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In partial fulfillment of the requirements for the degree of Doctor of Nursing Practice, 2012
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Executive Summary

Diabetes is a complex, multifaceted condition that involves genetics, behavior patterns, environmental factors, cultural and religious beliefs, socioeconomic status, existing co-morbid conditions, and age. The purpose of this integrated literature review was to establish clinical guideline recommendations based on existing literature, expert opinion and clinical practice. This project was proposed as an integrated literature review of current recommendations for glycemic goals in diabetic patients over the age of 75. In addition to an integrated literature review, this project included results of an e-mail questionnaire that explored factors that influence decision making for local and regional clinicians who provide diabetes care for the elderly.

The objectives of this project were: 1) Develop an integrative review and summary of literature specifically addressing the unique needs of diabetes management in persons age 75 and older; 2) Determine current practice by means of a questionnaire to health care providers that treat the elderly population with diabetes; 3) Submit recommendations arising from the review to the Utah and Wyoming Diabetes Prevention and Control Programs; and 4) Present findings and results of this project to the staff and health care providers at St. John’s Hospital in Jackson, Wyoming.

After obtaining IRB approval, the questionnaire was distributed to approximately 2000 healthcare providers. Four-hundred and fifty-three responses were obtained, with 200 of these involved in primary care. A majority (89%) acknowledged the importance of specific guidelines for this population, yet only 20.5% reported using specific guidelines. Eighteen percent of respondents reported a hemoglobin A1C (A1C) <7.0% was optimal in the elderly; 7.6%, stated 7.0% to 7.9%; 23.4 percent state 8.0%. The general consensus of the literature review stressed individualized treatment of diabetes in the elderly and quality of life as priorities of management. Specific recommendations for management of the elderly with diabetes include: individual patient assessment including comorbid conditions and risk of hypoglycemia, avoidance of “diabetic diet”, encouraging exercise, frequent reassessment of medications, evaluation of limitations, simplification of regimes, and relaxed A1C guidelines. Aggressive pursuit of an A1C of < 7% is not recommended, particularly in the frail elderly. The Utah Diabetes Prevention and Control Program is now considering these recommendations for revisions to the Utah State Diabetes Practice Recommendations.

The objectives were fulfilled upon: 1) Approval of the integrative review and recommendations by content experts and committee chair; 2) Completion of a questionnaire of health care providers that treat elderly population with diabetes; 3) Submission of results of survey and integrated review with recommendations for specific and realistic glycemic goals for aged diabetics to the Utah and Wyoming Diabetes Prevention and Control Programs; and 4) Presentation of recommendations in January 2013 to the staff at St. John’s Hospital.

The DNP Essentials addressed in this project include: Essential I: Scientific Underpinnings for Practice and Essential III: Clinical Scholarship and Analytical Methods for Evidence-Based Practice.

The Project Chair for this project was David Winmill, DNP, ANP, CDE, BC-ADM. Robert E. Jones, MD- Medical Director of the Utah Diabetes Center and Katarina F. Felsted, MS-Director, Gerontology Interdisciplinary Program served as content experts. Assistance in survey design and statistical support was provided by Brenda Ralls, PhD, Research Consultant, Utah Diabetes Prevention and Control Program.
Background

The treatment and management of chronic conditions, like diabetes, in person’s over the age of 75 present unique challenges for healthcare providers. By the age of 65, most persons have at least one chronic medical condition, and many have multiple medical conditions including hypertension, heart disease, arthritis, cancer and diabetes (Administration on Aging, 2010). Current estimates are that 19%-25% of the elderly population has diabetes (Administration on Aging, 2010), (Meneilly, 2003). Diabetes is the seventh leading cause of death in the US, and complications of diabetes cost taxpayers and insurance companies millions of dollars each year, not to mention the social and psychological impact the disease has on those it affects (Conlon, 2010). Additionally the population of elderly is exploding around the world; those over the age of 75 encompass the fastest growing sector of the older population (Peel & Wilson, 2008). In the early 1900’s the number of persons age 75 and older was estimated to be around 900,000. This “very elderly” population is now projected to reach 22 million by the year 2020 (Administration on Aging, 2010).

The frail elderly represent a vulnerable and marginalized population and thus have generally been excluded from research due to issues such as ethical concerns, cognitive and physical limitations that limit participation in research and threatens validity, as well as poor concentration and comprehension skills that may threaten quality of data (Peel & Wilson, 2008). Health care providers are faced with new and ongoing challenges to help the elderly population age successfully. With this growing population of elderly diabetics, it is not clear how to best manage the delicate balance between risks and benefits of treatment.

An emerging body of literature has explored the underrepresentation of the very elderly in research studies as well as in clinical practice guidelines. A number of reasons are given for
the lack of inclusion of the frail elderly in clinical trials including greater severity of disease, comorbid conditions, place of residence, and cognitive and physical limitations (Cox, Kloseck, Crilly, McWilliam, & Diachun, 2011). Any or all of these issues may be a threat to the internal validity of a study (Cox et al., 2011). However, exclusion of this growing population from research limits the generalizability and recommendations of research and guidelines.

**Problem Statement**

Helping patients over the age of 75 manage their diabetes is a growing challenge for healthcare providers due to the great heterogeneity of this population. The population over age 75 has the most diversity of health, illness, cognitive and physical capabilities, and social support than all other age groups. Very elderly diabetics are often prescribed complicated and costly therapy regimens to control diabetes and its potential complications in attempt to maintain “goal A1C levels” of <7%. Currently there is limited research that has investigated actual patient outcomes as related to specific A1C or blood glucose levels and there are no standardized guidelines for glucose management specifically geared towards elderly diabetics. Existing treatment programs are based on guidelines for younger diabetics and can be difficult to generalize to the very elderly as well as challenging for an elderly person to follow. Adhering to strict glucose targets places the elderly at risk for hypoglycemia, polypharmacy, injurious falls, adverse side effects, and drug-to-drug interactions. Additionally, overlapping guidelines from multiple evidenced based recommendations and treatments without consideration for comorbidities can increase the risk of injury and polypharmacy in the elderly (Cox et al., 2011). The health care community currently relies upon expert opinion, extrapolation, and common sense to make data applicable to the elderly. Standardized guidelines that consider the unique
context of the very elderly diabetic need to be formulated and implemented in order to prevent injury, enhance quality of life, and optimize aging in the very elderly.

While current guidelines provide some flexibility for adjustment of glycemic, lipid, and blood pressure targets in the general diabetic population, there are no clear, evidence based recommendations that allow for generalization of therapy to the very elderly population. Some guidelines, such as those published by the American College of Clinical Endocrinologists (ACCE) do not address the elderly as a separate population (Handelsman et al., 2011). Multiple studies have shown that there is no doubt that early glycemic control prevents microvascular and macrovascular complications related to diabetes, however these studies failed to include persons over the age of 75 or those with significant co-morbid illnesses (Matthews, 2011). This limits their applicability to the population over the age of 75. There is a variety of evidence-based literature regarding parameters for care of diabetes in the general population, but evidence based guidelines for the elderly are limited and recommendations are generally based on expert opinion rather than research.

**Project Description**

**Objectives**

1. Identify current literature that discussed glycemic guidelines in patients age 75 and older with preexisting diagnosis of diabetes.

2. Compile an integrated review and summary of literature that specifically addressed the use of unique guidelines in the diabetes management in the population age 75 and older.

3. Determine current practice for managing diabetes in the patient population age 75 and over by means of a questionnaire distributed by e-mail to a sample of health care providers that treat elderly who live with diabetes.
4. Submit these findings, including any recommendations that arose from the review, for review by the Utah and Wyoming Diabetes Prevention and Control Programs.

5. Present a professional, oral presentation to the staff and healthcare providers at St. John’s Hospital in Jackson, WY.

It was the purpose of this project to explore existing literature, as it related to the use of glycemic guidelines in the elderly, potential risks and benefits of existing guidelines, and the evidence supporting the use of current guidelines in elderly persons with diabetes. Additionally this project explored current clinical practice for the treatment and management of diabetes in the population over the age of 75.

Clinical and Policy Implications

Addressing the clinical implications for revised guidelines for diabetes treatment in the population over the age of 75 requires a paradigm shift from previous management styles. The heterogeneous and unique population over the age of 75 presents a number of challenges in the management of type 2 diabetes for both the healthcare provider and the patient. Existing American Diabetes Association (ADA) guidelines, European Diabetes Working Guidelines (EDWG), American Geriatric Society (AGS) guidelines, and Veterans Affairs/Department of Defense (VA/DoD) guidelines all suggested that patients with a life expectancy of greater than ten years, without significant co-morbidities, and are cognitively intact should follow existing guidelines developed for younger adults (Abbatecola & Paolisso, 2009). However, uncertainty regarding the benefits of these glycemic guidelines in the treatment of the very elderly with diabetes has recently been raised, particularly in regards to the lack of clinical trial data that weighs the benefits of long-term intensive glucose control in the elderly population, risks of hypoglycemia, cognitive or functional impairments, significant comorbid conditions, and
Diabetes Management in the Very Elderly

Optimization of quality of life (Huang, Zhang, Gandra, Chin, & Meltzer, 2008). These "guidelines" are vague and dynamic.

Patients with diabetes, in any age group, but most especially the very elderly, need to be assessed at each visit for cognitive, physical, social and financial limitations that may interfere with their ability to manage their diabetes. Clinicians must take into consideration patient safety as a key priority in managing diabetes in the elderly. Prevention of hypoglycemia is critical to avert injurious falls, poly-pharmacy, myocardial ischemia and drug-to-drug interactions (Inzucchi et al., 2012). Symptomatic hyperglycemia needs to be avoided, as well, as it may cause dehydration, urinary incontinence, blurred vision, impaired wound healing, and falls (Neumiller & Setter, 2009). This is a difficult and delicate balance to maintain, and each patient must be evaluated individually with personal goals, physical and cognitive abilities, disease duration, life expectancy, established vascular complications as well as resources and social support systems (Inzucchi et al., 2012). Additionally, several ethical issues must be addressed as practice guidelines are individualized. These include a potential perception by patients or their families that a clinician may be providing inferior care if standardized goals are not met. As well, many insurance companies measure performance of providers based on whether or not patients are meeting specific practice goals. These issues need to be addressed before a change in guidelines can be successful. The clinician, patient, and the patient’s family need to assess how diabetes treatment impacts quality of life and perhaps may impede a person from the ability to age safely and gracefully. Determination of life expectancy is difficult and often underestimated, thus practitioners must use caution when using this parameter to set care goals (Lowry, Vallejo, & Studenski, 2012).
Policy implications for relaxed clinical guidelines in elderly diabetics would impact a number of stakeholders including the healthcare providers, insurance companies, labs, hospitals and other healthcare facilities, as well as state and national diabetes and endocrinology associations. At the forefront of diabetes care in the very elderly is maintenance of quality of life and successful aging.

**Implementation**

**Keywords:** Diabetes care, diabetes, elderly, frail elderly, older adults, diabetes management, diabetes guidelines, practice guidelines, guidelines for diabetes treatment, Advanced search limitations: Human studies, English language, age >65, full text available.

A comprehensive review of data and literature were collected by means of a search of PubMed and CINAHL on line databases. Reverse searches were also completed from bibliographies of articles addressing the topic. With the exception of the landmark studies and guidelines, all literature collected was published between 2008 and 2012 to ensure that the literature evaluated was as current as possible. Minimal information was garnered by extending the search prior to 2008. An integrative review was chosen for this topic to include qualitative, quantitative and mixed methods studies (Pluye, Gagnon, Griffiths, & Johnson-Lafleur, 2009). The integrative approach allows for a more holistic approach to a topic as opposed to a single approach, thus providing deeper insight into the topic (Pluye et al., 2009). Synthesizing all data on the topic of diabetes guidelines in the very elderly allowed for an expansion of the breadth and depth of understanding and substantiation of the information based on all types of empirical research (Pluye et al., 2009). A systematic approach for selecting and evaluating studies for this review utilized a combination of the PRISMA guidelines (Moher, Liberati, Tetzlaff, & Altman, 2009) as well as a mixed methods research scoring system developed by Pluye, et al. (Pluye et
al., 2009) specifically for analyzing qualitative, quantitative, and mixed methods research (Appendix A). Because most of the available literature addressing glycemic guidelines in the elderly is based on expert opinion and extrapolation, the use of any one critical appraisal tool for the evaluation of existing literature proved to be impractical. Quality of evidence in the articles reviewed for this project were generally rated as “B”, “C”, or “E” (see appendix B) (American Diabetes Association, 2012b).

The purpose of this integrated review was to establish clinical guideline recommendations based on existing literature, expert opinion, and current clinical practice. Exclusion criteria was set for articles outside the set time frame (other than published guidelines or landmark studies), unpublished manuscripts, and articles that were interventional or addressed specific teaching strategies for elderly diabetics rather than establishing care guidelines and rational for such guidelines, articles that did not include or discuss persons over the age of 75. Sources were evaluated in terms of strength and technique of theory analysis (meta-analysis, randomized controlled trial (RCT), cross-sectional, descriptive studies etc.) (Whittemore & Knafl, 2005).

In order to garner an understanding of current diabetes management in the very elderly a questionnaire was sent via e-mail to local and regional healthcare providers that are responsible for administration of care to elderly diabetics. The questionnaire (see Appendix E) explored what, how and why decisions are made regarding glycemic, blood pressure control in the over 75 year old diabetic population. Participants were excluded if they did not provide care to diabetics age 75 or older. Brenda Ralls PhD, Research Consultant with the Utah Diabetes Prevention and Control Program was the primary consultant on this project assisting with the construction and distribution of the survey via Survey Monkey, as well as assisting with data collection and data
evaluation. Institutional Review Board (IRB) approval (Appendix D) was obtained prior to data collection. The ordered, coded, and categorized data was evaluated for patterns, themes, relationships, differences, and gaps (Whittemore & Knafl, 2005).

**Integrative Literature Review**

Four hundred forty six articles were initially identified through the search terms. Twenty seven full text articles were comprehensively appraised; four guidelines were reviewed, as well as three landmark studies. This comprehensive review process netted seventeen articles for inclusion in this project, as well as all four guidelines and the three landmark studies.

The seventeen articles retained included one weighted review, one longitudinal cohort study, two cross-sectional studies, one decisional analysis, one guideline implementation, one decisional analysis, one retrospective study, two observational study, one position statement, one case study, and five general review/expert opinion/deductive reports including one that was entitled a “point of view”. In all of the studies, current glycemic guideline use in the very elderly was addressed. All of the studies also shared a similar research question or primary purpose (see table 2).

**Frailty**

The concept of frailty was addressed in all of the articles. Frailty and geriatric syndrome are characterized by sarcopenia or the development of excess body fat with loss of lean body mass associated with age, decreased muscle strength, deterioration in nerve function, and declining cardiopulmonary reserve all of which generally lead to loss of independence and low quality of life for these elderly (Chen, Chen, Lin, Peng, & Hwang, 2010). Aside from these challenges, elderly persons with diabetes more commonly have malnutrition, depression, urinary incontinence, cognitive decline, functional disabilities, falls, increased rates of bone fracture, and
are at higher risk of hypoglycemic reactions than their younger or non-diabetic counterparts (Chen et al., 2010). Frailty decreases a person’s resistance to situational stressors, both physical and emotional, placing them at increased risk for injury related to illness, treatments, and polypharmacy (Abbatecola & Paolisso, 2009). Diabetes is known to accelerate the aging process due to accumulation of advanced glycation end products in the tissues, which is a marker of aging, as well as the high incidence of atherosclerotic disease in diabetics, both of which hasten geriatric syndrome and frailty (Araki & Ito, 2009). Additionally, elderly persons with diabetes tend to have reduced renal function, impaired liver function, diminished glucagon response, increased rates of malnutrition and decreased psychomotor function placing them at increased risk of complications from aggressive diabetes management (Soe, Sacerdote, Karam, & Bahtiyar, 2011). Due to sarcopenia, a normal serum creatinine does not necessarily reflect a normal creatinine clearance in elderly persons with diabetes, thus increasing the risk of medication side effects (Soe et al., 2011).

Another risk of aggressive diabetes treatment in the frail elderly is that recognition of hypoglycemia can be impaired due to decreased nerve function and a shift from adrenergic responses (sweating, tremors, palpitations) to neuroglycopenic symptoms (dizziness, weakness, confusion, nightmares, or violent behavior) (Hornick & Aron, 2008). Also, medications such as beta-blockers can suppress symptoms of hypoglycemia in the elderly (Hornick & Aron, 2008).

Lowry, Vallejo, and Studenski (2011) discussed successful aging as a multicontextual continuum of achievement that is based on a person’s mobility, disability, social involvement. The authors noted that neither arthritis nor diabetes, either alone or in combination, was related to length of life in the elderly, but that the combination of these two pathologies significantly exacerbated disability (Lowry, Vallejo, & Studenski, 2012). In discussing management and
treatment goals of diabetes with an elderly patient, a clinician must consider all aspects that may affect outcomes. These include, but are not limited to environment, social support, socio-economic status, limitations in activities, cognitive status, disability, and willingness to comply with treatment recommendations.

**Glycemic Recommendations**

The general consensus from the literature reviewed was that the healthy elderly, without significant comorbid conditions, and a life expectancy greater than 10 years should strive to meet glycemic goals established for younger diabetics, specifically, an A1C of 7% or lower (ADA 2012a; 2012b; California Healthcare Foundation/American Geriatrics Society Panel, 2003; CHF, 2003; Inzucchi et al., 2012; Lee et al., 2011; Soe et al., 2011; Veterans Administration/Department of Defense, 2010; Yau et al., 2012). For the frail elderly, most of the literature recommends maintaining an A1C less than 8% (American Diabetes Association, 2012a, 2012b; CHF, 2003; Inzucchi et al., 2012; Veterans Administration/Department of Defense, 2010). The VA/DoD recommend an A1C between 8% and 9% for patients “with advanced microvascular complications and/or major comorbid illness, and/or a life expectancy of less than 5 years is unlikely to benefit from aggressive glucose lowering management” (Veterans Administration/Department of Defense, 2010). As mentioned earlier, the issue with these recommendations is that none of them are grounded in evidence based research.

A single study was released during the course of this project that finally asked the question whether A1C levels could predict functional decline in older adults (Yau et al., 2012). This was a longitudinal cohort study of 367 community dwelling, nursing home eligible patients with a pre-existing diagnosis of diabetes and a mean age of 80 (Yau et al., 2012). It was
hypothesized that those participants with an A1C of 8% or less, as was the recommendation of the AGS guidelines, would fare better than those participants with higher A1C levels (Yau et al., 2012). This was not the case. After two years of study, those participants with an A1C level between 8% and 8.9% showed the lowest relative risk (RR) of death, functional decline, and the combined outcome of death or functional decline (Yau et al., 2012). An A1C less than 7% had the highest risk of poor outcomes and an A1C greater than 9% seemed to be associated with worse outcomes than that of the 8%-8.9% group (Yau et al., 2012). Admittedly, this study had limitations including the fact that it was observational and not randomized, there may have been participant bias, and that A1C was the only measure of glucose levels and may not be an accurate measure in certain physiological conditions, however, it has challenged the traditional guidelines and has opened the door for further study into the appropriateness of extrapolated guidelines in the elderly population (Yau et al., 2012).

Table 1- Summary of articles reviewed

<table>
<thead>
<tr>
<th>Author/Year</th>
<th>Design/No of subjects</th>
<th>Intervention</th>
<th>Control group</th>
<th>Tool(s)/Outcome times</th>
<th>Outcomes/Other findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soe et al, 2011</td>
<td>Weighted review</td>
<td>Review of current literature</td>
<td>N/A</td>
<td>Suggested framework to determine glycemic treatment targets in elderly pts with DM. No time frame for search</td>
<td>A1C goals for well elderly&lt;7%; A1C goals for frail elderly &lt;8%; minimize risk of hypoglycemia; Prioritize lifestyle interventions; Careful use of oral medications; Use of insulin pen delivery systems; telehealth approaches; awareness of alternative therapies; protection from formulary changes by rx plans</td>
</tr>
<tr>
<td>Yau et al, 2012</td>
<td>Longitudinal cohort/observational study/367</td>
<td>Repeated measures of glycemic control and functional decline</td>
<td>None</td>
<td>Measurement of A1C; measurement of functional decline and/or death 2 years</td>
<td>A1C&lt;7%-Worst outcomes A1C 7%-7.9%- reference group A1C 8%-8.9%- Best outcomes A1C &gt;9%-Suggested worse outcomes</td>
</tr>
<tr>
<td>Chin et al, 2008</td>
<td>Cross-sectional/473 patients and 64 physicians</td>
<td>Patient survey and physician survey</td>
<td>None</td>
<td>Assessed global health perception of patients as compared to physician goals for each individual patient</td>
<td>Pt and physician responses were most dependent on life expectancy Physician goals differed by specialty Encouraged physician to operationalize individualization of care</td>
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<tr>
<td>Study</td>
<td>Study Design/Setting</td>
<td>Intervention/Outcome Measures</td>
<td>3 years</td>
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<tr>
<td>Bruce et al, 2009</td>
<td>Cross-sectional/302 pts with dementia or cognitive impairment</td>
<td>Assessment for association between hypoglycemia and cognitive status/historical hypoglycemia and predicted decline in cognitive decline and use of health related services (HRS) for hypoglycemia.</td>
<td>Non-demented patients Self-reports hypoglycemic episodes and Dr. interpretation of events 2001-2002 Severe hypoglycemia does not cause or contribute to cognitive impairment and dementia in diabetes. Frail elderly and elderly with dementia are at substantial risk of hypoglycemia and hypoglycemia requiring HRS.</td>
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<tr>
<td>Sjöblom et al, 2008</td>
<td>Observational/98 pts</td>
<td>Complete withdrawal of oral anti-diabetic drugs; complete insulin withdrawal when insulin doses were ≤20 u/day &amp; reduction by ½ in pts on &gt; 20 u/day.</td>
<td>No intervention Measurement of A1C &amp; measurement of plasma glucose fasting, 2 h after breakfast, bedtime, &amp; 2 AM 6 months Medication withdrawal was successful in 75% of pts. Average A1C dropped in the control group. Confirmed a high frequency of hypoglycemic episodes, especially at night.</td>
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<tr>
<td>Bouillet et al, 2010</td>
<td>Observational/retrospective/100 pts</td>
<td>Chart review to assess epidemiologic data, clinical data, &amp; to see if a pt is on diabetic diet or not.</td>
<td>No control group Chart review May 2008-January 2009 Among older nursing home pts, the prevalence of DM is high, control is too tight. Diabetic diets are useless for glycemic control and may hamper quality of life</td>
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<tr>
<td>Gadsby et al, 2011</td>
<td>Retrospective notes review/75 pts</td>
<td>Chart review to assess polypharmacy, appropriateness of meds prescribed, &amp; cost of meds.</td>
<td>No control group Chart review February 2010-April 2010 Average number of meds was 6.7/day. 75% were being prescribed meds for cardiovascular (CV) disease prevention. High costs associated with liquid preparations.</td>
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<tr>
<td>Huang, et al, 2008</td>
<td>Decision analysis/Computer model, in hypothetical patients - no actual subjects</td>
<td>Integration of multiple prediction models that projected the progression of DM through individual diabetes related complications and death</td>
<td>A1C of 7% - 7.9% Computer model Pt lifetime. Expected benefits of rigorous glycemic control progressively declined as the level of comorbid illness and functional impairment increased.</td>
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<tr>
<td>Lee et al, 2011</td>
<td>Guideline implementation/N=338 (before)</td>
<td>Clinician education in Pre-implementation, Finger stick and laboratory glucose</td>
<td>Greater intensity of treatment resulted in lower A1C levels, but</td>
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<tr>
<td>Author(s)</td>
<td>Study Design</td>
<td>Findings</td>
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<tr>
<td>N=289 (early) N=385 (late)</td>
<td>N/A</td>
<td>Early implementation and, late implementation groups were compared to each other. Measurements &amp; A1C measurements recorded in the electronic medical record (EMR). Hyperglycemic and hypoglycemic related ED visits, Antihyperglycemic medication use. Before- Oct 2002-Dec 2004 Early- Jan 2005-June 2006 Late- July 2006-Dec 2008 also in greater numbers of hypoglycemic episodes, greater number of hypoglycemic ED visits and increased numbers of medications. Less hypoglycemic episodes were found in the late group than the early implementation group. “Good guidelines sometimes do not make good quality indicators”</td>
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<tr>
<td>Inzucchi et al, 2012</td>
<td>Position statement N/A</td>
<td>Systematic review/consensus report. Published 6/2012 Encouraged pt centered, individualized approach, stressing pt choice. Addressing multifactorial risk reduction. A1C goals 7.5%-8% for those with extensive comorbid conditions, advanced disease, limited life expectancy, or if goals are too difficult to attain.</td>
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<tr>
<td>Hornick &amp; Aron, 2008</td>
<td>Review N/A</td>
<td>Treatment goals based on a discussion of benefits and harms with the pt. Nonpharmacologic therapy-diet &amp; exercise Caution with oral meds and simple insulin dosing regimens.</td>
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</tr>
<tr>
<td>Araki &amp; Ito, 2009</td>
<td>Review N/A</td>
<td>Assessment of Geriatric syndromes like depression, functional disability, falls, malnutrition, urinary incontinence, &amp; cognitive impairment in conjunction with micro and macrovascular complications, comorbid illness and social support when treating elderly people with DM.</td>
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<tr>
<td>Abbatecola &amp; Paolisso, 2009</td>
<td>Review N/A</td>
<td>Elderly persons with type 2 DM have increased risk of frailty, cognitive decline, &amp; physical disability. The EDWPG takes into account the importance of frailty syndrome with their published guidelines.</td>
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<tr>
<td>Chen et al, 2010</td>
<td>Review N/A</td>
<td>Stressed the importance of identifying and accommodating guidelines for the frail elderly</td>
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</table>
## Guidelines

There have been several published guidelines on the management of diabetes care by a variety of organizations including the American Diabetes Association (ADA), The American Association of Clinical Endocrinologists (AACE), the Department of Veterans Affairs and The Department of Defense (VA/DoD) (2010), and the American Geriatrics Society (AGS) (2003). All of these guidelines are based on systematic literature reviews, peer reviews, and professional judgment. The general consensus of all the guidelines is that diabetes care must be individualized to meet the unique needs of each patient, but, with the exception of the AGS guidelines, attention to the elderly population is limited or even non-existent as is the case with the AACE guidelines (Handelsman et al., 2011).

<table>
<thead>
<tr>
<th>Munshi, Maguchi, &amp; Segal, 2012</th>
<th>Review</th>
<th>Provide a balance, holistic approach to DM in the elderly</th>
<th>EDWPG. Published Aug 2012</th>
<th>Encouraged further research and development of therapeutic strategies for DM in the frail elderly.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laubscher, Regier, &amp; Bareham, 2012</td>
<td>Case Study 2 subjects</td>
<td>Individualization of glycemic management</td>
<td>Goal setting algorithm for older persons with attention to risk of hypoglycemia and tactics for lowering glucose levels safely. Published April 2012</td>
<td>Diabetes management in the elderly requires a holistic, individualized approach to provide maximum benefit while minimizing risk. Establishment of patient centered quality-of-life goals.</td>
</tr>
<tr>
<td>Vandenhaute, 2012</td>
<td>Point of View</td>
<td>A need for new guidelines in end of life populations with DM</td>
<td>Discussion &amp; review of Landmark studies that have been instrumental in formulation of current guidelines. Published July 2012</td>
<td>Weighing benefit vs discomforts of treatment of DM in end of life care. Urged the formulation of guidelines for persons with diabetes in the final years of life.</td>
</tr>
</tbody>
</table>
The most current of these guidelines are those published by the ADA in January 2012 (American Diabetes Association, 2012a, 2012b) with a position statement issued in June 2012 (American Diabetes Association, 2012a) that specifically addressed individualization of care as a priority (Inzucchi et al., 2012). A systematic review of Med Line revealed 477 citations that were associated with each subsection of the guidelines. This extensive review was performed to ensure the most up to date information on diabetes care (American Diabetes Association, 2012a). Recommendations were reviewed and updated as appropriate, based on the newest and strongest evidence available. In the opening statement of the guidelines it is stressed the “standards of care are intended to provide clinicians …with the components of diabetes care, general treatment goals and tools to evaluate quality of care. While individual preferences, comorbidities, and other patient factors may require modification” (American Diabetes Association, 2012a). The ADA guidelines encouraged individually tailored care plans for diabetics, based on patient and clinician preferences, patient abilities, resources, and co-morbidities. The guidelines did include a small section where the older population was directly addressed; however, all the recommendations were rated as “E” and were based solely on expert opinion and clinical experience, rather than on actual evidence based research (American Diabetes Association, 2012b). Overall, the ADA recommends that older adults, who have a “significant” life expectancy, are cognitively intact, and do not have major comorbidities should have the same treatment goals as the general diabetic population, otherwise, the goals should be “individualized” (American Diabetes Association, 2012a). The authors do acknowledge that there are few long-term studies that have established the benefits of intensive treatment goals of glycemic, lipid and blood pressure control in the elderly population (American Diabetes Association, 2012a).
In June 2012, the ADA and the European Association for the Study of Diabetes (EASD) released a position statement outlining a patient centered approach for the management of type 2 diabetes (Inzucchi et al., 2012). This paper stressed patient-centered care, merging best available evidence with clinical expertise and patient preference, lifestyle choices, and the range of individual choices in therapies and interventions available for optimizing diabetes care (Inzucchi et al., 2012). The authors specifically addressed glycemic targets for A1C to remain at 7% or lower for most individuals with diabetes in order to reduce the incidence of microvascular disease, however, they went on to recommend less demanding goals (7.5%-8%) for patients with significant comorbid conditions, those with a history of severe hypoglycemia, limited life expectancy, advanced diabetic complications, or for those who found it difficult to achieve goal, despite intensive treatment and education (Inzucchi et al., 2012). The position paper also discouraged insurance companies and healthcare organizations from utilizing an A1C of <7% as a quality indicator (Inzucchi et al., 2012). The authors specifically addressed the issue of age, especially as it related to a clinicians choice of antihyperglycemic agents and stressed that a medication choice “should focus on drug safety, especially protecting against hypoglycemia, heart failure, renal dysfunction, bone fractures, and drug-to-drug interactions” (Inzucchi et al., 2012).

The AACE guidelines, published in 2011, incorporated a similar evaluation process as other professional guidelines. Extensive literature reviews were conducted using 375 total citations. Recommendations for diabetes care was rated according to the strength of the reference materials used ranging from meta-analysis and randomized clinical trials through expert and clinical judgment (Handelsman et al., 2011). With the exception of a recommended A1C of less than 6.5%, the general recommendations for goals and care of diabetic patients were
similar to the ADA (Handelsman et al., 2011). As with the ADA guidelines, the AACE guidelines emphasized clinical judgment and individualization of glycemic, blood pressure, and lipid goals based on available resources, patient needs and professional judgment (Handelsman et al., 2011). There were no specific recommendations for the elderly as a unique group of diabetics in the AACE recommendations.

The VA/DoD Version 4 guidelines, revised and updated in August, 2010, contained approximately 380 references (Veterans Administration/Department of Defense, 2010). As with previous guideline development, a committee of experts was assembled to systematically review appropriate literature related to optimal care of the diabetic and pre-diabetic patient (Veterans Administration/Department of Defense, 2010). Guidelines were graded, as with other diabetes management guidelines, according to the level of evidence used for specific recommendations. Guideline development admittedly drew extensively from previously published guidelines and algorithms distributed by the ADA, National Cholesterol Education Program (NCEP), and the National Kidney Foundation (NKF) (Veterans Administration/Department of Defense, 2010). The VA/DoD guidelines stressed, early on, the balance between benefit and harm (Veterans Administration/Department of Defense, 2010). These guidelines recognized and specifically addressed life expectancy, co-morbid illness, and disease severity in graded A1C recommendations, allowing persons with advanced disease or limited life expectancy to have an A1C of 8-9% (Veterans Administration/Department of Defense, 2010). Detailed definitions of disease states were provided to guide clinicians in decision making (Veterans Administration/Department of Defense, 2010).

The American Geriatric Society (2003) has provided diabetes care guidelines specific to the improvement of care of older persons with diabetes. These guidelines, an undertaking of the
California Healthcare Foundation, were based on 187 citations of various sources on aging and diabetes care (California Healthcare Foundation/American Geriatrics Society Panel, 2003). Evidence was rated based on strength of the literature used to make specific recommendations. Based on data gathered from systematic reviews, meta-analysis, and randomized controlled trials the AGS recommendations addressed several specific geriatric syndromes that were most noted in elderly persons with DM (California Healthcare Foundation/American Geriatrics Society Panel, 2003). These areas included the phenomenon of polypharmacy, depression, cognitive impairment, urinary incontinence, injurious falls and pain (California Healthcare Foundation/American Geriatrics Society Panel, 2003). The AGS guidelines also recognized that strong data regarding the care of elder diabetics was limited (California Healthcare Foundation/American Geriatrics Society Panel, 2003).

All of the guidelines were based on considerable literature review, peer review, and expert opinion. All of the guidelines were in agreement that care should be individualized and that most individuals with DM should have an A1C less than 6.5-7%, fasting blood sugar levels (FBS) from 70-130, post prandial (pp) blood sugar < 180, systolic blood pressure (SBP) < 130, and low density lipoprotein (LDL) levels 70-100 (American Diabetes Association, 2012a). They all agreed that maintaining targets in the previous areas leads to decreased morbidity and mortality related to DM. All the guidelines recommended optimizing lifestyle, avoiding obesity, tobacco cessation, and exercise in order to promote wellness in diabetic persons. A major limitation of the all the guidelines was the lack of contributory meta-analysis or randomized controlled trial (RCT) specifically related to the care of the elderly with diabetes.

**Table 2-Summary of Guideline Recommendations**

<table>
<thead>
<tr>
<th>Organization</th>
<th>Year published</th>
<th>Addresses elderly as unique</th>
<th>Encourages individualized care</th>
<th>A1C goal</th>
<th>BP/LDL goal</th>
</tr>
</thead>
</table>


<table>
<thead>
<tr>
<th>Organization</th>
<th>Year</th>
<th>Intensive</th>
<th>Blood Pressure</th>
<th>Lipid Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Diabetes Association</td>
<td>2012</td>
<td>Yes</td>
<td>&lt;7%; &lt;8% if severe comorbidity</td>
<td>&lt;130/80/&lt;70-100</td>
</tr>
<tr>
<td>American Association of Clinical Endocrinologists</td>
<td>2011</td>
<td>No</td>
<td>Yes</td>
<td>&lt;6.5%</td>
</tr>
</tbody>
</table>
| VA/DoD                                            | 2010 | Yes       | Yes            | 7%-9% depending on comorbidity and life expectancy | <140/80/"should be treated more aggressively than those w/o DM"
| American Geriatrics Society                       | 2003 | Yes       | Yes            | <7% if healthy; <8% if ill or life expectancy <5 yrs | <140/80/100 |


**Landmark Studies**

Three landmark studies have been published that have investigated the role of intensive glycemic control (A1C < 6.0-7%), blood pressure control (SBP < 130) and lipid management (LDL target of 70) in the treatment of diabetes. These included the United Kingdom Prospective Diabetes Study (UKPDS), Action to Control Cardiovascular Risk in Diabetes Study Group (ACCORD), and the Veterans Administration Diabetes Trial (VDAT). Much of the research done today and all of the current diabetes guidelines cite these landmark trials in their recommendations for glycemic targets. The ages of the subjects in all three studies varied greatly from 40-79. While one could potentially extrapolate these finding to the very elderly, there are clear gaps in the literature as far as evidence based guidelines for this unique group of diabetics.
The UKPDS was a multi-centered RCT that investigated standard (diet alone) versus intensive glucose management (sulfonylurea/insulin or metformin) in 2078 patients over a 6 year time period in the mid 1990’s (United Kingdom Prospective Diabetes Study, 1998). The results indicated that newly diagnosed type 2 diabetics who received intensive glucose management with sulfonylurea oral therapy, insulin therapy, or metformin had fewer microvascular complications than type 2 diabetics who were treated with diet alone (United Kingdom Prospective Diabetes Study, 1998). However, the intensive sulfonylurea/insulin treatment group had more weight gain, more hypoglycemic episodes, and had more hospitalizations than the metformin group or the standard therapy group (UKPDS, 1998). In a 10 year follow up to the UKPDS, Holman, et al. examined data collected from post-trial follow-up to determine if the microvascular benefits garnered from early intensive glucose therapy with sulfonylurea/insulin or metformin versus conventional diet therapy had resulted in long term prevention of macrovascular complications (Holman, Paul, Bethel, Matthews, & Neil, 2008). The authors found that between group differences in A1C were lost within the first year, however in the sulfonylurea/insulin group, the relative risk reduction for any diabetes related end points, microvascular complications, myocardial infarction (MI), and death from any cause persisted at 10 years (Holman et al., 2008). The metformin treated group continued to have significant risk reductions for any diabetes-related end point, MI, and death from any cause (Holman et al., 2008).

The diabetes arm of the ACCORD Trial (Gerstein HC et al., 2011) was designed to determine whether persons with type 2 DM could benefit from intensive glycemic control (A1C below 6.0%). This was a multi-centered double-blind RTC completed in 2008, that enrolled 10,251 subjects into groups of standard therapy for glycemic control (targeting an A1C of 7.0-
7.9%) or into an intensive target control group (A1C <6.0%) (Gerstein HC et al., 2011). The study was halted 17 months prior to its scheduled completion date due to higher overall mortality rates in the intensive-therapy group (Gerstein HC et al., 2011). At the time of publication there was no clear explanation for this higher mortality rate in the intensive control group of this study, though some theories were discussed (Gerstein HC et al., 2011). The authors proposed the possibility that the magnitude of A1C reduction may have played a role in the early mortality or that the speed in the reduction of A1C levels may have led to the higher number of deaths in the intensive group (Gerstein HC et al., 2011). The possibilities of a drug reaction or drug to drug interaction were also explored as possible reasons for the differences between the standard therapy group and the intensive treatment group (Gerstein HC et al., 2011). A non-significant decrease in non-fatal MI was detected in the intensive group 1-2 years after randomization (Gerstein HC et al., 2011). This indicated that the benefits of intensive treatment would take up to 3 years to be recognized, therefore not offering much, if any, benefit to the frail elderly population.

The VADT was another landmark RTC that reinforced the current notion that over treating DM with intensive glycemic control (A1C<6.9%) does not result in decreased CV events and that intensive treatment in the elderly may increase adverse events in those persons who have had diabetes for greater than 15 years (Duckworth et al., 2011). This study enrolled 1791 veterans with poor glucose control and less than optimal response to initial therapy and randomized them, again, into an intensive treatment arm maintaining A1C levels <6.9%, or into standard treatment therapy with A1C levels averaging 8.4% (Duckworth et al., 2011). As with the ACCORD and ADVANCE studies, the VADT showed minimal CV benefit and greater risks of hypoglycemia in the intensively treated veterans (Duckworth et al., 2011). This is not to say
that glycemic control is not extremely important in diabetes care, only to say that *intensive* lowering of glucose levels below 6.0% in the diabetic population does not seem to have significantly added benefit over modest glucose control (A1C 6.5-7%). In support of more relaxed glycemic targets in the elderly, the VADT trial found intensive diabetes treatment for greater than 21 years was potentially harmful to diabetic patients (Duckworth et al., 2011).

While the ACCORD trial did enroll patients up to the age of 79, the mean age of the study group was 62.2 years (Gerstein HC et al., 2011). Elderly persons were excluded from the study groups in the UKPDS, the VADT, as well as the ADVANCE studies. A significant contrast in the definition of “intensive control” was noted between the studies. The ACCORD and VADT trial used A1C to define control, whereas the UKPDS used type of treatment to define standard or intensive control. This may account for the differences in the results of each of the studies.

**General Recommendations**

Overall consensus of all the included studies and reviews was individualization and caution in treatment of diabetes in the frail and elderly population. Healthcare providers should question how the management of diabetes contributes to improving overall quality of life (Levine et al., 2006). Clinicians need to keep in mind that it takes an average of 8 years to realize the benefit of strict glucose control and if an accurate estimate of life expectancy is less than 5-10 years that enhancing quality of life and prevention of osmotic symptoms of hyperglycemia should take priority (Neumiller & Setter, 2009). There is no doubt that early and aggressive treatment of younger persons with diabetes results in decreased morbidity and mortality associated with micro and macrovascular disease, but as evidence grows, it has become evident that this type of treatment for the frail elderly can do more harm than good. Even an
intervention as simple as the diabetic diet has been challenged in the elderly. Bouillet and associates (2010) performed an observational/retrospective study of 100 nursing home patients with diabetes, with a mean age of 81.8 years, living in France (Bouillet et al., 2010). Among their findings was that a “diabetic diet”, low in carbs and sweets, was prescribed for 54% of the participants, but that A1C levels did not differ from the A1C levels in the diabetic patients who did not follow a specialized diet (Bouillet et al., 2010). It was also noted that such restrictive diets have been associated with protein-energy malnutrition in nursing home residents and that such diets impinged on quality of life for these patients (Bouillet et al., 2010; Chen et al., 2010).

Goal setting that involves the patient and caregiver preferences was shown to improve quality of treatment decisions by in a cross-sectional study involving 473 patients and 64 physicians (Chin et al., 2008). Results showed that treatment preferences, in regards to diabetes management and complications, varied greatly among the elderly and that rarely did the physician collaborate with the patient on any sort of goals, treatment, or outcome preferences (Chin et al., 2008). Clearly this was an important concept. Incongruence between patient and clinician can lead to suboptimal care. Other studies have shown that the primary goal for the elderly, whether they have a diagnosis of diabetes or not, is maintenance of independence (Chen et al., 2010). Additionally it was noted that physicians were aiming to meet standardized goals 69%-82% of the time, and that few were truly individualizing care based on patient preference (Chin et al., 2008). Another interesting point was that physicians estimated patient life expectancy to be less than five years 33% of the time while patients only reported a life expectancy of less than five years 26% of the time (Chin et al., 2008).

Non pharmacologic treatments are always preferred to medications. Obesity is at the heart of the diabetes epidemic, and while persons in the age group over 80 have the lowest rates
of obesity when compared to their younger counterparts, obesity continues to fuel the epidemic of diabetes (Soe et al., 2011). The elderly tend to have decreased physical activity and energy expenditure which predisposes them to sarcopenia and muscle loss, which contributes to insulin resistance (Soe et al., 2011). All persons, regardless of age, should be encouraged to be active, even if it is simply “chair aerobics”. Prescriptions for physical therapy (PT) can be useful in getting the elderly started on an exercise program. Healthy eating habits should be encouraged. While avoiding the traditional “ADA diet”, the elderly can be encouraged to eat whole grain carbohydrates, fruits, vegetables, proteins and healthy fats and still be allowed to indulge from time to time (Soe et al., 2011).

Pharmacologic treatment of diabetes in the elderly needs to be approached with extreme caution. Munshi, Maguchi and Segal (2010) found insulin rated second, only to warfarin, as the drug with the most adverse events in the elderly resulting in emergency hospitalizations (Munshi, Maguchi, & Segal, 2012). This same study found oral hypoglycemic agents fourth on the list of the drugs with significant adverse effects in the elderly (Munshi et al., 2012). Many of the drugs used to treat diabetes are affected by compromised renal and hepatic function, common in the elderly, and must be dosed with caution. Due to its long acting hypoglycemic effects, Glyburide was recently added to the BEERS list, a document published by the American Geriatrics Society for potentially inappropriate medication use in the elderly (American Geriatrics Society Expert Panel, 2012).

Sjoblom et al. (2008) undertook an observational study of 98 nursing home residents in Sweden to investigate whether A1C levels or health status would change if diabetes medications were reduced or withdrawn in this elderly population. The findings were twofold. The overall A1C levels in the intervention group increased by a mere 0.6% over a 6 month time period from
5.2% to 5.8% and of 31 hypoglycemic episodes, half occurred during the night (Sjöblom et al., 2008). These results illustrated that the participants were already overmedicated prior to the study as was indicated by the average A1C levels of 5.2% and that the reduction or removal of antihyperglycemic medications did not result in significant elevations in average blood sugar levels (Sjöblom et al., 2008). Additionally, the study revealed the rather frequent episodes of previously undetected hypoglycemia occurring throughout the night, which can prove detrimental to such a frail population (Sjöblom et al., 2008).

Relaxed or individualized glycemic goals for the frail elderly were proposed in all of the literature reviewed. The question remains, to what extent? Patient centered goals that focus on safety, avoidance of complications both from hypo and hyperglycemia, and quality of life are at the forefront of helping the elderly manage their diabetes (Inzucchi et al., 2012).

**Theoretical Model**

The ACE Star Model of Knowledge Transformation was used to guide the development of this project. The Star Model is a straightforward method of organizing concepts for improvement of care into a whole and provides a framework in which to organize evidence-based practice processes and approaches (Stevens, 2004). The structure of The Star Model allows for the flow of “relationships between the various stages of knowledge transformation, as newly discovered knowledge is moved into practice” (Stevens, 2004). It provides a framework for systematically linking evidence-based information to clinical practice (Stevens, 2004). The five stages of the Star Model include knowledge discovery, evidence summary, translation into practice recommendations, integration into practice, and evaluation (Stevens, 2004).
Discovery is the initial stage of the Star Model. This is the stage in which new knowledge is garnered through research and scientific inquest (Stevens, 2004). One must keep in mind that the framework is intended as a continuum and has no true beginning and end. As information is gathered, it causes the clinician and researcher to re-evaluate previous conclusions and constantly rediscover knowledge and uses in clinical application.

The following stage in the Star Model is the evidence summary. This was the main focus of this project. It involved “synthesis of existing knowledge into a single, meaningful statement about the state of the science” (Stevens, 2004), as well as generation of new knowledge by merging existing literature, expert opinions, and current practice. This step was accomplished by means of the literature review as well as the information gathered in the clinician questionnaire. Translation of evidence involved presentation of the evidence summary into practice recommendations and integration into practice (Stevens, 2004). The intention of this project was to interpret and organize the evidence collected and present it to healthcare providers who care
for elderly persons with diabetes with the intention of optimizing health care for the elderly. Integration of new information involves changing individual and organizational practices in regards to diabetes management of the elderly (Stevens, 2004). Integration involves changing individual and organizational practices in regards to diabetes management of the elderly through submission of these findings, including the recommendations that arose from the review, for review by the Utah and Wyoming Diabetes Prevention and Control Programs. A presentation of findings and recommendations is scheduled to be delivered to medical staff and other local healthcare providers at St. John’s Hospital in Jackson, WY in early 2013. Evaluation is an ongoing stage in which patient health outcomes are measured as well as provider and patient satisfaction with the changes, efficacy, economic analysis of the changes, as well as health status impact (Stevens, 2004). This was measured in terms of the objectives and will be discussed in the evaluation section of this project.

Results

An online questionnaire was distributed to approximately 2000 healthcare providers in the Utah and Wyoming areas in order to assess attitudes, resources, and care for elderly patients with diabetes. Four-hundred and fifty-three responses were obtained. Providers who were not involved in primary care were eliminated from the survey, leaving two hundred valid respondents. A summary of the findings was provided in Appendix F. Of these two hundred respondents, 20.5% (n=41) reported that their offices did have a written protocol for treating elderly patients with diabetes. Among those who had a written protocol for care of the elderly with diabetes, 92.7% found it to be helpful or very helpful (Figure 1). Respondents who reported their offices did not have established guidelines were asked to state whether or not they would use them if they were available. About ten percent (10.4%) of the respondents indicated
they probably would not use guidelines, if they had them, for treating elderly persons with diabetes, (figure 2).

Figure 1.

![Figure 1](image1.png)

Figure 2.

Most providers felt that guidelines specifically for treating elderly patients with diabetes were an important part of health care, with 89.0 percent agreeing or strongly agreeing. More than three-fourths of providers (78.5%) reported that preventing hypoglycemia in their elderly patients with diabetes was generally one of their primary concerns. This concern for hypoglycemia is reflected in the responses to the question asking whether or not they would use
the same A1C for targets for their elderly patients as for their younger patients. More than half of the providers disagreed (45.5%) or strongly disagreed (7.0%) with the notion of treating elderly the same as their younger counterparts. In contrast, providers used the standard blood pressure target (130/80) for elderly patients, and it does not appear that they generally modified this target for elderly patients. Only fifteen percent (15.5%) of providers felt they needed more information and resources for treating elderly patients. When asked what they considered to be a reasonable A1C level for their elderly patients with diabetes, 18.1 percent reported an A1C of less 7.0 percent. More than one-half, 57.6%, stated a range from 7.0% to 7.9%, and 23.4 percent state 8.0% as reasonable.

Table 3 ranks treatment concerns for treating elderly patients with diabetes. Respondents were asked to select the top four items, from a list of ten items, with an optional write-in item, that played a role in the treatment decisions with their most recent encounter with an elderly patient with diabetes. Comorbidity, cognitive capacity, and risk of hypoglycemia topped the list. Although most diabetes organizations have recommended patient focused care, patient wishes ranked only 6th on the list of priorities that guide treatment. Despite the relatively high ranking of patient’s hypoglycemia history, the patient’s history of falls ranked near the bottom on the list of concerns, in ninth place.

Table 3.

<table>
<thead>
<tr>
<th>Item</th>
<th>Percentage of Total Responses</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient’s co-morbidity</td>
<td>66.0</td>
<td>1</td>
</tr>
<tr>
<td>Patient’s cognitive capacity</td>
<td>63.0</td>
<td>2</td>
</tr>
<tr>
<td>Patient’s history of hypoglycemia</td>
<td>54.0</td>
<td>3</td>
</tr>
<tr>
<td>Patient’s quality of life</td>
<td>39.0</td>
<td>4</td>
</tr>
<tr>
<td>Patient’s age</td>
<td>36.0</td>
<td>5</td>
</tr>
<tr>
<td>Patient’s own or family’s wishes</td>
<td>35.0</td>
<td>6</td>
</tr>
<tr>
<td>Exisiting standardized guidelines for care</td>
<td>19.5</td>
<td>7</td>
</tr>
</tbody>
</table>
An open-ended question was used, asking respondents to state what guides their treatment decisions. Due to the large number and variety of responses, a word cloud, shown below, was used to demonstrate results. The cloud suggests that patient’s ability, co-morbidity, risk of hypoglycemia and quality of life were important factors in guiding decisions.

| Patient’s mental or emotional health | 15.5 | 8 |
| Patient’s history of falls | 13.0 | 9 |
| Patient’s gender | 0.5 | 11 |
| Other | 5.5 | 10 |

Note: Because more than one response was possible, total will not add to 100.0%

The outcomes of this project were evaluated by the following criteria:

1. The integrative review and recommendations have been reviewed and approved by both content experts and the committee chair.

2. There was a 25% return of questionnaires.

3. The integrated review, questionnaire results, and recommendations for realistic glycemic goals in elderly persons with diabetes will be submitted to the Utah and
Wyoming Diabetes Prevention and Control Programs at the completion of the final evaluation of this project.

4. The findings and recommendations are scheduled to be presented to the staff and interested clinicians at St. John’s Hospital in January 2013.

Limitations

As mentioned throughout the project, the most significant limitation of this project was the weakness of the literature. None of the research articles was a RCT; therefore, none received a “strong” or “A” evidence rating. Heterogeneity of the elderly population made them a difficult population to study. The population over the age of 75 ranges from very capable, healthy, and independent to quite frail and infirm. They have been a challenging cohort to study due to their vulnerability, comorbid conditions, attention span, understanding of materials presented, physical and mental limitations, and even due to the mortality rate (Cox et al., 2011).

The questionnaire, although based on a previous questionnaire with established reliability and validity, was an original tool without established reliability and validity. One of the comments from the participants was that the questionnaire seemed “biased”. The majority of the respondents were family practice MD’s or DO’s who had been in practice for >20 years and practice in Utah. It was noted that many providers, who in fact did provide diabetes care to the elderly, were inadvertently excluded from completing the questionnaire as they were disqualified by specialty in the initial question. For example, nephrologists and hospitalists were not allowed to complete the survey, as our primary intent for the study was to examine care offered by primary care providers. An important note is that at least three providers who were eliminated asked to participate. In the future a more appropriate disqualifying question should be based
specifically on the response to the question that asks if a provider manages care for persons with diabetes over the age of 75.

**DNP Essentials**

**Essential I: Scientific Underpinnings for Practice:** This project has integrated nursing science with knowledge of an array of other specialties including ethics, biophysical, psychosocial, analytical, and organizational sciences to accomplish the highest level of nursing (American Association of Colleges of Nursing, 2006). Additionally, the underpinnings of this project addressed the well-being, life-process, and optimal function of the elderly living with diabetes attempting to result in positive changes in health status for this vulnerable population (American Association of Colleges of Nursing, 2006).

**Essential III: Clinical Scholarship and Analytical Methods for Evidence-Based Practice:** An attempt to uncover best evidence for practice was the intent of this project. Evaluation of literature, practice outcomes, and practice patterns was performed by means of an integrated literature review and questionnaire distributed to healthcare providers to the elderly in an attempt to uncover answers to questions that relate to optimal glycemic values in the very elderly (American Association of Colleges of Nursing, 2006).

**Recommendations for Practice**

Clearly, the recommendations for practice stress the individualization of management for this diverse population of elderly living with diabetes. It was the intent of this project to produce a concrete list of recommendations that would blanket the entire population. The research has shown that this is not best practice and likely not possible given the heterogeneity of the very elderly population. What is evident from the research is that aggressive pursuit of an A1C of < 7% in the population age 75 and older is not generally recommended due to the increased risk of
hypoglycemia and subsequent injury that may result. Patient centered care with quality of life and patient goals guiding management is the consensus of the literature. The following recommendations have been culled from the literature review and are based primarily on expert opinion:

1. Individual assessment of patient and family goals for management of diabetes with a thorough discussion of risks and benefits of aggressive diabetes control.
2. Assessment of comorbid conditions, geriatric syndrome, frailty, cognitive impairment, physical disability, social support, financial support, and life expectancy.
3. Assessment for a predisposition to hypoglycemia.
5. Encouragement of exercise and increased activity in all persons with diabetes.
6. Reassessment of medication lists with each office visit.
7. Patients should be assessed at each visit for cognitive, physical, social and financial limitations that may interfere with their ability to manage their diabetes.
8. Simplification of medication regimes, whenever possible.
9. Avoidance of aggressive attempts to lower A1C levels below 7% in the frail elderly.
10. Relaxed A1C guidelines to 8%-8.9% with a specific goal to avoid hypoglycemia while also avoiding symptoms of hyperglycemia.

**Conclusion**

Optimizing care of elderly persons living with diabetes by analyzing existing evidence with an integrative review of data of glycemic guidelines for the elderly was the intent of this project. In order to optimize healthcare for the increasing population of elderly patients with
diabetes, evidence needs to be compiled, reviewed, and organized. A paradigm shift must take place to tailor care among older individuals. Policy change, that recognizes the heterogeneity of the elderly, at the state and national levels of diabetes organizations can steer individualized care for the older adults with diabetes. State and national organizations must adopt evidence based recommendations for the care and management of aging diabetics. Research needs to be undertaken that specifically addresses optimal glycemic management for persons over the age of 75 with diabetes both frail and healthy. Clinicians need to rely on evidence in their decision making and clinicians should be part of the effort to establish and utilize these evidence based guidelines.
References


CHF. (2003). Guidelines for Improving the Care of the Older Person with Diabetes Mellitus. *Journal of the American Geriatrics Society, 51*(5s), 265-280. doi: 10.1046/j.1532-5415.51.5s.1.x


Handelsman, Y., Mechanick, J. I., Blonde, L., Grunberger, G., Bloomgarden, Z. T., Bray, G. A.,
Guidelines for clinical Practice for Developing a Diabetes Mellitus Comprehensive Care

Follow-up of Intensive Glucose Control in Type 2 Diabetes. *New England Journal of
Medicine, 359*(15), 1577-1589. doi: 10.1056/NEJMoa0806470

*Cleveland Clinic Journal of Medicine, 75*(1), 70-78. doi: 10.3949/ccjm.75.1.70

comorbid illness and functional status on the expected benefits of intensive glucose
control in older patients with type 2 diabetes: a decision analysis. *Annals of Internal
Medicine, 149*(1), 11-19.

Inzucchi, S. E., Bergenstal, R. M., Buse, J. B., Diamant, M., Ferrannini, E., Nauck, M., ...
Matthews, D. R. (2012). Management of Hyperglycemia in Type 2 Diabetes: A Patient-
Centered Approach. *Diabetes Care, 35*(6), 1364-1379. doi: 10.2337/dc12-0413

Lee, S. J., Boscardin, W. J., Stijacic Cenzer, I., Huang, E. S., Rice-Trumble, K., & Eng, C.
(2011). The Risks and Benefits of Implementing Glycemic Control Guidelines in Frail
Older Adults with Diabetes Mellitus. *Journal of the American Geriatrics Society, 59*(4),

management of the frail elderly population. *Disease Management & Health Outcomes,


observational study of diabetes drug withdrawal in nursing home patients with tight
glycaemic control. *Diabetes Research and Clinical Practice, 82*(2), 197-202. doi:
10.1016/j.diabres.2008.08.014


www.acestar.uthscsa.edu

Study 24: A 6-Year, Randomized, Controlled Trial Comparing Sulfonylurea, Insulin, and
Metformin Therapy in Patients with Newly Diagnosed Type 2 Diabetes That Could Not
Be Controlled with Diet Therapy. [Article]. *Annals of Internal Medicine, 128*(3), 165-
175.

Management of diabetes Mellitus (DM) Version 4: Department of Veterans Affairs/
Department of Defense.

Advanced Nursing, 52*(2), 546-553.

Glycosylated Hemoglobin and Functional Decline in Community-Dwelling Nursing
Home–Eligible Elderly Adults with Diabetes Mellitus. *Journal of the American
Geriatrics Society, 60*(7), 1215-1221. doi: 10.1111/j.1532-5415.2012.04041.x
Appendix A- A scoring system for mixed methods research and mixed studies reviews

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<thead>
<tr>
<th>Types of mixed methods study components or primary studies in a SMSR context</th>
<th>Methodological quality criteria</th>
</tr>
</thead>
</table>
| 1. Qualitative | • Qualitative objective or question  
• Appropriate qualitative approach or design or method  
• Description of the context  
• Description of participants and justification of sampling  
• Description of qualitative data collection and analysis  
• Discussion of researchers’ reflexivity |
| 2. Quantitative experimental | • Appropriate sequence generation and/or randomization  
• Allocation concealment and/or blinding  
• Complete outcome data and/or low withdrawal/drop-out |
| 3. Quantitative observational | • Appropriate sampling and sample  
• Justification of measurements (validity and standards)  
• Control of confounding variables |
| 4. Mixed methods | • Justification of the mixed methods design  
• Combination of qualitative and quantitative data collection-analysis techniques or procedures  
• Integration of qualitative and quantitative data or results |

Caution notice: Outside quantitative experimental studies, the implication of clustering primary studies or study components by quality score has not been critically examined. With respect to systematic reviews of quantitative experimental studies, the clustering of primary studies and the weighting of quantitative results by quality score are discouraged.

(Pluye et al., 2009)
### Appendix B- ADA evidence grading system

ADA evidence grading system for clinical practice recommendations

<table>
<thead>
<tr>
<th>Level of evidence</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Clear evidence from well-conducted, generalizable, RCTs that are adequately powered, including:</td>
</tr>
<tr>
<td></td>
<td>- Evidence from a well-conducted multicenter trial</td>
</tr>
<tr>
<td></td>
<td>- Evidence from a meta-analysis that incorporated quality ratings in the analysis</td>
</tr>
<tr>
<td></td>
<td>Compelling nonexperimental evidence, i.e., “all or none” rule developed by Center for Evidence Based Medicine at Oxford</td>
</tr>
<tr>
<td>B</td>
<td>Supportive evidence from well-conducted randomized controlled trials that are adequately powered, including:</td>
</tr>
<tr>
<td></td>
<td>- Evidence from a well-conducted trial at one or more institutions</td>
</tr>
<tr>
<td></td>
<td>- Evidence from a meta-analysis that incorporated quality ratings in the analysis</td>
</tr>
<tr>
<td>C</td>
<td>Supportive evidence from poorly controlled or uncontrolled studies</td>
</tr>
<tr>
<td></td>
<td>- Evidence from RCTs with one or more major or three or more minor methodological flaws that could invalidate the results</td>
</tr>
<tr>
<td></td>
<td>- Evidence from observational studies with high potential for bias (such as case series with comparison with historical controls)</td>
</tr>
<tr>
<td></td>
<td>- Evidence from case series or case reports</td>
</tr>
<tr>
<td>E</td>
<td>Conflicting evidence with the weight of evidence supporting the recommendation</td>
</tr>
<tr>
<td></td>
<td>Expert consensus or clinical experience</td>
</tr>
</tbody>
</table>

(*American Diabetes Association, 2012b*)
Appendix C- Questionnaire Cover Letter

The University of Utah College of Nursing and the Utah Department of Health are conducting a study to improve their understanding of the current practices for caring for elderly people with diabetes. It should take less than 10 minutes to complete the questionnaire.

Would you please take a moment to respond to a brief survey by clicking on the link below?

https://www.surveymonkey.com/s.aspx?sm=7jDdIAwICa7alouw0WWCZQ_3d_3d

Information will be used to formulate guidelines for practice, and enhance the safety, health, and quality of life for people with diabetes over the age of 75.

Participation in this study is voluntary. You can choose not to take part. You can choose not to finish the questionnaire or omit any question you prefer not to answer without penalty or loss of benefits. Your responses are purely confidential. Your returned questionnaire will be given a unique identifier in order to protect your identity and responses. Only the principal investigator and the statistician will be able to view the collected data.

Contact the Institutional Review Board (IRB) if you have questions regarding your rights as a research participant. Also, contact the IRB if you have questions, complaints or concerns which you do not feel you can discuss with the investigator. The University of Utah IRB may be reached by phone at (801) 581-3655 or by e-mail at irb@hsc.utah.edu.

If you have any questions, complaints, or if you feel you have been harmed by this research, please contact Charlotte Kearney-Mason MS, FNP-BC, University of Utah College of Nursing, 307-413-0180. By answering this questionnaire, you are giving your consent to participate.

Thank you in advance for your help.

Sincerely,

Charlotte Mason
University of Utah, College of Nursing

Please note: If you do not wish to receive further emails from us, please click the link below, and you will be automatically removed from our mailing list.
Appendix D- IRB Approval letter

IRB:  IRB_00059421

PI:  Charlotte Mason

Title:  Diabetes management in the very elderly: Guidelines for establishing realistic goals

Thank you for submitting your request for approval of this study. The IRB has administratively reviewed your application and a designated IRB member has determined that your study is exempt from further IRB review, under 45 CFR 46.101(b), Category 2, from the Federal regulations governing human research.

It is the policy of the University of Utah that all human subject research which is exempt under this section will be conducted in accordance with (1) the Belmont report (http://ohrp.osophs.dhhs.gov/humansubjects/guidance/belmont.htm), (2) this institution's administrative procedures to ensure valid claims of exemption, and (3) orderly accounting for such activities. All research involving human subjects must be approved or exempted by the IRB before the research is conducted.

Since this determination is not an approval, it does not expire or need renewal. This determination of exemption from continuing IRB review only applies to the research study as submitted to the IRB and you are expected to follow the protocol as outlined. Before implementing any changes in the study, you must submit an amendment application to the IRB and secure either approval or a determination of exemption.

If you have questions about this, please contact our office at 581-3655 and we will be happy to assist you. Thank you again for submitting your proposal.

Click IRB_00059421 to view the application.

Please take a moment to complete our customer service survey. We appreciate your opinions and feedback.
Appendix E - Diabetes Management in the Elderly- Provider Questionnaire

1. What is your specialty?

- Anesthesiology
- Cardiology
- Dermatology
- Diabetes Education
- Emergency Medicine
- Endocrinology
- Family Practice
- Gastroenterology
- Geriatrics
- Hospitalist
- Infectious Disease
- Internal Medicine
- Nephrology
- Neurology
- OB/Gyn
- Oncology
- Ophthalmology
- Orthopedics
- Pathology
- Pediatrics
- Pharmacy
- Psychiatry
- Radiology
- Surgery
- Other (please specify)

2. What are your credentials? Please check all that apply.

- MD/DO
- PAC
- APRN
- Other (please specify)

3. How many years have you been a prescribing provider?
4. Which of the following best describes your principal practice arrangement. Please check only one response.

- Solo private practice
- Group practice
- Hospital based practice
- Health department
- University/academic setting
- Community health center (HRSA funded)
- Other (please specify)

5. In which county do you primarily practice?

6. Do you provide care (clinical or educational) for patients with diabetes who are over the age of 75?

- Yes
- No

7. Does your organization or office have written protocols specifically for treating elderly patients with diabetes?

- Yes
- No

Thinking about your most recent encounters with your elderly patients who have diabetes, please state how much you would agree or disagree with each of the following statements as you treated those patients.

8. I find my office’s written protocol to be helpful when treating elderly patients with diabetes.

- Strongly agree
- Agree
- Disagree
9. If they were available, I would use guidelines for treating my elderly patients with diabetes.

10. Guidelines specifically for treating elderly patients with diabetes are an important part of health care.

11. Preventing hypoglycemia is usually my primary consideration for diabetes management when I treat elderly patients with diabetes.

12. In general, I have sufficient information and resources for treating elderly patients with diabetes.

13. In general, I attempt to maintain blood pressure levels under 130/80 for my elderly patients with diabetes.
14. In general, I use the same A1C targets for my elderly patients as I do for my younger patients with diabetes.

15. Please think of your most recent encounter with an elderly patient with diabetes. Which of the following items played the largest role in deciding the treatment plan for that patient? Please select up to FOUR items.

- Elimination of diabetes symptoms
- Weight reduction in obese patients
- Achievement of normal or target A1C levels
- Achievement of target blood pressure levels
- Achievement of target LDL/triglyceride levels
- Maintenance of normal micro-albumin levels

16. Please rank each of the following in order of importance when treating your elderly patients with diabetes.

   - Patient's age
   - Patient's cognition capacity
   - Patient's gender
   - Patient's quality of life
   - Patient's mental or emotional health
   - Patient's comorbidity
   - Patient's history of falls
   - Patient's history of hypoglycemia
   - Patient's own or patient's family's wishes
   - Existing standardized guidelines

17. Have you ever participated in any formal training or received continuing education credits that was focused specifically on treating elderly patients with diabetes?

   - No
   - Yes

18. Do you provide diabetes education for your elderly patients?

   - Please describe
   - Yes
   - No
19. Who provides the diabetes education in your office? You may check more than one response.
- Provider (MD/FNP/PA)
- Office nurse (LNP/RN)
- Office dietitian (RD)
- Certified Diabetes Educator (CDE)
- Office medical assistant
- Other (please specify)

20. In general, what do you consider a reasonable A1C level for your typical elderly patients with diabetes?

21. What generally guides your treatment decisions when caring for your elderly patients with diabetes?

Please feel free to let us know about practice for treating your elderly patients with diabetes. If you would like a copy of the survey results, please email Charlotte Mason at charlottekmason@gmail.com and write the word "Results" in the subject line.
Appendix F- Sample Description of Respondents by Training, Years in Practice and Practice Location

<table>
<thead>
<tr>
<th>Sample Description</th>
<th>Percentage of Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey of Diabetes Care for the Elderly 2012</td>
<td></td>
</tr>
<tr>
<td><strong>Specialty</strong></td>
<td></td>
</tr>
<tr>
<td>Family Practice</td>
<td>50.0</td>
</tr>
<tr>
<td>Internal Medicine</td>
<td>26.5</td>
</tr>
<tr>
<td>Geriatrics</td>
<td>5.0</td>
</tr>
<tr>
<td>Emergency Medicine</td>
<td>3.5</td>
</tr>
<tr>
<td>Ophthalmology</td>
<td>2.5</td>
</tr>
<tr>
<td>Other</td>
<td>12.5</td>
</tr>
<tr>
<td><strong>Credentials</strong></td>
<td></td>
</tr>
<tr>
<td>MD/DO</td>
<td>66.0</td>
</tr>
<tr>
<td>PA-C</td>
<td>12.5</td>
</tr>
<tr>
<td>APRN</td>
<td>21.0</td>
</tr>
<tr>
<td><strong>Number of Years as Prescribing Provider</strong></td>
<td></td>
</tr>
<tr>
<td>Less than 5 years</td>
<td>25.5</td>
</tr>
<tr>
<td>5-9 years</td>
<td>13.0</td>
</tr>
<tr>
<td>10-14 years</td>
<td>11.0</td>
</tr>
<tr>
<td>15-19 years</td>
<td>14.0</td>
</tr>
<tr>
<td>20 or more years</td>
<td>35.5</td>
</tr>
<tr>
<td>Not prescribing</td>
<td>1.0</td>
</tr>
<tr>
<td>Unknown</td>
<td>1.0</td>
</tr>
<tr>
<td><strong>Work Setting</strong></td>
<td></td>
</tr>
<tr>
<td>Group Practice</td>
<td>42.5</td>
</tr>
<tr>
<td>Hospital-based Practice</td>
<td>17.0</td>
</tr>
<tr>
<td>University/academic</td>
<td>14.5</td>
</tr>
<tr>
<td>Solo private practice</td>
<td>10.0</td>
</tr>
<tr>
<td>HRSA-funded center</td>
<td>6.5</td>
</tr>
<tr>
<td>Veterans Administration</td>
<td>2.0</td>
</tr>
<tr>
<td>Indian Health Services</td>
<td>1.0</td>
</tr>
<tr>
<td>Locum Tenens</td>
<td>1.0</td>
</tr>
<tr>
<td>Health Department</td>
<td>1.5</td>
</tr>
<tr>
<td>Other</td>
<td>4.0</td>
</tr>
<tr>
<td>State</td>
<td></td>
</tr>
<tr>
<td>Utah</td>
<td>89.0</td>
</tr>
<tr>
<td>Outside of Utah</td>
<td>8.5</td>
</tr>
<tr>
<td>Unknown</td>
<td>2.5</td>
</tr>
</tbody>
</table>