (a) describe self efficacy, Cherokee self reliance, adherence to self care recommendations for diet, exercise, and medications, and glycemic control in adult Cherokee men and women; (b) explore the relationship between self efficacy and Cherokee self reliance; and (c) examine relationships among self efficacy and Cherokee self reliance, adherence to self care recommendations, and glycemic control as measured by A1C.

## Description of Sample

### Accrual

Table 5 describes the accrual of 300 participants from the three Cherokee Nation clinics in Oklahoma between July 28, 2010 and June 21, 2011. This was just less than 10% of the 3700 patients on the diabetes registry for Cherokee Nation at the three clinics. A total of 385 individuals were contacted and of those, 300 (78%) participated in the study.

### Profile

Demographic details regarding the participants are shown in Tables 6 and 7. Of the 300 participants, 136 (45%) were men and 164 (55%) were women. The largest

Table 5
*Participant Accrual*

| | Clinic | | | |
|---|---|---|---|---|
| **Potential Participants** | **A** (*n*) | **B** (*n*) | **C** (*n*) | **Total** (*N*) |
| On Diabetes Registry | 500 | 2000 | 1200 | 3700 |
| Participant Information | | | | |
| Contacted | 130 | 148 | 107 | 385 |
| Declined | 20 | 10 | 10 | 40 |
| Excluded | 15 | 20 | 10 | 45 |
| Not Cherokee | 8 | 12 | 5 | 25 |
| Diagnosed < 1 year | 5 | 5 | 5 | 15 |
| Type 1 | 2 | 3 | 0 | 5 |
| Participants | 95 | 118 | 87 | 300 |

*Note.* The diabetes registry numbers contain all patients with diabetes with health records in the respective clinics. The registry includes those with type 1 diabetes and those who are other than Cherokee.

Table 6
*Sample Description (Discrete Data)*

| Characteristic | Total *n (%)* | Men *n (%)* | Women *n (%)* |
|---|---|---|---|
| Clinic | | | |
| A | 103 (34.3) | 39 (28.7) | 64 (39.0) |
| B | 118 (39.3) | 61 (44.9) | 57 (34.8) |
| C | 79 (26.3) | 36 (26.5) | 43 (26.2) |
| Marital Status | | | |
| Single | 76 (25.3) | 35 (25.7) | 41 (25.0) |
| Married | 174 (58.0) | 84 (61.8) | 90 (54.9) |
| Partnered | 8 (2.7) | 5 ( 3.7) | 3 (1.8) |
| Widowed | 40 (13.3) | 12 (8.8) | 28 (17.1) |
| Education level completed | | | |
| High school or less | 50 (16.7) | 21 (15.4) | 29 (17.7) |
| GED or high school | 144 (48.0) | 72 (52.9) | 72 (43.9) |
| Some college or college graduate | 99 (33.0) | 42 (30.9) | 57 (34.8) |
| Depression past 6 months (yes) | 81 (27.0) | 26 (19.1) | 55 (33.5) |
| Smoking past 7 days (yes) | 58 (19.3) | 26 (19.1) | 32 (19.5) |
| Preferred language at home (Cherokee) (yes) | 43 (14.4) | 23 (16.9) | 20 (12.2) |
| Traditional healer consulted (yes) | 33 (11.0) | 25 (18.4) | 8 (4.9) |
| Form Completion | | | |
| Self | 244 (81.3) | 107 (78.7) | 137 (83.5) |
| With assistance | 52 (17.4) | 28 (20.6) | 24 (14.6) |
| Participant in previous diabetes research (yes) | 31 (10.3) | 14 (10.3) | 17 (10.4) |

*Note.* A total of 136 men and 164 women took part. Column percentages are given for each variable.

Table 7
*Sample Description (Continuous Data)*

| | Total | | | Men | | | Women | | |
|---|---|---|---|---|---|---|---|---|---|
| Characteristic | *n* | *M* | *SD* | *n* | *M* | *SD* | *n* | *M* | *SD* |
| Age | 269 | 58.29 | 12.072 | 123 | 59.48 | 11.984 | 146 | 57.29 | 12.096 |
| Years since diagnosis | 280 | 9.06 | 7.849 | 129 | 10.25 | 9.092 | 151 | 8.04 | 6.464 |
| Age at diagnosis | 253 | 49.24 | 12.510 | 118 | 49.16 | 12.091 | 135 | 49.31 | 12.909 |

percentage of participants (58%) were married with an educational level of at least a high school diploma. The majority 244 (81%) of participants completed the questionnaires without assistance from family or the principal investigator in reading the tools or marking the item selections.

The mean age at diagnosis was 49 years and 9 was the mean years since diagnosis with type 2 diabetes. Only 58 (19.3%) of participants had smoked in the past seven days. Depression in the previous six months was reported by 81 (27%) of the participants. Only 31 (10%) had previously participated in diabetes research.

Approximately 10% of Cherokee speak their language according to Cherokee Nation (2011); of the participants in the study, 14% spoke Cherokee. Seeing a traditional healer regarding their diabetes was reported by 33 (11%) of the participants.

**Comparison with Population Statistics**

This convenience sample of adult Cherokee shared some characteristics with other U.S. population groups, but was unique in some ways. According to U.S. Department of Health and Human Services (2010) statistics, American Indian Alaska Native adults (21.1%) were more likely than Asian adults (12.4%) and about twice as likely as Caucasian adults (10.7%) to not have graduated from high school compared with other minority groups. Almost 32% of Cherokees have less than 12 grade education (S. Khan, personal communication, June 19, 2012). In this study, 16.7% reported not having graduated from high school.

American Indian Alaska Native adults (46.4%) were also less likely than Asian adults (64.4%), White (58.7%), or Hispanic adults (57.5%) to be married. Within the

sample in this study, 42% were found to be married. American Indian Alaska Native adults (32.7%) were more likely to be current smokers than White adults (22.5%), Hispanic adults (14.4%), or Asian adults (10.4%). Among participants in this study, only 19% reported cigarette smoking.

**Clinic Comparison**

Several important differences were noted in data when broken down by clinic as shown in Table 8. Clinic C participants reported the highest number of those who spoke any Cherokee, the most years since diagnosis with type 2 diabetes, and the highest mean A1C. Important differences in the composition of the sample, as well as diabetes status and glycemic control, were informative. Although Clinic C had a significantly higher mean A1C level, the proportion with elevated A1C (> 7%) was similar across clinics (Table 9).

Table 8
*Clinic Comparisons*

| Variable | Clinic | *n* | *M* | *SD* | *p* |
|---|---|---|---|---|---|
| A1C | A | 103 | 7.53 | 1.75 | .027 |
| | B | 114 | 7.58 | 1.63 | |
| | C | 73 | 8.22 | 2.18 | |
| Age | A | 95 | 56.59 | 10.99 | .039 |
| | B | 108 | 60.56 | 12.18 | |
| | C | 63 | 57.02 | 12.95 | |
| Years since Diagnosis | A | 94 | 8.24 | 7.81 | .019 |
| | B | 114 | 8.32 | 6.44 | |
| | C | 72 | 11.30 | 9.45 | |
| Adherence Mean | A | 103 | 4.29 | 1.13 | NS |
| | B | 118 | 4.34 | 1.19 | |
| | C | 79 | 4.56 | 1.18 | |
| Self efficacy Mean | A | 102 | 7.64 | 2.03 | NS |
| | B | 117 | 7.11 | 2.21 | |
| | C | 79 | 7.64 | 1.92 | |
| Cherokee Self Reliance Mean | A | 103 | 4.04 | .462 | NS |
| | B | 117 | 3.98 | .534 | |
| | C | 79 | 4.06 | .456 | |
| Current Educational Level | A | 102 | 3.35 | 1.86 | NS |
| | B | 115 | 3.68 | 2.12 | |
| | C | 76 | 3.17 | 2.02 | |

*Note.* One-way analysis of variance was used to compare clinic means.

Table 9
*Additional Clinic Comparisons*

| | Clinic | | | |
|---|---|---|---|---|
| | A | B | C | |
| Variable | *n* (%) | *n* (%) | *n* (%) | *p* |
| A1C (Elevated) | 47 (46) | 54 (47) | 40 (55) | NS |
| Marital Status | | | | |
| Single | 27 (27) | 28 (24) | 21 (27) | .002 |
| Married | 65 (65) | 72 (61) | 37 (47) | |
| Partnered | 0 (0) | 1 (1) | 7 (9) | |
| Widowed | 9 (19) | 17 (14) | 14 (18) | |
| Language at Home | | | | |
| English | 101 (98) | 100 (86) | 55 (70) | .001 |
| Cherokee | 1 (1) | 6 (5) | 7 (9) | |
| Both | 1 (1) | 11 (9) | 17 (22) | |

## Aim 1: Description of Variables

### Self efficacy

Information about responses to the Self efficacy for Diabetes Questionnaire is summarized in Table 10. Participants used the full range of response options to the eight self efficacy Likert-type items. Based on the item mean scores being lower, self efficacy related to exercise was more challenging than any other activity, including following a healthy diet or routinely taking medications. Participants reported the most self efficacy in knowing when to see the doctor and what to do to when their blood sugar was too low or too high (α all = .86).

### Cherokee Self reliance

Cherokee self reliance responses summarized in Table 11 also included the full range on the 5 point-Likert type scale for all 24 items. Speaking Cherokee was rated the lowest ($M$ = 2.3) and this is consistent with the low percentage of Cherokee who reported speaking their native language (Cherokee Nation, 2012). Participating in traditional Cherokee ceremonies also ranked low in the entire sample ($M$ = 2.7). "I think about my personal talents, gifts, and abilities when I set goals for my future" had the highest item-total correlation ($r$ = .665).

Table 10
*Item and Scale Summary: Self efficacy for Diabetes Questionnaire*

| Item/Scale | Sample | *n* | *Minimum* | *Maximum* | *Mdn* | *M* | *SD* | *r* | α |
|---|---|---|---|---|---|---|---|---|---|
| 1. Confident meals every 4 hours | All | 295 | 1 | 10 | 8.0 | 7.17 | 3.027 | .499 | |
| | Men | 135 | 1 | 10 | 9.0 | 7.6 | 2.893 | .399 | |
| | Women | 160 | 1 | 10 | 7.5 | 6.84 | 3.106 | .567 | |
| 2. Adhere diet when with others | All | 296 | 1 | 10 | 7.0 | 6.90 | 2.821 | .635 | |
| | Men | 135 | 1 | 10 | 8.0 | 7.11 | 2.766 | .625 | |
| | Women | 161 | 1 | 10 | 7.0 | 6.72 | 2.862 | .640 | |
| 3. Know what to eat when hungry | All | 296 | 1 | 10 | 9.0 | 8.01 | 2.443 | .652 | |
| | Men | 135 | 1 | 10 | 9.0 | 8.01 | 2.436 | .645 | |
| | Women | 161 | 1 | 10 | 9.0 | 8.02 | 2.456 | .673 | |
| 4. Exercise 15-30 minutes 4-5 days/week | All | 295 | 1 | 10 | 7.0 | 6.22 | 3.320 | .510 | |
| | Men | 135 | 1 | 10 | 8.0 | 6.64 | 3.327 | .457 | |
| | Women | 160 | 1 | 10 | 6.0 | 5.86 | 3.281 | .546 | |

(continued)

| Item/Scale | Sample | *n* | *Minimum* | *Maximum* | *Mdn* | *M* | *SD* | *r* | α |
|---|---|---|---|---|---|---|---|---|---|
| 5. Prevent low blood sugar when exercising | All | 294 | 1 | 10 | 8.0 | 7.26 | 2.962 | .699 | |
| | Men | 135 | 1 | 10 | 8.0 | 7.26 | 2.995 | .642 | |
| | Women | 159 | 1 | 10 | 8.0 | 7.25 | 2.944 | .759 | |
| 6. Know what to do for low/high blood sugar | All | 297 | 1 | 10 | 9.0 | 8.06 | 2.674 | .673 | |
| | Men | 135 | 1 | 10 | 10.0 | 8.39 | 2.480 | .695 | |
| | Women | 162 | 1 | 10 | 9.0 | 7.80 | 2.804 | .650 | |
| 7. When to see doctor | All | 295 | 1 | 10 | 10.0 | 8.23 | 2.519 | .612 | |
| | Men | 135 | 1 | 10 | 10.0 | 8.49 | 2.301 | .583 | |
| | Women | 160 | 1 | 10 | 9.0 | 8.01 | 2.287 | .623 | |
| 8. Control diabetes so not to interfere with life | All | 296 | 1 | 10 | 9.0 | 7.95 | 2.521 | .643 | |
| | Men | 135 | 1 | 10 | 10.0 | 10.0 | 2.287 | .651 | |
| | Women | 161 | 1 | 10 | 8.0 | 7.60 | 2.661 | .630 | |
| Scale: Self Efficacy for Diabetes | All | 298 | 1 | 10 | 7.9 | 7.44 | 2.085 | | .861 |
| | Men | 135 | 1 | 10 | 8.0 | 7.73 | 1.866 | | .842 |
| | Women | 163 | 1 | 10 | 7.8 | 7.19 | 2.227 | | .873 |

*Note. r* is the corrected item-total correlation.

Table 11
*Item and Scale Summary: Cherokee Self Reliance Questionnaire*

| | Item/Scale | Sample | *n* | *Minimum* | *Maximum* | *Mdn* | *M* | *SD* | *r* | α |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. | I care about myself | All | 299 | 1 | 5 | 5.00 | 4.48 | .734 | .553 | |
| | | Men | 135 | 1 | 5 | 5.00 | 4.54 | .655 | .589 | |
| | | Women | 164 | 1 | 5 | 5.00 | 4.43 | .792 | .539 | |
| 2. | I will get assistance when I need it to take care of myself. | All | 288 | 1 | 5 | 5.00 | 4.40 | .763 | .507 | |
| | | Men | 132 | 1 | 5 | 5.00 | 4.42 | .752 | .456 | |
| | | Women | 156 | 1 | 5 | 5.00 | 4.39 | .775 | .540 | |
| 3. | I think others can rely on me. | All | 297 | 1 | 5 | 4.00 | 4.36 | .781 | .572 | |
| | | Men | 135 | 1 | 5 | 4.00 | 4.37 | .751 | .616 | |
| | | Women | 162 | 1 | 5 | 4.50 | 4.35 | .807 | .539 | |
| 4. | I help others when they need it. | All | 286 | 1 | 5 | 5.00 | 4.50 | .684 | .595 | |
| | | Men | 128 | 1 | 5 | 5.00 | 4.49 | .652 | .575 | |
| | | Women | 158 | 1 | 5 | 5.00 | 4.50 | .712 | .609 | |
| 5. | My behaviors and actions are respectful of others. | All | 291 | 1 | 5 | 5.00 | 4.49 | .687 | .620 | |
| | | Men | 132 | 1 | 5 | 5.00 | 4.48 | .659 | .696 | |
| | | Women | 159 | 1 | 5 | 5.00 | 4.50 | .710 | .565 | |
| 6. | I use resources responsibly provided by the Creator/God/Supreme Being. | All | 289 | 1 | 5 | 5.00 | 4.46 | .691 | .530 | |
| | | Men | 131 | 1 | 5 | 5.00 | 4.41 | .732 | .538 | |
| | | Women | 158 | 1 | 5 | 5.00 | 4.49 | .656 | .534 | |
| 7. | I think my behaviors represent my family well. | All | 297 | 1 | 5 | 5.00 | 4.39 | .764 | .605 | |
| | | Men | 134 | 1 | 5 | 5.00 | 4.40 | .747 | .656 | |
| | | Women | 163 | 1 | 5 | 5.00 | 4.38 | .779 | .567 | |
| 8. | I participate in traditional Cherokee ceremonies. | All | 281 | 1 | 5 | 3.00 | 2.74 | 1.181 | .257 | |
| | | Men | 131 | 1 | 5 | 3.00 | 2.80 | 1.179 | .161 | |
| | | Women | 150 | 1 | 5 | 3.00 | 2.68 | 1.183 | .326 | |

(continued)

| | Item/Scale | Sample | *n* | *Minimum* | *Maximum* | *Mdn* | *M* | *SD* | *r* | α |
|---|---|---|---|---|---|---|---|---|---|---|
| 9. | I speak Cherokee. | All | 283 | 1 | 5 | 2.00 | 2.36 | 1.473 | .063 | |
| | | Men | 128 | 1 | 5 | 2.00 | 2.44 | 1.457 | .013 | |
| | | Women | 155 | 1 | 5 | 2.00 | 2.30 | 1.487 | .095 | |
| 10. | I have set goals for my future. | All | 288 | 1 | 5 | 4.00 | 3.84 | 1.068 | .603 | |
| | | Men | 132 | 1 | 5 | 4.00 | 3.89 | 1.050 | .570 | |
| | | Women | 156 | 1 | 5 | 4.00 | 3.79 | 1.084 | .627 | |
| 11 | I think about my personal talents, gifts and abilities when I set goals for my future. | All | 285 | 1 | 5 | 4.00 | 3.88 | 1.028 | .665 | |
| | | Men | 130 | 1 | 5 | 4.00 | 3.98 | 1.004 | .672 | |
| | | Women | 155 | 1 | 5 | 4.00 | 3.79 | 1.043 | .657 | |
| 12. | The decisions I make involve taking risks. | All | 287 | 1 | 5 | 3.00 | 3.00 | 1.209 | .184 | |
| | | Men | 133 | 1 | 5 | 3.00 | 3.12 | 1.243 | .141 | |
| | | Women | 154 | 1 | 5 | 3.00 | 2.90 | 1.172 | .215 | |
| 13. | I make decisions about my future without being forced by others. | All | 291 | 1 | 5 | 4.00 | 4.34 | .708 | .613 | |
| | | Men | 133 | 1 | 5 | 4.00 | 4.38 | .681 | .619 | |
| | | Women | 158 | 1 | 5 | 4.00 | 4.31 | .731 | .606 | |
| 14. | I believe in Cherokee ways. | All | 291 | 1 | 5 | 4.00 | 4.06 | .902 | .242 | |
| | | Men | 133 | 1 | 5 | 4.00 | 4.08 | .897 | .226 | |
| | | Women | 158 | 1 | 5 | 4.00 | 4.04 | .909 | .253 | |
| 15. | I get assistance when I need it to help me achieve my goals. | All | 289 | 1 | 5 | 4.00 | 4.06 | .866 | .584 | |
| | | Men | 132 | 1 | 5 | 4.00 | 4.13 | .766 | .616 | |
| | | Women | 157 | 1 | 5 | 4.00 | 4.00 | .941 | .560 | |
| 16. | If I do not achieve a goal, I can set other goals. | All | 290 | 1 | 5 | 4.00 | 4.10 | .798 | .625 | |
| | | Men | 132 | 1 | 5 | 4.00 | 4.10 | .770 | .488 | |
| | | Women | 158 | 1 | 5 | 4.00 | 4.10 | .823 | .741 | |
| 17 | I can change directions/paths to achieve my goals. | All | 287 | 1 | 5 | 4.00 | 4.14 | .746 | .639 | |
| | | Men | 132 | 1 | 5 | 4.00 | 4.13 | .756 | .623 | |
| | | Women | 155 | 1 | 5 | 4.00 | 4.15 | .740 | .666 | |

(continued)

| | Item/Scale | Sample | *n* | *Minimum* | *Maximum* | *Mdn* | *M* | *SD* | *r* | α |
|---|---|---|---|---|---|---|---|---|---|---|
| 18. | I use resources provided by the Creator for the good of others | All | 288 | 1 | 5 | 4.00 | 4.23 | .788 | .609 | |
| | | Men | 133 | 1 | 5 | 4.00 | 4.19 | .760 | .585 | |
| | | Women | 155 | 1 | 5 | 4.00 | 4.26 | .813 | .636 | |
| 19. | I am proud of my Cherokee heritage. | All | 296 | 1 | 5 | 5.00 | 4.64 | .594 | .347 | |
| | | Men | 135 | 1 | 5 | 5.00 | 4.61 | .669 | .386 | |
| | | Women | 161 | 1 | 5 | 5.00 | 4.66 | .524 | .327 | |
| 20. | I have personal talents and skills. | All | 291 | 1 | 5 | 4.00 | 4.11 | .878 | .512 | |
| | | Men | 133 | 1 | 5 | 4.00 | 46.2 | .806 | .410 | |
| | | Women | 158 | 1 | 5 | 4.00 | 3.97 | .917 | .584 | |
| 21. | I seek advice from others to pursue my goals. | All | 285 | 1 | 5 | 4.00 | 3.94 | .925 | .631 | |
| | | Men | 129 | 1 | 5 | 4.00 | 3.99 | .870 | .615 | |
| | | Women | 156 | 1 | 5 | 4.00 | 3.90 | .969 | .647 | |
| 22. | I learn to care for myself by watching the actions of others. | All | 290 | 1 | 5 | 4.00 | 3.76 | 1.018 | .421 | |
| | | Men | 134 | 1 | 5 | 4.00 | 3.87 | .987 | .450 | |
| | | Women | 156 | 1 | 5 | 4.00 | 3.66 | 1.038 | .394 | |
| 23. | I learn to care for myself from others who show me the way. | All | 292 | 1 | 5 | 4.00 | 3.91 | .975 | .552 | |
| | | Men | 133 | 1 | 5 | 4.00 | 3.89 | 1.017 | .545 | |
| | | Women | 159 | 1 | 5 | 4.00 | 3.93 | .942 | .579 | |
| 24. | My talents and skills are recognized by others such as (friends, family, community, or tribe). | All | 292 | 1 | 5 | 4.00 | 4.09 | .828 | .570 | |
| | | Men | 135 | 1 | 5 | 4.00 | 4.07 | .830 | .497 | |
| | | Women | 157 | 1 | 5 | 4.00 | 4.11 | .829 | .628 | |
| Scale: Cherokee Self reliance Questionnaire | | All | 224 | 58 | 119 | 96.00 | 96.39 | 11.043 | | .887 |
| | | Men | 105 | 64 | 118 | 96.00 | 97.23 | 10.450 | | .874 |
| | | Women | 119 | 58 | 119 | 96.00 | 95.66 | 11.534 | | .896 |

*Note. r* is the corrected item-total correlation.

**Adherence to Self care Recommendations**

Table 12 reflects that respondents also utilized the full range on the seven point Likert-type scale of the 17 items for adherence to self care. Based on the mean scores, exercise was the most challenging domain. Taking medications as prescribed was the area with which participants reported the highest amount of adherence. Spacing carbohydrates throughout the day was the most difficult part of dietary adherence. Participants also reported adherence to self monitoring of blood glucose levels four days out of the previous seven.

The scale (alpha) and item-total correlations for self efficacy were .861 for all, .842 for men, and .873 for women. Across all diabetes self care activities, on average in the entire sample, participants reported adherence of 4.5 days. "Followed eating plan" and "ate five or more servings of fruits and vegetables" had the highest item-total correlations.

Table 12
*Item and Scale Summary: Summary of Diabetes Self care Activities*

| | Item/Scale | Sample | *n* | *Minimum* | *Maximum* | *Mdn* | *M* | *SD* | *r* | α |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. | How many of the last seven days have you follow a healthful eating plan? | All | 297 | 0 | 7 | 5.00 | 4.29 | 2.178 | .540 | |
| | | Men | 134 | 0 | 7 | 5.00 | 4.54 | 2.185 | .503 | |
| | | Women | 163 | 0 | 7 | 5.00 | 4.09 | 2.156 | .565 | |
| 2. | On average, over the past month, how many days per week have you followed your eating plan? | All | 296 | 0 | 7 | 5.00 | 4.36 | 2.029 | .549 | |
| | | Men | 135 | 0 | 7 | 5.00 | 4.62 | 2.022 | .493 | |
| | | Women | 161 | 0 | 7 | 5.00 | 4.14 | 2.014 | .591 | |
| 3. | On how many of the last seven days did you eat five or more servings of fruits and vegetables? | All | 296 | 0 | 7 | 4.00 | 4.13 | 2.167 | .546 | |
| | | Men | 135 | 0 | 7 | 4.00 | 3.98 | 2.351 | .571 | |
| | | Women | 161 | 0 | 7 | 4.00 | 4.26 | 1.999 | .552 | |
| 4. | On how many of the last seven days did you eat high fat foods such as red meat or full fat dairy products? | All | 293 | 0 | 7 | 3.00 | 3.35 | 1.973 | -.092 | |
| | | Men | 132 | 0 | 7 | 3.00 | 3.47 | 1.944 | -.064 | |
| | | Women | 161 | 0 | 7 | 3.00 | 3.26 | 1.999 | -.121 | |
| 5. | On how many of the last seven days did you space carbohydrates evenly through the day? | All | 294 | 0 | 7 | 4.00 | 3.79 | 2.124 | .454 | |
| | | Men | 133 | 0 | 7 | 4.00 | 3.71 | 2.102 | .442 | |
| | | Women | 161 | 0 | 7 | 4.00 | 3.86 | 2.147 | .485 | |
| 6. | On how many of the last seven days did you participate in at least 30 minutes of physical activity? | All | 294 | 0 | 7 | 4.00 | 3.47 | 2.526 | .449 | |
| | | Men | 134 | 0 | 7 | 5.00 | 4.01 | 2.480 | .485 | |
| | | Women | 160 | 0 | 7 | 3.00 | 3.01 | 2.480 | .420 | |
| 7. | On how many of the last seven days did you participate in a specific exercise session? | All | 295 | 0 | 7 | 2.00 | 2.83 | 2.647 | .450 | |
| | | Men | 134 | 0 | 7 | 3.00 | 3.37 | 2.666 | .467 | |
| | | Women | 161 | 0 | 7 | 1.00 | 2.39 | 2.555 | .432 | |
| 8. | On how many of the last seven days did you take your recommended diabetes medication? | All | 273 | 0 | 7 | 7.00 | 6.27 | 1.934 | .354 | |
| | | Men | 124 | 0 | 7 | 7.00 | 6.35 | 1.926 | .405 | |
| | | Women | 149 | 0 | 7 | 7.00 | 6.19 | 1.944 | .312 | |

(continued)

| | Item/Scale | Sample | *n* | *Minimum* | *Maximum* | *Mdn* | *M* | *SD* | *r* | α |
|---|---|---|---|---|---|---|---|---|---|---|
| 9. | On how many of the last seven days did you take your recommended insulin injections? | All | 121 | 0 | 7 | 7.00 | 5.53 | 2.662 | .322 | |
| | | Men | 58 | 0 | 7 | 7.00 | 5.72 | 2.574 | .317 | |
| | | Women | 63 | 0 | 7 | 7.00 | 5.35 | 2.748 | .329 | |
| 10. | On how many of the last seven days did you take your recommended number of diabetes pills? | All | 264 | 0 | 7 | 7.00 | 6.11 | 2.144 | .314 | |
| | | Men | 119 | 0 | 7 | 7.00 | 6.39 | 1.892 | .264 | |
| | | Women | 145 | 0 | 7 | 7.00 | 5.89 | 2.313 | .359 | |
| 11 | On how many of the last seven days did you test your blood sugar? | All | 295 | 0 | 7 | 4.00 | 4.18 | 2.794 | .390 | |
| | | Men | 134 | 0 | 7 | 5.00 | 4.37 | 2.798 | .232 | |
| | | Women | 161 | 0 | 7 | 4.00 | 4.02 | 2.789 | .522 | |
| 12. | On how many of the last seven days did you test your blood sugar the number of times recommended by your healthcare provider? | All | 290 | 0 | 7 | 4.00 | 4.04 | 2.871 | .428 | |
| | | Men | 130 | 0 | 7 | 4.00 | 4.05 | 2.858 | .313 | |
| | | Women | 160 | 0 | 7 | 5.00 | 4.03 | 2.891 | .527 | |
| 13. | On how many of the last seven days did you check your feet? | All | 295 | 0 | 7 | 7.00 | 5.24 | 2.438 | .410 | |
| | | Men | 134 | 0 | 7 | 7.00 | 5.10 | 2.522 | .473 | |
| | | Women | 161 | 0 | 7 | 7.00 | 5.36 | 2.368 | .377 | |
| 14. | On how many of the last seven days did you inspect the inside of your shoes? | All | 295 | 0 | 7 | 4.00 | 3.67 | 3.063 | .419 | |
| | | Men | 135 | 0 | 7 | 5.00 | 3.76 | 3.081 | .346 | |
| | | Women | 160 | 0 | 7 | 3.00 | 3.59 | 3.054 | .478 | |
| 15. | On how many of the last seven days did you wash your feet? | All | 288 | 0 | 7 | 7.00 | 6.57 | 1.248 | .247 | |
| | | Men | 133 | 0 | 7 | 7.00 | 6.58 | 1.130 | .195 | |
| | | Women | 155 | 0 | 7 | 7.00 | 6.55 | 1.344 | .281 | |
| 16. | On how many of the last seven days did you soak your feet? | All | 290 | 0 | 7 | 0.00 | 2.27 | 2.805 | .278 | |
| | | Men | 133 | 0 | 7 | .00 | 2.19 | 2.916 | .197 | |
| | | Women | 157 | 0 | 7 | 1.00 | 2.33 | 2.716 | .357 | |
| 17 | On how many of the last seven days did you dry between your toes after washing? | All | 295 | 0 | 7 | 7.00 | 5.45 | 2.576 | .307 | |
| | | Men | 134 | 0 | 7 | 7.00 | 5.31 | 2.602 | .303 | |
| | | Women | 161 | 0 | 7 | 7.00 | 5.57 | 2.556 | .329 | |
| Scale: | Summary of Diabetes Self care Activities | All | 300 | .81 | 7.00 | 4.65 | 4.54 | 1.138 | | .775 |
| | | Men | 136 | 1.29 | 7.00 | 4.68 | 4.65 | 1.080 | | .746 |
| | | Women | 164 | .81 | 6.59 | 4.65 | 4.45 | 1.179 | | .799 |

*Note. r* is the corrected item-total correlation.

**Glycemic Control**

Figure 3 illustrates the A1C results in stem and leaf plot format by gender. The range of A1C results was 4.9 to 14.5%. The positive skew apparent in each group reflects asymmetry due to values higher than the recommend target of 7. The distribution appearance is similar for men and women.

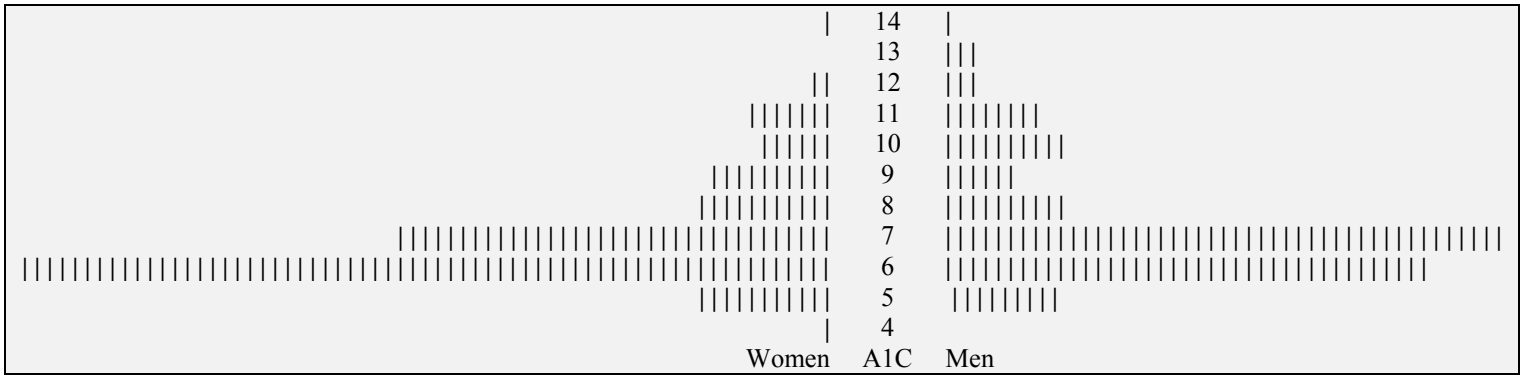


*Figure 3*. Stem and leaf plot of A1C by gender.

## Aim 2: Self efficacy and Cherokee Self reliance

The purpose of this aim is to explore relationships among responses to the items in the Diabetes Self Efficacy Scale (DSES) and the Cherokee Self Reliance Questionnaire (CSRQ). The DSES is a general measure of confidence in ability to manage type 2 diabetes on a daily basis. The CSRQ measures self perceptions of discipline in setting and pursuing goals, responsibility in caring for self and others and confidence in self identity and self worth from the perspective of the Cherokee world view. Exploratory maximum likelihood factor analysis was used to model relationships among the DSES and CSRQ responses (Costello & Osborne, 2005). Ten factors were extracted. Varimax (orthogonal) rotation with Kaiser normalization was used. The scree plot was inspected to determine the number of factors to retain. The eigenvalues associated with each factor were also considered. A final solution was then interpreted.

### Item Correlations

Correlations among the 8 DSES items and 23 CSRQ items are shown in Table 13. The values are based on the responses of 223 participants who answered each question. The correlations were generally moderate in size, and positive. Exceptions were correlations of "I speak Cherokee," "take part in traditional Cherokee ceremonies," "believe in Cherokee ways," and "decisions involving risk" with other DSES and CSRQ items; these correlations tended to be low and unrelated to the self orientation, other orientation that reflected relationships among the responses. The KMO measure of sampling adequacy (KMO = .875) and Bartlett's test of sphericity ($x^2 = 3606.2$, $p < .001$) both suggested the matrix was factorable.

Table 13

*Correlations among Self-efficacy for Diabetes and Cherokee Self reliance Items (N =223)*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CSR 1 | 1.00 | | | | | | | | | | | | | | | | | | | | | | | |
| CSR 2 | .60 | 1.00 | | | | | | | | | | | | | | | | | | | | | | |
| CSR 3 | .52 | .49 | 1.00 | | | | | | | | | | | | | | | | | | | | | |
| CSR 4 | .47 | .45 | .72 | 1.00 | | | | | | | | | | | | | | | | | | | | |
| CSR 5 | .62 | .47 | .66 | .66 | 1.00 | | | | | | | | | | | | | | | | | | | |
| CSR 6 | .36 | .46 | .37 | .42 | .45 | 1.00 | | | | | | | | | | | | | | | | | | |
| CSR 7 | .52 | .41 | .54 | .54 | .68 | .49 | 1.00 | | | | | | | | | | | | | | | | | |
| CSR 8 | .05 | .02 | .08 | .08 | .10 | .13 | .16 | 1.00 | | | | | | | | | | | | | | | | |
| CSR 9 | -.06 | -.11 | -.10 | -.06 | -.05 | .00 | -.09 | .27 | 1.00 | | | | | | | | | | | | | | | |
| CSR 10 | .41 | .37 | .43 | .45 | .44 | .24 | .39 | .16 | .06 | 1.00 | | | | | | | | | | | | | | |
| CSR 11 | .39 | .34 | .35 | .40 | .41 | .36 | .41 | .21 | .13 | .68 | 1.00 | | | | | | | | | | | | | |
| CSR 12 | .08 | .06 | -.01 | .01 | .04 | -.01 | -.04 | .03 | .18 | .13 | .21 | 1.00 | | | | | | | | | | | | |
| CSR 13 | .43 | .46 | .38 | .45 | .45 | .40 | .46. | .17 | -.02 | .48 | .46 | .12 | 1.00 | | | | | | | | | | | |
| CSR 14 | .01 | .02 | .11 | .12 | .08 | .20 | .17 | .31 | .19 | .05 | .10 | .00 | .13 | 1.00 | | | | | | | | | | |
| CSR 15 | .33 | .30 | .30 | .29 | .37 | .20 | .35 | .21 | .04 | .28 | .45 | .24 | .40 | .11 | 1.00 | | | | | | | | | |
| CSR 16 | .39 | .40 | .47 | .42 | .43 | .30 | .43 | .10 | -.01 | .56 | .42 | .08 | .42 | .09 | .35 | 1.00 | | | | | | | | |
| CSR 17 | .35 | .38 | .36 | .38 | .41 | .36 | .37 | .10 | -.03 | .41 | .49 | .16 | .49 | .17 | .47 | .65 | 1.00 | | | | | | | |
| CSR 18 | .38 | .41 | .46 | .47 | .48 | .67 | .55 | .16 | .07 | .32 | .34 | .02 | .42 | .24 | .28 | .45 | .44 | 1.00 | | | | | | |
| CSR 19 | .23 | .19 | .23 | .29 | .29 | .28 | .38 | .12 | -.05 | .14 | .12 | -.04 | .34 | .31 | .20 | .22 | .23 | .31 | 1.00 | | | | | |
| CSR 20 | .34 | .31 | .39 | .39 | .37 | .30 | .28 | .11 | -.07 | .43 | .48 | .18 | .43 | .07 | .40 | .38 | .35 | .26 | .27 | 1.00 | | | | |
| CSR 21 | .32 | .33 | .29 | .35 | .30 | .25 | .38 | .17 | .03 | .38 | .43 | .16 | .40 | .15 | .56 | .47 | .55 | .35 | .29 | .41 | 1.00 | | | |
| CSR 22 | .13 | .16 | .18 | .16 | .12 | .23 | .16 | .08 | .04 | .27 | .40 | .25 | .13 | .10 | 38 | .38 | .43 | .26 | .04 | .19 | .41 | 1.00 | | |
| CSR 23 | .31 | .23 | .26 | .27 | .26 | .28 | .33 | .19 | .02 | .36 | .34 | .17 | .30 | .13 | .50 | .44 | .43 | .36 | .17 | .18 | .60. | .49 | 1.00 | |
| CSR 24 | .30 | .33 | .33 | .32 | .34 | .36 | .37 | .12 | .00 | .34 | .48 | .12 | .37 | .18 | .40 | .40 | .42 | .38 | .20 | .49 | .50 | .27 | .42 | 1.00 |
| SED1 | .24 | .25 | .22 | .16 | .26 | .19 | .23 | .04 | .05 | .19 | .21 | .02 | .12 | -.05 | .20 | .23 | .29 | .19 | .02 | .18 | .12 | .17 | .20 | .19 |
| SED2 | .29 | .30 | .21 | .19 | .19 | .20 | .25 | .06 | .08 | .25 | .25 | .03 | .14 | .10 | .12 | .24 | .21 | .19 | .09 | .17 | .08 | .09 | .13 | .15 |
| SED3 | .28 | .31 | .31 | .19 | .24 | .14 | .33 | .04 | -.07 | .30 | .31 | -.02 | .25 | .15 | .26 | .28 | .32 | .20 | .02 | .24 | .23 | .16 | .25 | .28 |
| SED4 | .42 | .28 | .31 | .28 | .30 | .20 | .20 | .02 | .01 | .36 | .36 | .01 | .28 | .00 | .21 | .20 | .27 | .14 | .09 | .29 | .11 | .05 | .06 | .08 |
| SED5 | .25 | .25 | .29 | .32 | .25 | .20 | .16 | .02 | .07 | .39 | .41 | .10 | .33 | .09 | .22 | .24 | .31 | .16 | -.01 | .29 | .23 | .14 | .15 | .24 |
| SED6 | .22 | .33 | .23 | .24 | .22 | .27 | .18 | .05 | .08 | .32 | .37 | .13 | .35 | .16 | .18 | .21 | .34 | .18 | .06 | .30 | .27 | .12 | .19 | .29 |
| SED7 | .21 | .31 | .22 | .17 | .24 | .24 | .22 | -.03 | .12 | .24 | .38 | .16 | .32 | .11 | .15 | .17 | .29 | .19 | -.03 | .17 | .21 | .12 | .18 | .24 |
| SED8 | .40 | .41 | .28 | .24 | .36 | .36 | .39 | .07 | .09 | .37 | .51 | .07 | .40 | .04 | .31 | .29 | .34 | .30 | .09 | .25 | .30 | .21 | .28 | .25 |
| Mean | 4.50 | 4.40 | 4.36 | 4.48 | 4.48 | 4.41 | 4.37 | 2.70 | 2.34 | 3.88 | 3.91 | 3.01 | 4.32 | 3.97 | 4.07 | 4.13 | 4.16 | 4.22 | 4.61 | 4.13 | 3.99 | 3.82 | 3.98 | 4.11 |
| SD | 0.71 | 0.73 | 0.74 | 0.68 | 0.70 | 0.66 | 0.78 | 1.15 | 1.43 | 1.01 | 1.00 | 1.21 | 0.70 | 0.93 | 0.84 | 0.76 | 0.72 | 0.77 | 0.61 | 0.87 | 0.89 | 0.92 | 0.87 | 0.78 |

(continued)

*Correlations among Self-efficacy for Diabetes and Cherokee Self-reliance Items (N =223)*

| | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 |
|---|---|---|---|---|---|---|---|---|
| SED1 | 1.00 | | | | | | | |
| SED2 | .528 | 1.00 | | | | | | |
| SED3 | .425 | .512 | 1.00 | | | | | |
| SED4 | .275 | .421 | .358 | 1.00 | | | | |
| SED5 | .323 | .471 | .481 | .569 | 1.00 | | | |
| SED6 | .363 | .411 | .502 | .380 | .665 | 1.00 | | |
| SED7 | .404 | .283 | 464 | .297 | .537 | .765 | 1.00 | |
| SED8 | .315 | .458 | .482 | .443 | .480 | .482 | .532 | 1.00 |
| | | | | | | | | |
| Mean | 7.35 | 7.01 | 8.15 | 6.27 | 7.32 | 8.21 | 8.24 | 8.13 |
| SD | 2.88 | 2.73 | 2.38 | 3.32 | 2.99 | 2.56 | 2.51 | 2.43 |

**Number of Factors**

The scree plot is shown in Figure 4. Eigenvalues for the ten extracted factors ranged from 9.992 to .862; the first 7 factors all had eigenvalues greater than 1. The eigenvalues and the elbo in the scree plot suggested that a 3 or 4 factor solution would adequately summarize the data.

**Rotated Factor Solution and Interpretation**

The factor loading matrix is in Table 14, with values greater than .40 shown. Loadings on the first two factors were all CSRQ items; items loading on factor 1 had an "other" orientation, whereas those on factor 2 had a "self" orientation. The DSES items were split across factors 3 and 4. The first six DSES items were associated with factor 3 and reflected self efficacy related to day-to-day diabetes self care activities, whereas DSES item 7 (confidence in knowing when to contact the doctor) was associated with factor 4. DSES item 6 (confidence in knowing what to do when blood glucose level is low) cross-loaded on factor three and factor four. Many CSRQ items did not load on any of the first four factors, including "using resources responsibly," "ceremonies," "speak Cherokee," "set goals," "personal gifts," "take risks," "decisions without force," "Cherokee ways," "achieve goals," "set other goals," "change directions," "proud of Cherokee heritage," "personal talents," "advice from others," "actions of others," "others show way," and "talents recognized." Thus, these items seem to reflect unique aspects of Cherokee self reliance not related to "other" or "self" orientation and not related to dimensions of diabetes self efficacy. The DSES and CSRQ items appear distinct.

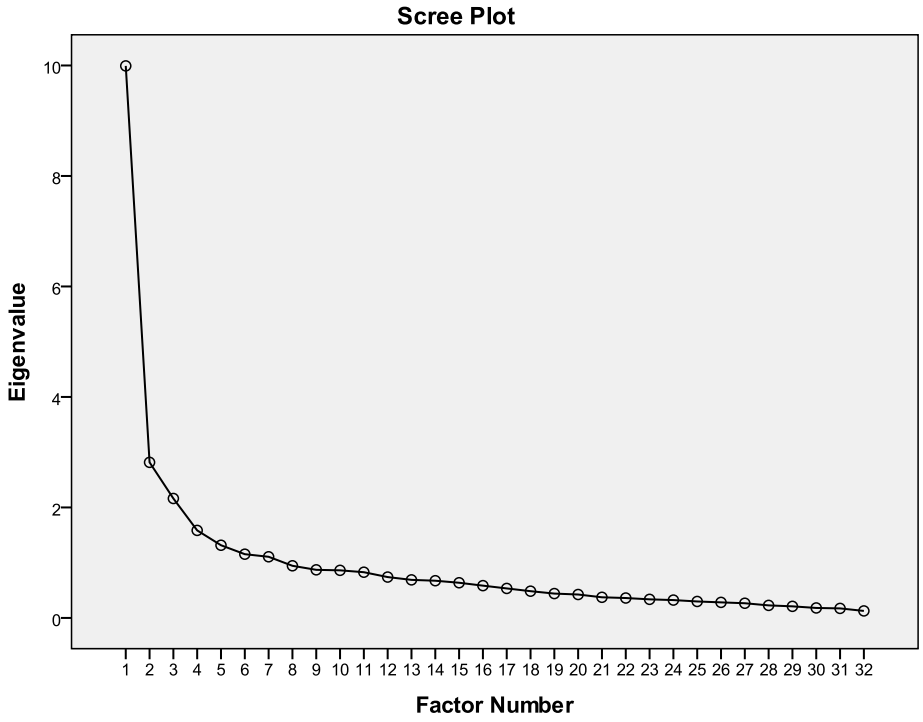


*Figure 4*. Scree plot displaying eigenvalues from the factor analysis of item responses from the self efficacy and Cherokee self reliance measures.

Table 14
*Factor Structure: Self efficacy for Diabetes and Cherokee Self reliance Questionnaire*

| | Factor | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Item** | **I** | **II** | **III** | **IV** | **V** | **VI** | **VII** | **VIII** | **IX** | **X** |
| CSRQ1 care self | .580 | | | | | | | | | |
| CSRQ2 get assistance | .467 | | | | | | | | | |
| CSRQ3others can rely | .795 | | | | | | | | | |
| CSRQ4 help others | .783 | | | | | | | | | |
| CSRQ5respect others | .783 | | | | | | | | | |
| CSRQ6resources responsibly | | | | | | .898 | | | | |
| CSRQ7represent family | .650 | | | | | | | | | |
| CSRQ8 ceremonies | | | | | | | | | | |
| CSRQ9 speak Cherokee | | | | | | | .410 | | | |
| CSRQ10 set goals | | | | | .501 | | | | | |
| CSRQ11personal gifts | | | | | .821 | | | | | |
| CSRQ12 take risks | | | | | | | | | | |
| CSRQ13 decisions w/o force | | | | | | | | | | |
| CSRQ14 Cherokee ways | | | | | | | | | .413 | |
| CSRQ15achieve goals | | .640 | | | | | | | | |
| CSRQ16 set other goals | | | | | | | | .834 | | |
| CSRQ17 change directions | | .510 | | | | | | | | |
| CSRQ18 resources for good | .462 | | | | | .469 | | | | |
| CSRQ19 proud of Cherokee | | | | | | | | | | |
| CSRQ20 personal talents | | | | | | | | | | |
| CSRQ21 advice from others | | .720 | | | | | | | | |
| CSRQ22 actions of others | | .612 | | | | | | | | |
| CSRQ23others show way | | .685 | | | | | | | | |
| CSRQ24talents recognized | | .455 | | | | | | | | |
| DSES1 eat meals 4 hours | | | .583 | | | | | | | |
| DSES2 food with others | | | .813 | | | | | | | |
| DSES3know what to eat | | | .625 | | | | | | | |
| DSES4 know low | | | .507 | | | | | | | |
| DSES5prevent low | | | .551 | | | | | | | |
| DSES6 know high or low | | | .475 | .615 | | | | | | |
| DSES7 visit doctor | | | | .903 | | | | | | |
| DSED8not interfere with life | | | .530 | | | | | | | |

*Note.* Factor loadings > .40 are displayed. CSR = Cherokee Self Reliance Questionnaire; SED = Self efficacy for Diabetes Questionnaire.

## Aim 3: Predicting Glycemic Control

The purpose of aim 3 in this study is to predict glycemic control to better understand diabetes outcomes among Cherokee adults. Predictors were: adherence, self efficacy, Cherokee self reliance, years since diagnosis, age, gender, and clinic.

Clinic was effect-coded, with Clinic B serving as the reference group. All cases with complete responses to this variable set were used in the analysis ($N = 241$).

### Correlations

Correlations are shown in Table 15. Correlations of the predictors with A1C were modest but in the expected direction, except for age; older age was associated with better A1C values. Among the predictors, adherence was related to self efficacy ($r = .437$); and self efficacy was related to Cherokee self reliance ($r = .473$), but Cherokee self reliance was less related to adherence ($r = .287$). Age and years since diagnosis were negatively correlated ($r = -.264$). Inspection of scatterplots, as shown in Figure 5, did not reveal any obvious outlying observations in the pair wise graphs.

### Regression Model

Estimates of the regression model parameters are shown in Table 16. The individual characteristics of self efficacy, years since diagnosis and age were all significant predictors of A1C. In addition, the effect of Clinic C was significant.

### Model Diagnostics

Basic principles for evaluating the residuals as outlined in the Weisberg (1985) were used. The plot of standardized residuals against standardized predicted values is shown in Figure 4. There was no obvious curvature, suggesting that a linear model was

appropriate. However, a pattern of nonconstant, increasing variance was obvious (i.e., higher predicted values were associated with larger residuals). Plots were then obtained for each clinic. The nonconstant variance was characteristic of Clinic A, but was less obvious in the other two clinics. The standardized residuals were greater than 3.0 for 3 cases. All 3 cases had actual A1C values greater than 13, but predicted values were about 8. To assess the effect of these cases on the parameter estimates, the model was re-estimated with these cases deleted. The coefficients and $r^2$ were similar to the model reported in Table 16, so they did not appear to be exerting undue influence on the estimates.

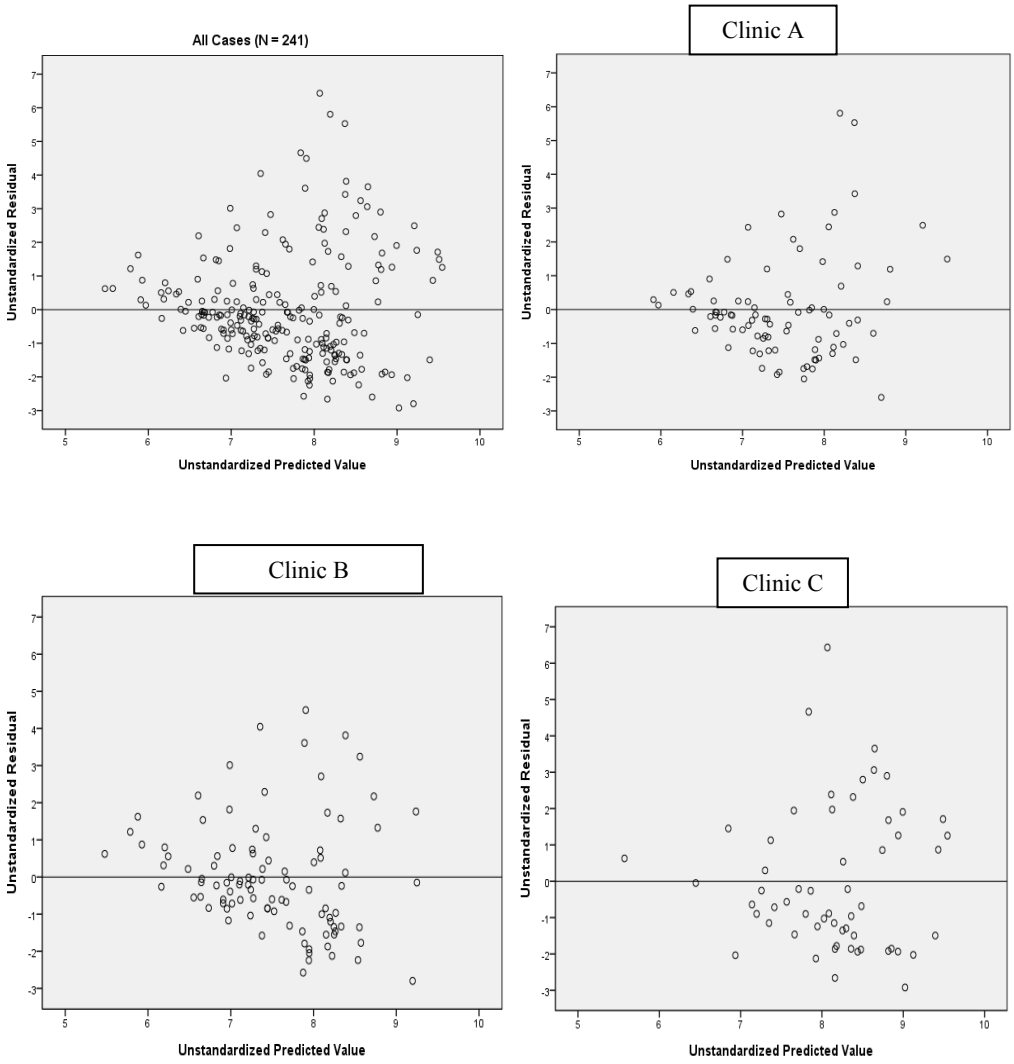


*Figure 5.* Scatterplots of regression residuals by predicted A1C values.

Table 15
*Means, SDs, and Correlations among Variables Used in the Regression Analysis*

| | Variables | Y | X1 | X2 | X3 | X4 | X5 | X6 | X7 | X8 |
|---|---|---|---|---|---|---|---|---|---|---|
| Y | A1C | 1.00 | | | | | | | | |
| X1 | Adherence | -.197 | 1.00 | | | | | | | |
| X2 | SED | -.237 | .437 | 1.00 | | | | | | |
| X3 | CSR | -.220 | .287 | .473 | 1.00 | | | | | |
| X4 | Years since diagnosis | .112 | .191 | .132 | .059 | 1.00 | | | | |
| X5 | Age | -.264 | .196 | -.120 | .175 | .266 | 1.00 | | | |
| X6 | Gender | -.080 | -.121 | .156 | .002 | -.156 | -.123 | 1.00 | | |
| X7 | Clinic A effect | .001 | .021 | .130 | .093 | .002 | -.127 | .165 | 1.00 | |
| X8 | Clinic C effect | .126 | .086 | .118 | .054 | .177 | -.091 | .059 | .582 | 1.00 |
| | Mean | 7.651 | 4.329 | 7.432 | 4.022 | 9.06 | 57.93 | 1.53 | -.05 | -.17 |
| | SD | 1.803 | 1.175 | 2.039 | .481 | 7.86 | 11.89 | .500 | .874 | .785 |

*Note.* $N = 241$. A1C = hemoglobin A1C (glycosolated hemoglobin) as measure of four month average blood glucose; SED = Self Efficacy for Diabetes Tool; CSR = Cherokee Self Reliance Questionnaire.

Table 16
*Regression: Predicting Glycemic Control*

| Predictor | *b* | *se (b)* | *b** | *t* | *p* |
|---|---|---|---|---|---|
| Constant | 13.259 | 1.05 | | 12.69 | .001 |
| Adherence | -.171 | .103 | -.112 | -1.66 | NS |
| Self efficacy | -.152 | .064 | -.171 | -2.36 | .02 |
| Cherokee Self reliance | -.272 | .254 | -.073 | -1.07 | NS |
| Years Since Diagnosis | .045 | .014 | .195 | 3.12 | .002 |
| Age | -.041 | .010 | -.270 | -4.27 | .001 |
| Gender | -.410 | .220 | -.114 | -1.86 | NS |
| Clinic A Effect | -1.56 | .153 | -.075 | -1.02 | NS |
| Clinic C Effect | .380 | .168 | .165 | 2.26 | .03 |

*Note.* $R = .45$, $R^2 = .20$, $Adj\ R^2 = .174$.

# CHAPTER V

# DISCUSSION

## Key Findings and Interpretation

In this sample of Cherokee adults with type 2 diabetes, the individual characteristics of self efficacy, years since diagnosis and age were all significant predictors of A1C. Cherokee self reliance, adherence to self care and gender were non-significant predictors of A1C. In addition to individual factors, a clinic effect (clinic C, compared to reference clinic B) significantly predicted A1C. Self efficacy for diabetes and Cherokee self reliance emerged as similar but separate concepts, based on correlations among the total scores despite distinct relationships with underlying factors in the analysis of Diabetes Self Efficacy Scale and Cherokee Self Reliance Questionnaire item responses. Exercise was reported to be a more challenging aspect of diabetes self care than diet or medication regimen, based on lower ratings for exercise items on both the Diabetes Self Efficacy Scale and Summary of Diabetes Self care Activities Scale. The alpha reliability for the Summary of Diabetes Self care Activities Scale was acceptable ($\alpha = .78$) but corrected item-total score correlations were modest. Some activities were performed relatively more often (general dietary guidelines, medications, self monitoring of blood glucose, examining feet) whereas others were less often

performed (spacing carbohydrates, exercising, inspecting shoes), based on the self reports.

**Predicting A1C**

**Predictability of A1C.** In this study, the $R^2$ for prediction of A1C was .20. Self efficacy, age, years since diagnosis, and Clinic C compared to Clinic B were the only significant predictors of glycemic control as measured by A1C. Implications that can be drawn from this study with respect to research predicting A1C would be that there may be additional variables needing investigation to better predict glycemic control. Type 2 diabetes is extremely complex and challenging to manage or predict.

From the data related to predicting glycemic control, older age was associated with lower (better) A1C values. Gilliland, Carter, Skipper, & Acton (2002) found A1C levels decreased with increasing age. Survival bias may partially explain this finding because those with more severe disease may have succumbed to complications at a younger age. There may also be a cohort effect reflecting the increasing incidence of type 2 diabetes at an earlier age (ADA, 2012; Jacobson et al., 1987).

**Multicollinearity issues.** Correlations within the set of self efficacy, self reliance, and adherence were relatively high. Adherence was related to self efficacy ($r$ = .437) and Cherokee self reliance was related to self efficacy ($r$ = .473). At the same time, each of these variables also has similar correlation with A1C ($r \approx .2$). Only self efficacy, the strongest correlate with A1C, was a significant predictor of A1C. Because the shared variance of self efficacy with self reliance was so high, there was nothing left to predict A1C; it had been accounted for in the coefficient for self efficacy ($b$ = - .152, $p < .02$).

Cherokee self reliance and adherence may still be important, but if so the effects of adherence and self reliance, if any, were accounted for by self efficacy.

**Measurement.** When a person with type 2 diabetes has an A1C > 7, the reason should be examined. Reviewing A1C trends over time and any influencing factors may have clinical significance, as A1C may also increase related to chronic infection or stress. Dichotomously **s**coring A1C by categories of $\leq 7$ and > 7, therefore, may be informative.

Scoring of other predictors, especially using subscales is also worthy of consideration. It is common for adherence to diet, exercise, and medication to be occurring at differing degrees simultaneously. Examining each of these aspects of adherence combined and independently may have clinical significance.

**Design.** Clinic was initially regard as a nuisance variable in the design of this study, and was not intended or expected to provide significant prediction or explanation. Yet, this was not the case. To better understand the variation in individual A1C, future studies should incorporate a multi-level perspective, including measurement of clinic characteristics (Raudenbush & Bryk, 2002).

**Self Efficacy and Cherokee Self reliance**

**Conceptualization and factor structure.** Findings from the factor analysis indicated that self efficacy and Cherokee self reliance are distinct. This may have been a result of the items on the Diabetes Self Efficacy Scale being specific to diabetes and the concept of self efficacy being very behavior specific with respect to exercise, diet, and medications. In contrast, Cherokee self reliance reveals a more general conceptualization. As originally conceptualized, Cherokee self reliance encompasses

being responsible and caring for oneself, as well as being disciplined or setting and pursuing goals (Lowe, 2002). As culturally understood, Cherokee self reliance also means being confident and having a sense of identity and a sense of self worth from the holistic and circular Cherokee word view. The structure that emerged from the factor analysis of responses of Cherokee adults to the Cherokee Self Reliance Questionnaire was somewhat different, with "self" and "other" orientations appearing in the factor structure. To better understand the structure of the Cherokee Self Reliance Questionnaire and generalizability of interpretation of the scores, it is recommended that the Cherokee Self Reliance Questionnaire be utilized with more Cherokee varying in age and health status. Comparing average Cherokee Self Reliance Questionnaire scores in known groups, correlation data with cultural engagement, and replication of the factor structure in independent samples are additional research findings that will help to elaborate the nomologic network for the Cherokee self reliance construct (cf. Cronbach & Meehl, 1955).

**Predictive validity.** Cherokee self reliance initially was examined to see if it might be a better predictor or complimentary predictor to self efficacy. Self efficacy was a significant predictor of A1C, but Cherokee self reliance was not. The zero order correlation between Cherokee self reliance and A1C was significant ($r$ = -.220), however (Table 15).

**Cherokee cultural practices.** Items from the Cherokee Self Reliance Questionnaire addressing Cherokee language and cultural practices were unrelated to the self-orientation and other-orientation factors that emerged in the analysis of item

responses. There may still be more clinical significance than statistical significance in assessing the degree to which Cherokee adults with type 2 diabetes speak Cherokee, believe in Cherokee ways, and are proud of their Cherokee heritage. Since the Removal and the Trail of Tears, the Cherokee have drawn upon cultural strengths to "adapt, survive, prosper, and excel" (Cherokee Nation Annual Report to the People, 2011). It is time to emphasize applying this cultural tradition to addressing the increasing prevalence of type 2 diabetes.

**Diabetes Self care and Glycemic Control**

**A1C.** "Because A1C is thought to reflect average glycemia over several months and has strong predictive value for diabetes complications, A1C testing should be performed routinely in all patients with diabetes, at initial assessment and then as part of continuing care" (ADA, 2012, p. S18). Measurement should occur approximately every three months to determine whether or not blood glucose targets have been attained and maintained. In this sample of Cherokee adults with type 2 diabetes, A1C values ranged from 4.9% to 14.5% and many were above the recommended target of 7% (ADA, 2012, p. S18). Further, average A1C varied by clinic (Table 15), and increasing age was associated with lower (better) A1C values.

In a study by Gilliland et al. (2002), the average A1C for a national Native American sample was 8.86% (*SD* = 2.3) which was higher (worse) than the average A1C at all three Cherokee Nation clinics in this study. This indicates results better than the national Native American average reported (Gilliland et al., 2002) in 1998, but there is

still room for improvement with respect to meeting the recommended A1C standard (ADA, 2012).

The negative relationship between age and A1C ($r$ = -.264) in this study (Table 15) was unexpected because as disease severity and time since diagnosis increase with age, this progression might logically be thought to be related with increasing A1C (so the correlation between age and A1C would be anticipated to be positive). The negative correlation between age and A1C has also been reported in other Native American samples (Gilliland et al., 2002, Table 2). Survival bias is one explanation (i.e., those with more severe disease have succumbed to complications of diabetes and are not available to be included in the sample of older Cherokee). Cohort effects could also create this pattern; (i.e., diabetes is appearing at younger ages and with greater severity or less adherence to self care among Native American youth, creating a negative correlation) (Kovacs, Brent, Steinberg, Paulauskas, & Reid, 1986).

**Adherence.** Adherence data from Table 12 indicate that exercise was more challenging than diet or medication. With respect to adherence, Orme (1989) and Johnson (1992) both described patients being more adherent to taking medications and less adherent to diet and exercise which is consistent with the data in this study. Adherence to exercise 30 minutes 3 times each week is challenging for the general population in the United States as well (Downs & Hausenblas, 2005; Gleeson-Kreig, 2006; Kim & Kang, 2006; Umpierre et al., 2011).

Rhee et al. (2005) found emphasis on appointment keeping and medication adherence was associated with A1C (p. 247). Adherence to a prescribed medication

routine was not found to be especially challenging for Cherokee in this study. This may be explained in part by the Indian Health Service benefit that medications and supplies for self monitoring of blood glucose are provided free of charge, can be obtained at the clinic after a regularly scheduled appointment, or even delivered by U.S. mail.

**Clinic differences.** Although the three clinics were all part of the Cherokee Nation Health Services, they had very unique differences in geography and patients served. Clinic A was the least rural of the three clinics and Clinic C the most rural. Clinic C also had the highest proportion of those who spoke Cherokee. Clinic A is the newest and has the largest clinic facility; Clinic B is the oldest and smallest, with ground broken for expansion.

Information regarding the number of certified diabetes educators**,** dieticians and other staff was not part of this study. The availability of space for patient education by certified diabetes educators, dieticians, podiatrists (Bray, Cummings, & Thompson, 2011), the range of education of the recipients of care, and accessibility of clinics (Zgibar et al., 2011) have been cited in previous studies and may have impacted the results of this study. The average perceived level of professional, personal, and social support at clinics was also associated with variation in A1C values (Karlsen, Oftendal, & Bru, 2012). Exploration of the relationship between perceived professional and social support from clinic personnel and A1C results is an important avenue for future research.

**Self efficacy.** Participants reported (Table 10) that exercise was where they most lacked self efficacy. Understanding factors contributing to self efficacy for exercise was beyond the scope of this study. Further research to discover what might motivate

Cherokee adults with type 2 diabetes to increase their physical activity to a level of at least 30 minutes 3 times per week is needed. A systematic review of exercise beliefs found factors such as knowledge about the outcomes of exercise, attitudes about exercise, family support, and normative beliefs have a strong influence on exercise, while physical impairments inhibit exercise (Downs & Hausenblas, 2005). Further research to discover if these same factors might motivate Cherokee adults with type 2 diabetes to increase their physical activity to a level of at least 30 minutes 3 times per week is needed. A similar dynamic may have contributed to the unexpected clinic effect in this study if some participants perceived more professional and social support than others.

Since the mean was the highest for the item referring to self efficacy expressed as confidence in knowing when to see the doctor, access to care does not appear to be a major barrier among participants in this study. Care received at the clinics is free or requires no out of pocket expense for those tribal members with private insurance, but does on occasion require long waits for these services through Cherokee Nation (2011).

**Cherokee self reliance.** Items with mean scores of greater than 4.0 on the Cherokee Self Reliance Questionnaire included the self oriented items such as “I care about myself”, “I will get assistance when I need it to take care of myself”, “I think others can rely on me”, and “I help others when they need it”. Cherokee do appear to be proud of their heritage and patient education to assist in recognizing the connection between staying healthy and having the ability to pass on that valued heritage is worthy of emphasis in practice. A few posters connecting foot care and the ability to continue to

dance in traditional ceremonies were observed during data collection, but more emphasis on such aspects of Cherokee self reliance is appropriate.

## Limitations

### Convenience Sampling

The convenience sample was a limitation. Statistics comparing study participants to others receiving care in other Cherokee Nation health clinics are unavailable at this time. Generalizibililty of the findings of this study are dependent on the representativeness of the sample compared to other Cherokee adults with type 2 diabetes who are receiving care in the additional Cherokee Nation health clinics.

### Cross-sectional Design

Cross-sectional versus longitudinal design was a limitation because self efficacy and adherence to self care recommendations change over time as type 2 diabetes is diagnosed and progresses (Jacobson et al., 1987; Johnson, 1992; Kovacs et al., 1986). The cross-sectional data in this study provided a beginning look at the relationships that can be used as the basis for future longitudinal studies of self care among adult Cherokee with diabetes.

### Retrospective Self report

Adherence data collected in this study was through retrospective self report. This is an important limitation, especially in today's world where real time reporting is increasingly feasible. What participants recall regarding diet, exercise, and medication adherence may not be what happened in reality. Technological advances such as using cell phone cameras to take photos of plates at meal time (enabling calorie count), or

applications that can automatically upload results of real time self monitoring of blood glucose to primary care providers might also improve self report by making it less retrospective. Thus, m-health (mobile health) technology may help overcome the limitation of retrospective self report. Two studies (Årsand et al., 2010; Mulvaney, Ritterband, & Bosslet, 2011) used mobile technology as an intervention, but in the process collected real time data about diet. A study by Kim and Kang (2006) utilized a web-based intervention to promote physical activity and glycemic control. This is presumably more accurate than the general recall from self report. In future studies, real time monitoring will permit creation of individual data series allowing estimation of models for trajectories of caloric intake, trajectories of weekly weight, or trajectories of A1C that can overcome limitations related to cross-sectional design and retrospective recall (Henly, Wyman, & Findorff, 2011).

## Implications

### Theory

Bandura's (1997) social cognitive theory was beneficial in laying a foundation for examination of some psychosocial aspects of diabetes management. Social cognitive theory provided theoretical support for multiple studies in the literature review (Clark, 2004; Miller, 2006; Nelson, 2007; Sacco, 2005; Sacco, 2007; Sarkar, 2006; Savoca, 2001; Skaff, 2003; Whittemore et al., 2005). The correlation between self efficacy and adherence in this study ($r$ = .437) demonstrated continued application of social cognitive theory for understanding adherence to diabetes self care recommendations. The results here and elsewhere (Table 3) show usefulness, yet most are based on cross-sectional studies. The most that can be learned is that self efficacy and adherence are associated.

In future work, the recommendation is to make temporal assumptions in social cognitive theory explicit and design longitudinal studies to unravel the associations over time. Longitudinal studies to investigate further whether self efficacy leads to adherence or adherence leads to self efficacy or if there is a feedback relationship are also warranted. According to Johnson (1992), "The timing of measurements (of adherence) should be based on the stability of adherence behaviors and temporal congruity with other measure of interest" (p. 1658).

**Research**

**Measurement.** The Cherokee Self Reliance Questionnaire is a new instrument. The tool was developed for use with Cherokee adolescents with substance abuse issues, where it was found that Cherokee adolescent males who had higher Cherokee self reliance scores were more focused on family, community, and tribe than self (Lowe, 2009). This study was the first known time the Cherokee Self Reliance Questionnaire was utilized with Cherokee adults with type 2 diabetes. The 24 items were answered with ease and responses covered the full range of response options indicating the tool was useful in a practical sense and that participants had little difficulty in responding to the items.

Clarifying the concept of self efficacy through cognitive interviewing may aid in understanding and developing nursing interventions to promote self efficacy in dealing with diabetes and potentially other chronic illnesses (Gleeson-Kreig, 2006; Neder, 2003). Cognitive interviewing is a recommended method in this endeavor for instrument development and refinement (Tourangeau, 1984; Willis, 1999). Understanding self

efficacy may save health care dollars by increasing the emphasis on health promotion and preventing long term complications of chronic conditions.

**Practice**

Many basic lessons regarding management of type 2 diabetes were learned in the course of this study and are applicable to nursing practice. Type 2 diabetes lasts a lifetime, so adults with type 2 diabetes may also require frequent reinforcement that their adherence to diet, exercise, and medication recommendations remain important in preventing the complications associated with hyperglycemia. An important part of practice related to type 2 diabetes is patient education to prevent or delay complications from hyperglycemia.

**Patient education. "**Greater self efficacy predicted more frequent blood glucose testing, less skipping of medication and binge eating, and closer adherence to an ideal diet" (Ajasem et al., 2001, p. 393). Allen's (2004) study found a statistically significant relationship between self efficacy and exercise. Exercise was reported to be the most challenging area of adherence in this study. The self efficacy link with adherence can be used as a foundation for patient education.

The data from Figure 3 indicates that there is room for improvement in glycemic control among this sample of Cherokee adults with type 2 diabetes, based on the number of both women and men who did not have an A1C $\leq$ 7.0 which is the recommended target. A clinic effect was also noted and this could be an avenue for a follow up study. During data collection, flyers were noted in aggregated fashion comparing one provider's

patients to another's on smoking cessation. Similarly truly healthy competition to encourage improved glycemic control might be beneficial.

**Adherence to exercise.** There are walking trails near each of the Cherokee Nation clinics and the tribal "Wings" program provides free registration and tee shirts and other incentives for participation in any of over 12 organized 5 kilometer runs per year. The goal of the "Wings" program is health promotion through physical activity, healthy eating and health education (Cherokee Nation, 2012). Additional educational effort to promote physical activity would be beneficial. It is worthy of note that Cherokee Nation is located in a part of the country where little mass transportation exists and a mostly sedentary lifestyle is common.

**Cultural insight.** Even though the principal investigator in this study is Cherokee and received diabetes care at one of the participating clinics, many insights related to the culture of Cherokee were revealed through this study. Consulting traditional healers is generally information which is considered highly personal and may not shared with the principal investigator. Psychological research on diabetes can inform health care policy and changes in the health care system for Cherokee, other minorities, and the general population. Self efficacy and Cherokee self reliance are similar, but separate concepts. The importance of spirituality, family, and community were also demonstrated in responses to items on the Cherokee Self Reliance Questionnaire. Because adherence in individuals with type 2 diabetes varies across diet, exercise, and medication, it is important to include all areas in studies whenever feasible. Adherence

can also vary from day to day or across the lifespan, indicating a need for future studies with a longitudinal perspective.

## Conclusion

In light of the growing health disparity of type 2 diabetes among minority populations, this study documents the need for further research on self efficacy and adherence to recommended self care among minority adults, especially those who are from a rural setting. It is important to examine how self reliance changes across the lifespan from young adulthood to older adulthood, differs in rural vs. more urban settings and among individuals with limited health literacy. This study supports the need for further investigation into the psychological aspects of type 2 diabetes management, particularly among Native Americans and other minorities. There is much yet to explain glycemic control; future studies are indicated to determine if glycemic control can be improved through attention to culture and age during type 2 diabetes education. Additional research on psychological aspects of diabetes self-management can inform health care policy and changes in the health care system for Cherokee, other minorities, and the general population.

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# APPENDIX

# Appendix A

## Cherokee Attitudes and Behaviors for Managing Type 2 Diabetes Project

## Background Information

Instructions: Please answer the following questions related to your participation in this study by **checking the selected box or filling in the blank** in the second column.

| | |
|---|---|
| 1. At which Cherokee Nation facility do you receive most of your diabetes care? | ☐ Muskogee<br>☐ Tahlequah<br>Stilwell |
| 2. What is your gender? | ☐ Male<br>☐ Female |
| 3. What is your age? | _____ years |
| 4. What is your marital status? | ☐ Single<br>☐ Married<br>☐ Partnered<br>☐ Widow/Widower<br>☐ Divorced |
| 5. What is your **current** educational level? | ☐ GED<br>☐ High School Diploma<br>☐ Attended College<br>☐ 2 year Degree<br>☐ 4 year Degree<br>☐ Graduate School<br>☐ Other (specify) _____ |
| 6. Is your type 2 diabetes currently treated with: | (**Check all that apply**)<br>☐ Diet<br>☐ Exercise<br>☐ Oral Medication<br>☐ Insulin |
| 7. How many years ago were you diagnosed with type 2 diabetes? | _____ years |
| 8. During the previous 6 months, have you felt depressed or been told by a healthcare provider that you seemed depressed? | ☐ Yes<br>☐ No |
| 9. Have you ever taken part in a diabetes research study before? | ☐ Yes<br>☐ No |
| 10. Who completed the information on this form? | ☐ I did it alone.<br>☐ I did it with help.<br>☐ Someone other than me completed the form. |
| 11. What language do you speak at home? | ☐ English<br>☐ Cherokee |
| 12. Do you see a traditional healer about your diabetes? | ☐ Yes<br>☐ No |

## Appendix B

## Questionnaire Part I
## Diabetes Self Efficacy Scale

Instructions: We would like to know how confident you are in doing certain activities. For each of the following questions, please **circle the number** from the scale that corresponds to your confidence that you can do the tasks regularly at the present time.

***How confident do you feel that you:***

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13. can eat your meals every 4 to 5 hours every day, including breakfast every day? | not at all confident | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | totally confident |
| 14. follow your diet when you have to prepare or share food with other people who do not have diabetes? | not at all confident | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | totally confident |
| 15. know what foods to eat when you are hungry (for example, snacks)? | not at all confident | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | totally confident |
| 16. can exercise 15 to 30 minutes, 4 to 5 times a week? | not at all confident | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | totally confident |
| 17. can do something to prevent your blood sugar level from dropping when you exercise? | not at all confident | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | totally confident |
| 18. know what to do when your blood sugar level goes higher or lower than it should be? | not at all confident | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | totally confident |
| 19. can judge when the changes in your illness mean you should visit the doctor? | not at all confident | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | totally confident |
| 20. can control your diabetes so that it does not interfere with the things you want to do? | not at all confident | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | totally confident |

## Appendix C

## Questionnaire Part II
# Cherokee Self Reliance Questionnaire

Instructions: Please use the following number scale to respond to statements 1 -24. **Circle the number** in the appropriate column to indicate your degree of agreement with each statement.

| | **Strongly Disagree** | **Disagree** | **Unsure** | **Agree** | **Strongly Agree** |
|---|---|---|---|---|---|
| 21. I care about myself. | 1 | 2 | 3 | 4 | 5 |
| 22. I will get assistance when I need it to take care of myself. | 1 | 2 | 3 | 4 | 5 |
| 23. I think others can rely on me. | 1 | 2 | 3 | 4 | 5 |
| 24. I help others when they need it. | 1 | 2 | 3 | 4 | 5 |
| 25. My behavior and actions are respectful of others. | 1 | 2 | 3 | 4 | 5 |
| 26. I use resources responsibly provided by the Creator/God/Supreme being. | 1 | 2 | 3 | 4 | 5 |
| 27. I think my behaviors and actions represent my family well. | 1 | 2 | 3 | 4 | 5 |
| 28. I participate in traditional Cherokee ceremonies. | 1 | 2 | 3 | 4 | 5 |
| 29. I speak Cherokee. | 1 | 2 | 3 | 4 | 5 |
| 30. I have set goals for my future. | 1 | 2 | 3 | 4 | 5 |
| 31. I think about my personal talents, gifts and abilities when I set goals for my future. | 1 | 2 | 3 | 4 | 5 |
| 32. The decisions I make involve taking risks. | 1 | 2 | 3 | 4 | 5 |
| 33. I made decisions about my future without being forced by others. | 1 | 2 | 3 | 4 | 5 |
| 34. I believe in Cherokee ways. | 1 | 2 | 3 | 4 | 5 |
| 35. I get assistance when I need it to help me achieve my goals. | 1 | 2 | 3 | 4 | 5 |
| 36. If I do not achieve a goal, I can set other goals. | 1 | 2 | 3 | 4 | 5 |
| 37. I can change directions/paths to achieve my goals. | 1 | 2 | 3 | 4 | 5 |
| 38. I use resources provided by the Creator for the good of others. | 1 | 2 | 3 | 4 | 5 |
| 39. I am proud of my Cherokee heritage. | 1 | 2 | 3 | 4 | 5 |
| 40. I have personal talents and skills. | 1 | 2 | 3 | 4 | 5 |
| 41. I seek advice from others to pursue my goals. | 1 | 2 | 3 | 4 | 5 |
| 42. I learn to care for myself by watching the actions of others. | 1 | 2 | 3 | 4 | 5 |
| 43. I learn to care for myself from others who show me the way. | 1 | 2 | 3 | 4 | 5 |
| 44. My talents and skills are recognized by others such as (friends, family, community, or tribe). | 1 | 2 | 3 | 4 | 5 |

## Appendix D

## Questionnaire Part III
# The Summary of Diabetes Self Care Activities

Instructions: The questions below ask you about your diabetes self care activities during the past 7 days. If you were sick during the past 7 days, please think back to the last 7 days that you were not sick. **Circle the number** corresponding to your response.

**Diet**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 45. How many of the last SEVEN DAYS have you followed a healthful eating plan? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 46. On average, over the past month, how many DAYS PER WEEK have you followed your eating plan? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 47. On how many of the last SEVEN DAYS did you eat five or more servings of fruits and vegetables? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 48. On how many of the last SEVEN DAYS did you eat high fat foods such as red meat or full-fat dairy products? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 49. On how many of the last SEVEN DAYS did you space carbohydrates evenly through the day? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

**Exercise**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 50. On how many of the last SEVEN DAYS did you participate in at least 30 minutes of physical activity? (Total minutes of continuous activity, including walking). | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 51. On how many of the last SEVEN DAYS did you participate in a specific exercise session (such as swimming, walking, biking) other than what you do around the house or as part of your work? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

**Medications**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 52. On how many of the last SEVEN DAYS, did you take your recommended diabetes medication? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 53. On how many of the last SEVEN DAYS did you take your recommended insulin injections? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 54. On how many of the last SEVEN DAYS did you take your recommended number of diabetes pills? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

**Blood Sugar Testing**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 55. On how many of the last SEVEN DAYS did you test your blood sugar? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 56. On how many of the last SEVEN DAYS did you test your blood sugar the number of times recommended by your health care provider? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

**Foot Care**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 57. On how many of the last SEVEN DAYS did you check your feet? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 58. On how many of the last SEVEN DAYS did you inspect the inside of your shoes? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 59. On how many of the last SEVEN DAYS did you wash your feet? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 60. On how many of the last SEVEN DAYS did you soak your feet? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 61. On how many of the last SEVEN DAYS did you dry between your toes after washing? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

**Smoking**

Instructions: **Circle** the word corresponding to your answer to the following items.

| | | | | | |
|---|---|---|---|---|---|
| 62. Have you smoked a cigarette—even one puff—during the past SEVEN DAYS? | No | Yes | | | |
| 63. *If yes*, how many cigarettes did you smoke on an average day? Number of cigarettes: | | | | | |
| 64. At your last doctor's visit, did anyone ask about your smoking status? | No | Yes | | | |
| 65. If you smoke, at your last doctor's visit, did anyone counsel you about stopping smoking or offer to refer you to a stop-smoking program? | No | Yes | Do Not Smoke | | |
| 66. When did you last smoke a cigarette? | More than two years ago, or never smoked | Four to twelve months ago | One to three months ago | Within the last month | Today |

**Self Care Recommendations**

67. Which of the following has your health care team (*doctor, nurse, dietitian, or diabetes educator*) advised you to do? **Check all that apply**:

- ☐ Follow a low-fat eating plan.
- ☐ Follow a complex carbohydrate diet.
- ☐ Reduce the number of calories you eat to lose weight.
- ☐ Eat lots of food high in dietary fiber.
- ☐ Eat lots (at least 5 servings per day) of fruits and vegetables.
- ☐ Eat very few sweets (for example: desserts, non-diet sodas, candy bars).
- ☐ Other (specify): _____
- ☐ I have not been given any advice about my diet by my health care team.

68. Which of the following has your health care team (*doctor, nurse, dietitian or diabetes educator*) advised you to do? **Check all that apply**:

- ☐ Get low level exercise (such as walking) on a daily basis.
- ☐ Exercise continuously for at least 20 minutes at least 3 times a week.
- ☐ Fit exercise into your daily routine (for example, take stairs instead of elevators, park a block away and walk, etc.)
- ☐ Engage in a specific amount, type, duration and level of exercise.
- ☐ Other (specify): _____
- ☐ I have not been given any advice about exercise by my health care team.

69. Which of the following has your health care team (doctor, nurse, dietitian, or diabetes educator) advised you to do? **Check all that apply**:

- ☐ Test your blood sugar using a drop of blood from your finger and a color chart.
- ☐ Test your blood sugar using a machine to read the results.
- ☐ Test your urine for sugar.
- ☐ Other (specify):_____
- ☐ I have not been given any advice either about testing my blood or urine sugar level by my health care team.

70. Which of the following medications for your diabetes has your doctor prescribed? **Check all that apply:**

- ☐ An insulin shot 1 or 2 times a day.
- ☐ An insulin shot 3 or more times a day.
- ☐ Diabetes pills to control my blood sugar level.
- ☐ Other (specify): _____
- ☐ I have not been prescribed either insulin or pills for my diabetes.

## Appendix E

## CONSENT FORM

## CHEROKEE ATTITIDES AND BEHAVIORS FOR MANAGING TYPE 2 DIABETES

You are invited to be in a research study of attitudes and behaviors of Cherokees with type 2 diabetes. You were selected as a possible participant because you are receiving care at a Cherokee Nation diabetes clinic. If you are Cherokee, I ask that you read this form and ask any questions you may have before agreeing to be in the study.

This study is being conducted by: Diana D. Mashburn, MS, RN-BC, CNE, Doctoral Candidate at the University of Minnesota.

### Background Information:

The goal of this study is to learn about attitudes and behaviors of Cherokees in regard to managing their type 2 diabetes. Based on cultural background, these attitudes may be different than in Caucasians with type 2 diabetes. Blood sugar control will be assessed based on your most recent Hemoglobin A1C lab work. The long-term goal of this study is the promotion and development of culturally appropriate nursing interventions for improved management of type 2 diabetes.

### Procedures:

If you agree to be in this study, we would ask you to do the following things:

Participants will be asked to complete a survey asking about who you are, activities related to diabetes management, Cherokee beliefs and practices, and self care activities. These are things such as blood glucose monitoring, healthy eating, exercise, and taking prescribed medications.

### Risks and Benefits of being in the Study:

The minimal risk of this study is the accidental release of private health information about your Hemoglobin A1C values. I will minimize this risk by keeping your chart number separate from the A1C value and your survey responses.

The benefit to participation is helping the community learn more about attitudes of Cherokees in general toward managing type 2 diabetes.

### Compensation:

You will receive no payment for participation in this study.

**Confidentiality:**
The records of this study will be kept private. In any sort of report I might publish, I will not include any information that will make it possible to identify a specific participant. Research records will be stored securely under lock and key in a locked office and only the researcher and academic advisor will have access to the records.

**Voluntary Nature of the Study:**
Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with the University of Minnesota or with Cherokee Nation. If you decide to participate, you are free to not answer any question or withdraw at any time without affecting those relationships or services.

**Contacts and Questions:**
The researcher conducting this study is Diana D. Mashburn, MS, RN-BC, CNE, Doctoral Candidate. You may ask any questions you have now. If you have questions later, **you are encouraged** to contact her at [redacted], by phone at [redacted], or e-mail [redacted]. Her academic advisors are Ann Garwick, RN, PhD., phone [redacted]; e-mail [redacted] and Dr. Susan Henly, RN, PhD, phone [redacted]; e-mail [redacted].

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher(s), **you are encouraged** to contact the Research Subjects' Advocate Line, [redacted].

You may also contact Dr. Gloria Grim, MD, FAAP, Co-Chair Cherokee Nation Institutional Review Board, at [redacted] or [redacted]

***You will be given a copy of this information to keep for your records.***

**Statement of Consent:**

I have read the above information. When needed, I have asked questions and have received answers. I consent to participate in the study.

Signature:_____ Date: _____

Signature of Investigator:_____ Date: _____

# Appendix F

GWY.Ɔ DƎP
CHEROKEE NATION™
P.O. Box 948 • Tahlequah, OK 74465-0948 • (918) 453-5000

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Chad "Corntassel" Smith
Principal Chief

ᏁᏓᏍᏗ ᏁᏓᏂᏍ
Joe Grayson, Jr.
Deputy Principal Chief

June 25, 2010

Diana Mashburn
[redacted]

Dear Ms. Mashburn,

The Cherokee Nation Institutional Review Board has reviewed your revised proposal entitled "Self-efficacy/Self-reliance, Adherence to Self-care and Glycemic Control among Cherokees with Type 2 Diabetes." Your revised protocol has been granted ***full approval.***

This decision will remain in effect for one year, until, June 25, 2011 and must be renewed annually thereafter. We request that you submit a progress report 60 days prior to the anniversary of this approval. **Research will be stopped if the Cherokee Nation Institutional Review Board does not receive the report in time for annual review.** The following items should be included in the progress report:

1. Any other affiliated IRB approvals.
2. Any significant findings.
3. Any adverse reaction, injuries, catastrophic events. (These should have also been reported immediately to the CN IRB).
4. Any publications, presentations, abstracts, etc that have arisen from this project. (These also require prior CN IRB approval per our publication policy which is enclosed).
5. Any other information you feel is pertinent or important.

A final written progress report notification to the CN IRB that the research is completed along with a final written progress report is also required. **No changes may be made to the protocol or consent form without prior approval from the CN IRB.**

We are excited about this project and look forward to reviewing any future submission you may have. If you have any questions, please contact me at [redacted]

Sincerely,
[redacted]

Sohail Khan, MBBS, MPH, CIP, Epidemiologist
Co-Chair, Cherokee Nation Institutional Review Board
FWA# 00000447

# Appendix G

UNIVERSITY OF MINNESOTA

*Twin Cities Campus*

***Human Research Protection Program***
*Office of the Vice President for Research*

*D528 Mayo Memorial Building*
*420 Delaware Street S.E.*
*MMC 820*
*Minneapolis, MN 55455*

*Office: 612-626-5654*
*Fax: 612-626-6061*
*E-mail: irb@umn.edu or ihc@umn.edu*
*Website: http://research.umn.edu/subjects/*

June 30, 2010

Diana D Mashburn
[redacted]

RE: "Self-efficacy/Self-reliance, Adherence to Self-care and Glycemic Control among Cherokees with Type 2 Diabetes"
IRB Code Number: **1003P79252**

Dear Ms. Mashburn

The Institutional Review Board (IRB) received your response to its stipulations. Since this information satisfies the federal criteria for approval at 45CFR46.111 and the requirements set by the IRB, final approval for the project is noted in our files. Upon receipt of this letter, you may begin your research.

IRB approval of this study includes the consent form and flyer received June 25, 2010.

The HIPAA Authorization received June 25, 2010 has been approved.

The IRB would like to stress that subjects who go through the consent process are considered enrolled participants and are counted toward the total number of subjects, even if they have no further participation in the study. Please keep this in mind when calculating the number of subjects you request. This study is currently approved for 450 subjects. If you desire an increase in the number of approved subjects, you will need to make a formal request to the IRB.

For your records and for grant certification purposes, the approval date for the referenced project is April 3, 2010 and the Assurance of Compliance number is FWA00000312 (Fairview Health Systems Research FWA00000325, Gillette Children's Specialty Healthcare FWA00004003). Research projects are subject to continuing review and renewal; approval will expire one year from that date. You will receive a report form two months before the expiration date. If you would like us to send certification of approval to a funding agency, please tell us the name and address of your contact person at the agency.

As Principal Investigator of this project, you are required by federal regulations to inform the IRB of any proposed changes in your research that will affect human subjects. Changes should not be initiated until written IRB approval is received. Unanticipated problems or serious unexpected adverse events should be reported to the IRB as they occur.

The IRB wishes you success with this research. If you have questions, please call the IRB office at [redacted]

We have created a short survey that will only take a couple of minutes to complete. The questions are basic, but will give us guidance on what areas are showing improvement and what areas we need to focus on:

https://umsurvey.umn.edu/index.php?sid=36122&lang=um

Sincerely,

Christina Dobrovolny, CIP
Research Compliance Supervisor
CD/bw

CC: Ann Garwick