ELDERS WITH DIABETES: IMPLICATIONS FOR DEPRESSION SCREENING

by

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ABSTRACT

Diabetes has been concluded to be a global epidemic (Wild, Sicree, Roger, King & Green, 2004). By the year 2030, it is predicted that depression will become the second leading cause of disability worldwide (World Health Organization [WHO], 2007). The relationship between diabetes and depression is likely not casual.

Those with diabetes are twice as likely to develop depression (Eaton, Armenian, Gallo, Pratt & Ford, 1996; Kawakami, Shimizu, Takatsuka, & Ishibashi, 1999). Conversely, diabetes doubles the likelihood of comorbid depression (Anderson, Clouse, Freedland & Lustman, 2001). The intersection of these two devastating diseases is far from benign. Black, Markides and Ray (2003) found that overall mortality was increased five times in those with diabetes who also suffered from depression.

There is a particularly increased burden of depression in elders with diabetes, with up to 30% of those over age 65 having this dual diagnosis (Anderson et al., 2001). Despite this high prevalence, depression is underdiagnosed in the elderly, and this group has a disproportionate rate of suicide. Better strategies are needed for identifying and treating depression in elders with concomitant diabetes.

The purpose of this study was to assess the prevalence of depression in a community-dwelling population of elders with type 2 diabetes who were receiving diabetes self-management education (DSME) services. Specific characteristics of elders with diabetes were assessed in relationship to depression. A diabetes and depression survey instrument (DD-S) and a self-administered depression instrument (CES-D) were

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administered to 153 elderly clients of Humphreys Diabetes Center in Boise, Idaho. Twenty-six completed surveys were returned by mail.

An extremely high prevalence of depression (46%) was discovered. Most participants in the depression group were female (88.8%). Four participants in this group had not been previously diagnosed with depression, and two participants under treatment for depression were found to have ongoing symptoms. Depression was found to be significantly associated with the total number of medications participants reported taking. Individual medical conditions were not associated with being classified in the depression group nor were complications of diabetes. Depression was not associated with any specific demographic variable, with diabetes care compliance, or with diabetes control as measured by HA1c.

It is concluded that elders with diabetes, especially females, are at very high risk of concomitant depression. Assessment of the total number of medications in elders with diabetes might help identify a subgroup at particularly high risk for depression. The findings from this study suggest that the use of the survey tools (DD-S in combination with the CES-D administered during DSME) may be an effective means of screening for depression in elders with diabetes.

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CHAPTER I

Introduction

Despite having high rates of suicide, elders with depression are underdiagnosed and undertreated for this disabling disorder (Centers for Disease Control and Prevention [CDC] 2007). There is a particularly increased burden of depression in elders with diabetes, with up to 30% of those over age 65 having this dual diagnosis (Anderson et al., 2001). A depression diagnosis has been associated with worsening of diabetes control, increase in diabetes complications and excess mortality (Black et al., 2003). Better strategies are needed to screen for and treat depression elders with concomitant diabetes.

The elderly are less likely to seek treatment for depression due to the stigma this age group often associates with having a mental illness (Ayalon, Arean & Alvidrez, 2005). In addition, the elderly have more drug side-effects and are less tolerant of medical therapy for depression (Borchelt, 1995) than younger patients with diabetes. Risk factors for depression in this population have not been well-characterized.

This study consisted of a diabetes survey and a depression self-test to examine the relationship between depression and possible risk factors for depression in elders with diabetes who were receiving diabetes self-management education (DSME) services at a community diabetes education center. DSME may represent an ideal opportunity to screen for depression.

Statement of the Problem

Elders with diabetes have a high rate of depression compared to younger persons with diabetes. In this particularly high-risk population, depression is underdiagnosed and can worsen diabetes control, complications and mortality rates. Better strategies are needed for identifying depression in elders with diabetes.

Purpose and Significance of the Study

The purpose of this study was to assess the prevalence of depression in a community-dwelling population of elders with type 2 diabetes receiving diabetes self-management education (DSME). In addition, specific characteristics of elders with diabetes, which might be associated with depression or depressive symptoms, were assessed. For example, certain demographic variables or differences in current practice of diabetes self-management techniques may be associated with the prevalence of depression in this population. A better understanding of factors associated with depression in elders with diabetes could lead to improved screening and treatment for this disabling disorder. Treatment of depression can dramatically improve quality of life for those with chronic diseases such as diabetes (Jackson, DeZee & Berbano, 2004) and has recently been shown to decrease overall mortality in those with type 2 diabetes (Bogner, Morales, Post & Bruce, 2007).

Specific Research Questions

The questions addressed in this study were:

1. What is the prevalence of depression and/or depressive symptoms in an elderly community dwelling sample of patients with diabetes receiving DSME services?

2. Are there particular characteristics of elders with diabetes that place them at higher risk for developing depression?

3. Will depression screening during DSME identify elders with undiagnosed depression?

Limitations

The limitations of this study include:

1. The study utilized a nonexperimental, cross-sectional design.

2. A convenience sample was used.

3. Those who attend DSME classes may have a different rate of depression than those who do not attend DSME classes.

4. Diagnosis of depression and assessment of depressive symptoms were by self-report and may underestimate the true prevalence.

5. The visually impaired may have had trouble completing the survey and self-test.

6. The study survey has not been validated in previous studies.

Delimitations

There were two major delimitations of this study:

1. This study was delimited to community-dwelling elders aged 55 and older with type 2 diabetes receiving DSME services at Humphreys Diabetes Center (HDC) in Boise, Idaho.

2. The variables of interest in this study were delimited to depression diagnosis and/or depressive symptoms, and self-reported data including: sociodemographic information, duration of diabetes, complications of diabetes, self-care behaviors, comorbidities, and medication use.

Assumptions

The following assumptions were made for this research study:

1. Participants completed the survey and depression self-assessment tool accurately and honestly.

2. Elders with diabetes receiving DSME services at HDC are representative of other elders in the community with diabetes.

Hypotheses

This study tested the following null hypotheses:

1. There is not a high prevalence of depression in elders with diabetes.

2. There are no specific characteristics associated with depression in elders with diabetes.

3. Screening during DSME will not identify elders with undiagnosed depression.

Definition of Terms

Elderly: for this study, elderly will be considered to be $\geq$ 55 years of age.

Type 2 diabetes: a condition of chronic carbohydrate intolerance characterized by elevated blood sugar due to insulin resistance and insulin deficiency.

Insulin: the hormone that allows sugar to be absorbed by cells in the body.

Microvascular: small blood vessel-related.

Macrovascular: large blood vessel-related.

Self-care behaviors: blood sugar self-monitoring, foot checks (checking feet for signs of infection and/or injury), meal plan adherence and frequency of exercise.

HA1c: percent of hemoglobin that is glycosylated or attached to sugar. It is an average measurement of the level of sugar in the blood over a three-month period.

CHAPTER II

Literature Review

The purpose of this literature review is to examine the relationship between diabetes and depression in the elderly. First, the literature on diabetes in the elderly population will be examined. Second, studies related to depression in the elderly will be reviewed. Third, the connection between diabetes and depression will be established. Next, treatment of depression in the elderly will be outlined. Finally, DSME as an opportunity for depression screening will be explored.

Diabetes in the Elderly

Wild et al. (2004) reviewed the prevalence of diabetes and concluded that diabetes is a global epidemic. They predicted that the number of people with diabetes will more than double from 177 million to 366 million from the year 2000 to the year 2030. One in five adults over the age of 65 has diabetes, and the most significant contribution to the diabetes epidemic is the increasing number of people over age 65. The Centers for Disease Control and Prevention (CDC) (2007) support the view of diabetes as an epidemic and underscore the tremendous impact of this disease.

Diabetes leads to devastating microvascular complications such as blindness, kidney failure and painful neuropathy, and it is the leading cause of nontraumatic amputations (American Diabetes Association (ADA), 2008). The macrovascular complications of diabetes include heart disease, stroke, and peripheral vascular disease

(Chau, Shumaker & Plodkowski, 2005). All of these complications are exacerbated by aging (Gregg & Brown, 2003).

The prevalence of diabetes increases dramatically with age, and studies have confirmed the high burden of diabetes in the elderly. For example, Selvin, Coresh, and Brancati (2006) analyzed data from 2,809 elderly individuals in the National Health and Nutrition Examination Survey and found the prevalence of diabetes in adults age 65 or older to be 15.3%. This is nearly twice the overall prevalence for the disease in the United States. In another population-based study conducted in Rotterdam, the Netherlands, oral glucose tolerance tests were administered to 7,439 elderly men and women age 55 years and older. The overall prevalence of diabetes was estimated to be 11.3%. However, in those age 85 years and older the prevalence was 18.9%. More than half of those in the study who were found to have diabetes were previously undiagnosed (Stolk et al., 1997). With those age 85 years and older being the fastest growing segment of the American population (Hobbs, 2001), the diabetes epidemic is likely to rapidly intensify.

Depression in the Elderly

Depression is another common affliction of modern society. By the year 2030, it will become the second leading cause of disability worldwide (WHO, 2007). It engenders high costs to both the individual in terms of anguish and decreased productivity and creates a tremendous economic and social loss to society (Simon, 2003). Depression is underdiagnosed in the elderly, and this group has a disproportionate rate of suicide (National Institute of Mental Health [NIMH], 2007). Spousal death and chronic illness

are the two most significant risk factors for the development of geriatric depression

(Shoevers et al., 2006). Other previously identified risk factors include prior depression,

sleep disturbance, disability, and female gender (Cole & Dendukuri, 2003). Risk factors

for depression in elders with diabetes have not specifically been studied.

The Interrelationship of Diabetes and Depression

The relationship between diabetes and depression is likely not casual. Those with

depression are twice as likely to develop diabetes (Eaton et al., 1996; Kawakami et al.,

1999). Conversely, diabetes doubles the likelihood of comorbid depression from 15% to

approximately 30%, according to a comprehensive meta-analysis by Anderson et al.

(2001). Finkelstein et al. (2003), in a retrospective study of over two million Medicare

claimants age 65 and older, found that there was a significantly greater likelihood (OR

1.58±0.05) of depression in those with diabetes than in those who did not have the

disease. A study of depressive symptoms in rural elders in North Carolina with diabetes

revealed a high risk for depressive symptoms, regardless of ethnicity (Bell et al., 2005).

When diabetes and depression intersect, the effect on adverse events appears to be

highly synergistic. Black et al. (2003) examined longitudinal data from the Hispanic

Established Population for the Epidemiologic Study of the Elderly (EPESE) survey and

found that the risk of microvascular complications of diabetes increase eleven-fold. In

addition, macrovascular complications double, and overall mortality increases five times

in those with diabetes who also suffer from depression. Increased mortality was also

strongly associated with both minor and major depression in a large Health Maintenance

Organization (HMO) study of 4,154 patients with type 2 diabetes (Katon et al., 2005).

DeGroot, Anderson, Freedland, Clouse, and Lustman (2001) conducted a meta-analysis of 27 studies linking diabetes and depression. A significant association was found between depression and diabetes complications. In addition, those with both diabetes and depression were less compliant with treatment and found to have 86% higher health costs than those with diabetes alone (Ciechanowski, Katon & Russo, 2000).

The dual presence of diabetes and depression has a dramatic effect on quality of life. More than 3,000 adults in Australia were assessed with the Short Form Health-Related Quality of Life Questionnaire (SF-36). Those with diabetes and depression experienced a severe impact, with a large effect size, on every dimension of the SF-36 as compared to those with diabetes who were not depressed (Goldney, Fisher, Phillips & Wilson, 2004). Likewise, an SF-36 study in an elderly Greek population with diabetes found that comorbidity, such as concomitant depression, was a significant predictor of lower health-related quality of life (Papadopoulos, Kontodimopoulos, Frydas, Ikonomakis & Niakas, 2007). Several instruments have been developed to assess diabetes-specific quality of life, and impact on psychological functioning is considered central to this assessment (Polonsky, 2000).

Treatment of Depression in Elderly Diabetes Patients

Even when depression is properly diagnosed, treatment of depression in the elder with diabetes is complicated. Physiological changes associated with aging make the elderly more prone to medication side effects and drug-drug interactions (Hitner & Nagle, 2005). Ayalon, Arean, and Alvidrez (2005) found significant barriers to treatment of depression in the elderly that included not only side effects of the medications, but also

fear of stigma of being treated for depression. Cognitive impairment was associated with unintentional nonadherence to medication.

Another issue facing elderly persons is the fact that type 2 diabetes has significant comorbidity with other medical conditions such as hypertension and hyperlipidemia (Robbins, Webb & Sciamanna, 2005). Almost all patients with type 2 diabetes are prescribed multiple medications, and adverse drug interaction becomes an increasing concern (Borchelt, 1995). Patients may not understand that the antidepressant is just as important as their other medications. Cost is also a huge barrier to treatment of depression and leads to poor health outcomes (Mojtabal & Olfson, 2003).

Standard antidepressants have been studied in the treatment of depression in those with diabetes. Nortriptyline, an older, less expensive antidepressant was evaluated in a double-blind, placebo-controlled trial of 68 patients (Lustman et al., 1997). This drug was found to be effective for treating depression; however, it had a negative effect on glycemic control. In addition, nortriptyline, and the older antidepressant drugs in general, can have substantive anticholinergic side effects (Hitner & Nagle, 2005). Anticholinergic action has recently been associated with cognitive decline in a longitudinal cohort study of 372 participants over age 60 (Ancelin et al., 2006). This is an unacceptable outcome of the treatment of geriatric depression.

Newer antidepressant agents, such as the selective serotonin reuptake inhibitor (SSRI) fluoxetine, have good efficacy and are less anticholinergic than the older agents (Lustman, Freedland, Griffith & Clouse, 2000). They do not worsen glycemic control; however, they are much more costly. No antidepressant drug trials have specifically

evaluated elders with diabetes and depression, though fluoxetine has been approved for use in the elderly population.

Second generation antipsychotics are being used more and more frequently as adjunctive treatment in both unipolar and bipolar depression. Koller, Cross, Doraiswamy, and Schneider (2003) studied the hyperglycemic effect of the drug respiradone, a second-generation antipsychotic agent. They reported that respiradone and several other antipsychotic drugs can cause not only hyperglycemia, but can cause the emergence of diabetes. Citrome et al. (2007) reviewed 25 studies of antipsychotic agents and concluded that the second generation agents are not significantly less of a risk than first-generation antipsychotic agents. Clearly, care must be taken when prescribing antidepressant and antipsychotic medication to elders with diabetes.

Diabetes Self-Management Education

DSME is the foundation of treatment for diabetes and should occur as close to the diagnosis as possible (Mensing et al., 2007). DSME has been shown to improve glycemic control as well as decrease the chronic complications of diabetes (ADA, 2008). Formal DSME usually consists of a week- long program from certified diabetes educators (CDE) at an American Diabetes Association (ADA) certified center. ADA certification is often required for insurance reimbursement (Powell, Glover, Probst & Laditka, 2005).

DSME provides an understanding of the pathophysiology of diabetes in lay terms, teaches patients how to test their own blood sugar, and also highlights the importance of care of their highly vulnerable feet. Healthy eating, exercise and weight management are also stressed. Advanced education teaches insulin adjustment and carbohydrate counting.

Despite the otherwise comprehensive nature of DSME, it has not traditionally included screening for depression. DSME may be an ideal opportunity to assess depressive symptomatology.

The Present Study

The present study assessed a community-dwelling population of elders with diabetes using a survey developed for this project. The presence of depressive symptoms was evaluated using the CES-D, a widely used and validated measure (Radloff, 1977). The study assessed self-reported demographic variables, attitudes about diabetes and control, and complications of diabetes. In addition the presence of comorbidities, medication use and self-care behaviors in relation to depression diagnosis and symptoms were also evaluated.

CHAPTER III

Method

<u>Introduction</u>

The tremendous burden of diabetes in the elderly population has been documented (CDC, 2007; Selvin et al., 2006; Stolk et al., 1997), and the connection between diabetes and depression has been well-established (Anderson et al., 2001; Eaton et al., 1996, Finkelstein et al., 2003). Many elders with diabetes and depression remain undiagnosed and untreated, partly because current screening is inadequate (NIMH, 2007). Diabetes Self-Management Education (DSME) is the foundation of diabetes therapy (Mensing et al., 2007) and has been shown to decrease diabetes complications as well as to increase well-being (Rubin, Peyrot & Saudek, 1989). DSME may be the ideal occasion to assess elders with diabetes for depression.

<u>Participants</u>

The sampling frame for this study was a nonrandom convenience sample of adults aged 55 or older receiving DSME services at Humphreys Diabetes Center (HDC) in Boise, Idaho. Permission was obtained from the research committee of HDC to conduct the study at this facility.

Study Design

  This is a nonexperimental, cross-sectional study. A cross-sectional approach is appropriate for measuring prevalence or risk factors of a disease in a population and when no study intervention is intended.

Measurement Tools

  The study utilized a diabetes and depression survey instrument, the DD-S (Appendix A). This instrument was constructed as the final project for the fall 2007 graduate seminar, Survey and Community-Based Research, at Boise State University.

  DSME stresses the importance of self-care. Several items related to compliance with diabetes self-care recommendations were queried with the DD-S. These included frequency of: 1) blood sugar testing; 2) following a meal plan; 3) foot inspection; and 4) exercise. Responses to these items were combined to create a compliance score for purposes of analysis. This allowed each respondent to receive a single self-care composite compliance score with a maximum of 16 points. Other constructs evaluated with the DD-S included depression diagnosis and self-reported data including: sociodemographic information, duration of diabetes, complications of diabetes, self-care behaviors, comorbidities, and medication use.

  In addition to completing the DD-S, each participant was asked to fill out the CES-D (Appendix B), a self-administered depression instrument. The CES-D has been widely used and validated and has a coefficient alpha of .85 (Radloff, 1977).

DD-S Survey Validation

Face and content validity of this survey was assessed by a number of health care professionals. With respect to construct validity, a high prevalence of depression was hypothesized for the study population, and the instrument was evaluated for ability to confirm this hypothesis. In addition, three separate questions on the survey associated with depression diagnosis were assessed for correlation.

Procedures

The study was approved by the Institutional Review Board at Boise State University.

The principal investigator is a previous Medical Director with longstanding relationships with HDC staff. Contact was made with Judy Davis, R.N., program director at HDC, and a copy of the study proposal was provided. After the protocol was approved by the HDC Research Committee, survey packets were delivered to Ms. Davis. Ms. Davis educated other HDC educators about the study and distributed survey packets to DSME classes and to individual nurses and dieticians. Nurses and dieticians conducting classes and individual consultations administered the survey packets to HDC clients. Participants had type 2 diabetes, were aged 55 and older, and were receiving DSME services. There were two distribution periods, the first from September 18 to October 5th and the second from January 5th to the 31st. Study participation was offered to all age-appropriate clients during the two distribution periods. Surveys were administered at both the Boise and Meridian HDC locations.

The packet contained a recruitment/consent letter (Appendix C), a diabetes and depression survey (DD-S – Appendix A) and a depression self-assessment instrument (CES-D – Appendix B). All information obtained was confidential and identified by protocol and participant numbers only. Study materials were kept in a cabinet in the Health Sciences Riverside Building, Room 122A at Boise State University for the duration of the study.

Statistical Analyses

The prevalence of depression was assessed via one of three methods: 1) by frequency counts of those who self-reported a depression diagnosis; 2) those who self-reported taking an antidepressant on the medication list; and 3) those with a score of 16 or above on the CES-D. Participants from these three categories were combined into a depression group for comparison to others in the study (the nondepression group).

A Mann Whitney test was used to compare the depression vs. nondepression groups on a number of variables such as age, score on the composite compliance variable, score on the CES-D, HA1c test score, number of medications and number of conditions.

A chi square test was used to assess the relationship between depression group and other variables in the study such as gender, specific conditions and complications of diabetes.

All data was analyzed using the Statistical Package for the Social Sciences (SPSS). Statistical tests were two-tailed maintaining an overall $\alpha = .05$ level of significance.

CHAPTER IV

Results

One hundred and fifty-three surveys were distributed to clients receiving diabetes

self-management education (DSME) at Humphreys Diabetes Center (HDC) in Boise,

Idaho. Twenty-six surveys were returned by mail for a 17% response rate.

This survey was presented to several health professionals and judged to have good face

and content validity. With respect to construct validity, a high prevalence of depression

was hypothesized for the study population, and the instrument confirmed this high

prevalence. In addition, there was complete correlation between self-reported diagnosis

of depression, reported treatments for depression and listed antidepressant medications.

Statistical Analyses

Of the 18 participants reporting their gender, 12 (67%) were female and 6 (33%)

were male. The mean age of the nineteen participants who reported their age was 66 (*SD*

= 4.98) with a range of 58 to 77. All but one participant reported their ethnicity, marriage

and financial status. All 25 (100%) of these were white. With respect to socioeconomic

status (SES), 17 (68%) reported their financial status as comfortable or very comfortable,

five (20%) reported just getting by and three (12%) reported not being able to make ends

meet. Twenty (80%) of participants were married. Of the 24 who reported information

about insurance status only one participant (4%) had no insurance.

Table 1.

Demographic Data

Variables	Total number of participants (% of total)
Gender (*N* = 18)	
Female	12 (67%)
Male	6 (33%)
Age (*N* = 19)	
<65 years of age	9 (47%)
65 and over	10 (53%)
Ethnicity (*N* = 25)	
White	25 (100%)
African American	0 (0%)
American Indian	0 (0%)
Hispanic	0 (0%)
Asian/Pacific Islander	0 (0%)
Other	0 (0%)
Marital Status (*N* = 25)	
Married or Partnered	20 (80%)
Divorced	2 (8%)
Separated	0 (0%)
Widowed	3 (12%)

Variables	Total number of participants (% of total)
Single	0 (0%)
Other	0 (0%)
Financial Status (*N* = 25)	
Very Comfortable	1 (4%)
Comfortable	16 (64%)
Just Getting By	5 (20%)
Can't Make Ends Meet	3 (12%)
Insurance Status (*N* = 24)	
Medicare Only	2 (8%)
Medicare/Medigap	12 (50%)
Medicaid	1 (4%)
No Insurance	0 (0%)
Private Insurance	8 (34%)
Veterans Administration	0 (0%)
Other	1 (4%)

Twenty-four (92%) participants were enrolled in a formal DSME program, and of these, 20 (80%) were satisfied with the education provided. Eleven (42%) participants had met with the nurse educator or dietician separately and nine (82%) of these were satisfied with their care. Of the 11 (42%) who received brief education in the doctor's

office, seven (64%) were satisfied. One participant reported having had no diabetes
education.

Seventeen (65%) of the participants were diagnosed within one year of receiving
DSME services. The mean years duration of diabetes was 4.69 (SD = 7.51) with a range
from less than one year to 34 years. Fifteen (58%) reported that fear of medical
complications was the worst aspect of having diabetes, while seven (27%) were most
bothered by having to follow a meal plan. Only one (4%) participant cited cost as the
worst aspect of having diabetes.

Table 2.

DSME, Satisfaction, Time Since Diagnosis, and Worst Aspect of Having Diabetes

Variables	Total number of participants (% of total)
DSME (*N* = 26)	
Formal DSME	24 (92%)
Satisfied	20 (83%)
Not Satisfied	1 (4%)
No response	3 (13%)
Nurse or Dietician	11 (42%)
Satisfied	9 (82%)
Not Satisfied	2 (18%)
Brief doctor/nurse office Ed.	11 (42%)

Variables	Total number of participants (% of total)
Satisfied	7 (64%)
Not Satisfied	4 (36%)
No Diabetes Education	1 (4%)
Years since diagnosis ($N = 25$)	
<5 years	18 (72%)
5 years or longer	7 (28%)
Worst aspect of diabetes ($N = 26$)	
Fear of medical complications	15 (58%)
Following a meal plan	7 (27%)
Cost	1 (4%)
Other	3 (11%)

Diabetes management self-care behaviors were evaluated as presented in Table 3. Almost two-thirds of the participants (65%) reported testing their blood sugar at home at least two or more times per day. Eight (31%) participants checked their feet on a daily basis and 10 (38%) checked at least two or more times per week. Eleven (42%) participants followed a meal plan on a daily basis, while seven (27%) followed two or more times per week. Exercise frequency was daily for six (23%) of the participants and two or more times per week for 11 (42%). One participant was unable to exercise due to severe neuropathy.

Twenty participants reported a HA1c level and all testing was within the last six months. The average was 7.7% ($SD = 2.8\%$). Six (23%) either did not know what a HA1c was or did not respond to the question.

Table 3.

Diabetes Care Self-Management Behaviors

Variables	Total number of participants (% of total)
Blood Glucose Testing ($N = 26$)	
Never	0 (0%)
Sometimes	2 (8%)
Daily	6 (23%)
Two or more times per day	17 (65%)
Can't afford test strips	1 (4%)
Checking feet ($N = 26$)	
Never	1 (4%)
Sometimes	7 (27%)
Two or more times per week	10 (38%)
Daily	8 (31%)
Follow Meal Plan ($N = 26$)	
Never	1 (4%)
Sometimes	6 (23%)

Variables	Total number of participants (% of total)
Two or more times per week	7 (27%)
Daily	11 (42%)
Other	1 (4%)
Exercise (*N* = 26)	
Never	2 (8%)
Sometimes	5 (19%)
Two or more times per week	11 (42%)
Daily	6 (23%)
Other	2 (8%)
Hemoglobin A1c (*N* = 21)	
Mean HA1c (*SD)* Range	7.68 (2.81) (5.90-18.40)
Last HA1c test (N = 26)	
Within 1 month	(61%)
Within 3 months	9 (35%)
Within 6 months	1 (4%)

Eight (31%) participants reported taking 0-4 medications, 11 (42%) reported taking, 5-8, and seven (27%) reported taking 9-12 medications as illustrated in Figure 1. Twelve (46%) participants reported daily aspirin use.

Number of Medications

0 to 4   5 to 8   9 to 12

27%   31%

42%
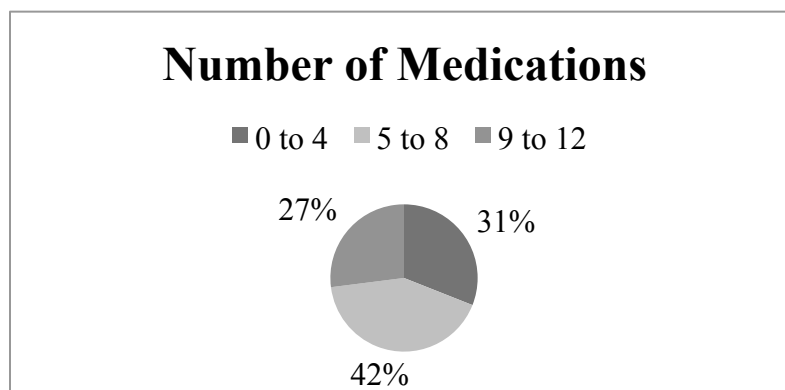
Figure 1. Number of Medications

A wide variety of concomitant illnesses were reported by the participants. These included high cholesterol (18; 69%), high blood pressure (18; 69%), obesity (13; 50%), depression (9; 35%), other medical problems (7; 27%) and heart problems (5; 19%).

Complications of diabetes were asked about and are illustrated in Figure 2. Six (23%) participants reported eye complications of diabetes, while 11 (42%) reported nerve problems. Only one (4%) participant reported heart problems and two (8%) reported circulation problems. No participant reported kidney problems.

Complications of Diabetes

50%				
40%				
30%				
20%				
10%				
0%				
Eye	Nerve	Heart	Circulation	Kidney
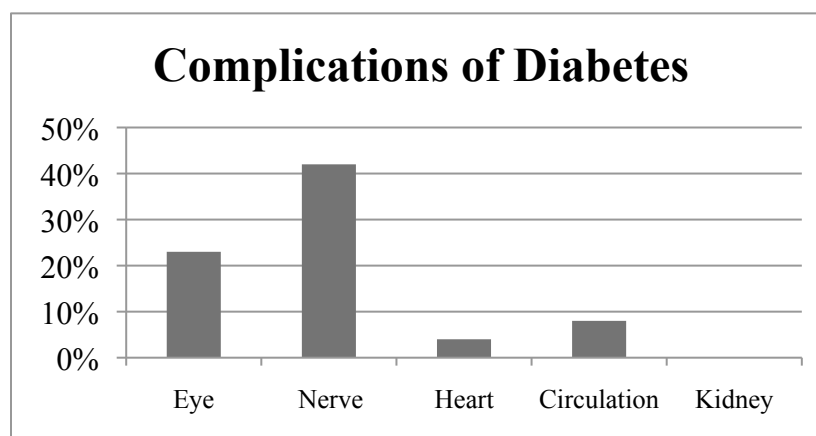
Figure 2. Complications of Diabetes

Table 4.

Medication, Aspirin Use, Comorbidity, and Complications of Diabetes

Variables	Total number of participants (% of total)
Number of Medications ($N = 26$)	
0-4	8 (31%)
5-8	11 (42%)
9-12	7 (27%)
Other Medical Problems ($N = 26$)	
High Cholesterol	18 (69%)
High Blood Pressure	18 (69%)
Obesity	13 (50%)
Depression	9 (35%)
Heart Problems	5 (19%)
Cancer	4 (15%)
Arthritis	4 (15%)
Lung Problems	3 (12%)
Anxiety	2 (8%)
Other	7 (27%)

Variables	Total number of participants (% of total)
Aspirin Use (*N* = 26)	
Daily aspirin	12 (46%)
No aspirin	14 (54%)
Complications of Diabetes (*N* = 26)	
Nerve Problems	11 (42%)
Eye Problems	6 (23%)
Kidney Problems	0 (0%)
Heart Problems	1 (4%)
Circulation Problems	2 (8%)
Other	1 (4%)
None	5 (19%)

Table 5 reveals that only two (8%) participants were seeing an Endocrinologist for their diabetes care, whereas most, or 18 (68%), were being cared for by their general doctor. Two (8%) participants were seeing a nurse practitioner and two (8%) had no current diabetes provider. Of the two that reported other sources of care, one (4%) reported that Humphreys Diabetes Center was his or her diabetes provider.

Eight (31%) participants reported that their provider was very informed about diabetes, six (23%) reported their provider was somewhat informed, and nine (34%) did not know.

Table 5.

Diabetes Provider Information

Variables	Total number of participants (% of total)
Diabetes Provider (*N* = 26)	
Specialist (Endocrinologist)	2 (18%)
General Physician	6 (33%)
Nurse Practitioner	2 (8%)
No Current Diabetes Provider	2 (8%)
Other	7 (27%)
Provider Knowledge	
Very Informed	8 (31%)
Somewhat Informed	6 (23%)
I Don't Know	9 (34%)
Somewhat Uninformed	1 (4%)
Very Uninformed	0 (0%)
No Provider	2 (8%)

Antidepressant medications reported by participants included fluoxetine, sertraline, duloxetine and trazadone. None of the participants reported taking third generation antipsychotic medication, nor were anticholinergic medications listed. No

participant in the study reported taking a medication for depression known to cause or worsen diabetes.

Eight participants reported that they had been diagnosed with depression, and of those, six (75%) were receiving medication therapy, one (12.5%) was receiving psychotherapy, and one (12.5%) was being treated with both modalities. Of those being treated for depression, two (25%) scored above 16 on the CES-D. One of those participants reported taking fluoxetine, and the other was not on an antidepressant. In addition, four (22%) who had not previously been diagnosed with depression also had significant depressive symptomatology on the CED-S. A total of 12 (46%) participants either had a previous diagnosis of depression or a positive score on the CES-D, and these 12 comprised the depression group for purposes of analysis.

Among the 18 participants who reported their gender, nine were classified in the depression group. Of these, eight (88.8%) were women. Women were thus found to be significantly more likely to be depressed or have a diagnosis of depression than men, $\chi^2(1, N = 18) = 4.27, p \leq .05$.

Gender Distribution of Depressed Group

11.20%

■ Male
■ Female

88.80%
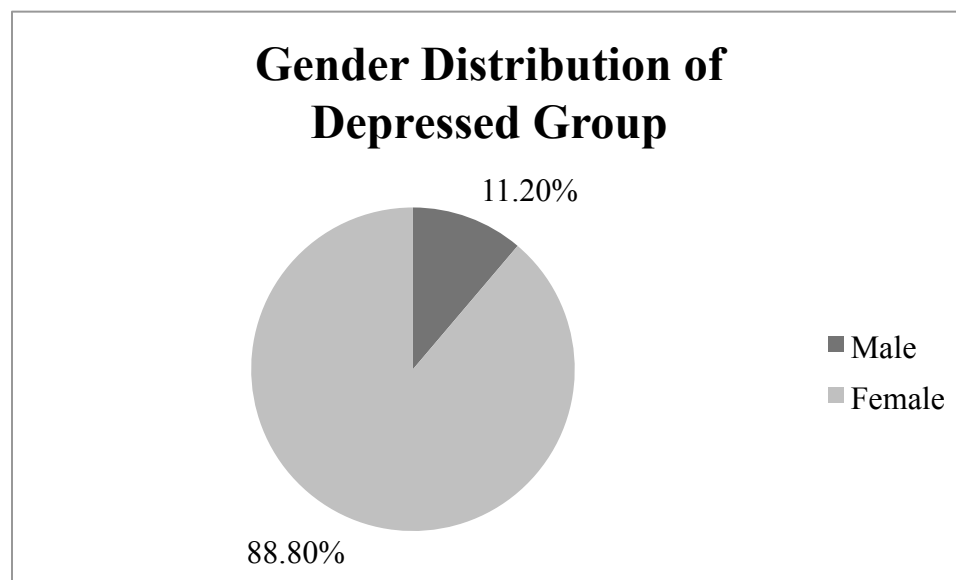
Figure 3. Gender Distribution of Depression Group

Table 6.

Depression Data

Variables	Total number of participants (% of total)
Diagnosis of depression ($N = 26$)	
Yes	8 (31%)
No	18 (69%)
Treated for depression ($N = 8$)	
Normal CES-D	6 (75%)
Depressive CES-D	2 (25%)
Therapies for Depression ($N = 8$)	

Variables	Total number of participants (% of total)
Medication	6 (74%)
Psychotherapy	1 (13%)
Medication and Psychotherapy	1 (13%)
No depression diagnosis ($N = 18$)	
Normal CES-D	14 (78%)
Depressive CES-D	4 (22%)

Mann-Whitney tests were performed comparing the depression and nondepression groups with respect to age, HA1c score, CES-D score, composite compliance score, number of conditions, number of medications and years with diabetes.

Table 7

Mann-Whitney Test Results for Depression versus Nondepression Group

Variable	N	Depression Mean	Median	N	Nondepression Mean	Median	Mann-Whitney z	p
Medications	12	8.33	9.5	14	3.71	3.5	-3.16	0.002
CES-D	11	15.36	17	13	4.54	3	-3.57	0.001
Conditions	12	4.42	5.5	14	2.5	2	-1.91	0.056
HA1c	8	6.95	6.85	13	8.13	7.2	-0.29	0.772
Compliance	12	12.08	13	14	12.71	14	-0.73	0.466

Number of conditions, HA1c value, compliance score, age and years with diabetes were not significantly different between depression and nondepression groups. The self-reported number of medications were significantly higher in the depression than nondepression group ($z =$ -3.16, $p =$ .002). Number of medications and number of conditions were highly correlated $r(26) =$ .57 p $\leq$ .01. Score on the CES-D was significantly higher in the depression compared to the nondepression group (z = -3.57, p = .001). Those with complications of diabetes were not found to have had a significantly longer duration of diagnosed diabetes or a difference in age.

Chi square analysis revealed that those in the depression group were no more likely to have high cholesterol, high blood pressure, obesity, heart problems, lung problems, cancer or anxiety, compared to those in the nondepression group. Similarly, none of the complications of diabetes such as eye, nerve, heart or circulation problems were more frequent in the depression group.

There was no difference between depression versus nondepression groups with respect to marital status or fear of medical complications from diabetes. Although twice as many in the nondepression group (64.7%) compared to the depression group (35.3%) were financially comfortable, financial status was not predictive of depression group.

CHAPTER V

Discussion

The overall rate of response to this survey was low, but approximates typical rates for mail-in surveys (Neutens & Rubinson, 2002). There is no reason to believe there was response bias to this survey. Although the stigma of depression may have led some clients not to participate, it is speculative whether those with or without depression would have been more or less likely to participate.

The most important finding of this study is the extremely high prevalence of depression in this group of community dwelling elders with diabetes. Nearly half (46%) of study participants had a diagnosis of depression and/or scored positively on the CES-D. Though prevalence data is not available specifically on elder adults with diabetes, previous estimates of depression in all adults with diabetes is stated to be about 30% (Anderson et al., 2001). Twenty-five percent of those with a positive CES-D in this study were previously undiagnosed with depression, and 25% of those under treatment for depression were still symptomatic. Clearly, better screening for depression is needed in elders with diabetes, and when depression is treated, better follow-up is needed for this insidious condition.

 No study participant was found to be taking a medication for depression that is known to cause or worsen type 2 diabetes. All antidepressants used by participants in this study were in the class of selective serotonin reuptake inhibitors. This class of antidepressants is usually effective and well-tolerated in the elderly (Lustman et al., 2000).

A further important finding from this study is that depression in the elder with diabetes is significantly related to the number of medications taken. As number of medications is highly correlated with number of medical conditions, number of medications alone may be a simple measure with which to estimate burden of disease. Number of medications as a factor associated with depression in diabetes has not been previously reported and may be useful in identifying a high-risk subgroup.
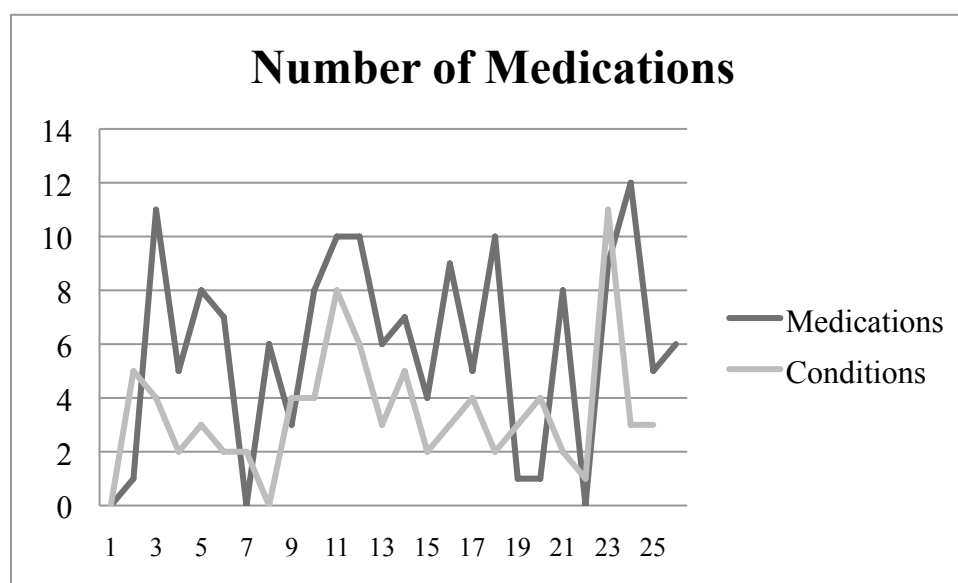
Figure 4. Medications and Conditions

No specific medical condition was associated with being in the depression group, nor was any specific complication of diabetes found with significantly greater frequency in this group. In previous studies heart disease has been so highly associated with depression that screening for depression is now recommended for all those with heart disease (Lichtman et al., 2008). Only five participants in this study reported heart disease,

and failure to find an association with depression is most likely related to such a small sample size.

Obesity has previously been shown to increase the risk of adult depression (Simon et al., 2006). Half of the people in the study reported being obese; however, obesity was no more common in the depression group than the nondepression group. It is possible that elders differ from other adults with respect to this variable and further study of this issue seems warranted.

Female gender is a well-known risk factor for depression (Cole & Dendukuri, 2003). This study suggests that the depression risk is even higher in the elderly female with diabetes than in other adult females. Previous studies have found a 2:1 female to male prevalence of depression (CDC, 2007); however, in this study, almost all of those in the depression group were female. Additionally, the two participants with a previous diagnosis of depression who were still symptomatic were both female. The reasons for gender differences in depression are not known; however, this knowledge may help inform future depression screening and treatment efforts.

This study did not show a relationship between depression and diabetes care compliance behaviors, as has previously been reported (Ciechanowski, Katon & Russo, 2000). It is likely that this is an artifact of participants being studied at a diabetes education center, where compliance and control are strongly emphasized. It may also relate to the relatively recent onset of diabetes diagnosis in this sample, as self-care behaviors may wane over time.

Similarly, diabetes control, as measured by HA1c, was not worse in the depression group than in the nondepression group. The overall average HA1c of all study

participants of 7.68 is remarkably low. Despite this excellent control, several participants did report complications of diabetes. It may be that participants had higher glucose levels at other times in the course of their illness, even prior to diagnosis. It is known that half of those with diabetes in this country remain undiagnosed, and many with diabetes may have the disease for up to 15 years before a clinical diagnosis is made (CDC, 2007).

Of no relation to depression, but of definite concern, is that only 46% of participants were taking daily aspirin. Those with diabetes are considered to have as high a risk for coronary disease as those who have had a previous myocardial infarction, and it recommended that all patients with diabetes take daily aspirin prophylaxis (ADA, 2008). This simple intervention could be life-saving for elders with diabetes. Almost all participants in this study were being followed for their diabetes in the primary care setting. It would seem greater education of primary care physicians regarding this issue is warranted.

Limitations

The primary limitation of this study is the small sample size. Failure to provide training and/or a written script to diabetes educators responsible for recruitment was a definite oversight and may have fostered low participation. In addition, the homogeneity of the participants with respect to ethnicity and financial status makes the results of the study less generalizable. Elders with diabetes receiving DSME services may be different in other ways from elders with diabetes in the community.

<u>Conclusions</u>

The high prevalence of depression found in this study lends support for regular depression screening of all elders with diabetes. The findings from this study further suggest that females and those with high comorbidity are at particular risk. These subgroups may need to be screened more often. In addition, this study underscores the need for regular assessment of the effectiveness of depression treatment.

The goal of DSME is to enable patients to control, care for and cope with diabetes. Untreated depression thwarts all of these efforts (Black, Markides, & Ray, 2003) and may make DSME much less effective. Fortunately, patients are often referred for DSME early after the diagnosis of diabetes, as was seen in this study. These factors indicate that DSME is an ideal occasion to screen for depression. The DD-S in combination with the CES-D, administered during DSME, was a very effective way to screen for depression in elders with diabetes. Such screening would promote early detection and treatment of depression. This could lead to improved quality of life (Jackson, DeZee & Berbano, 2004) and better outcomes for elders with diabetes (Bogner, Morales, Post & Bruce, 2007).

<u>Directions for Further Investigation</u>

Further validation of the DD-S survey instrument is needed. Utilization of the survey in a clinic setting with comparison to the medical record would provide criterion validity. Comparison of reported HA1c to that measured during DSME would be similarly informative.

To confirm that the results of this study can be generalized, especially the high prevalence of depression, it is important to study a community sample of elders with diabetes who are not receiving DSME services.

With a larger sample size, differences between the depression and nondepression group with respect to compliance score, obesity, and heart disease may be revealed. Power analysis reveals that 74 more participants would be needed to more fully evaluate these issues.

Key stakeholders such as the HDC Research Committee, Board of Directors and staff will be presented the results of this study. The most exciting possibility for further research would be to incorporate the study surveys into regular DSME programs for an extended study period. Stakeholder counsel and support will be invaluable to the next phase of study.

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APPENDIX A

DD-S, Diabetes and Depression Survey

DD-S

Q1. When were you diagnosed with diabetes?   _____year

Q2. What is the worst aspect of having diabetes?

   (Please circle your answer)

   1. Fear of complications
   2. Following a meal plan
   3. Cost of medical care and supplies
   4. Other_____

Q3. What sort of diabetes education have you completed?

(Circle the one answer that most closely describes your experience)

   1. Formal program or classes at a diabetes center
   2. Met with the nurse educator and/or dietician separately
   3. Brief education from my doctor and/or his or her nurse
   4. None

Q4. How satisfied or dissatisfied were you with your educational experience?

Very Dissatisfied				Very Satisfied
1	2	3	4	5

For the next <u>four</u> questions, please refer to your habits over the last month:

Q5. Do you test your blood sugar at home?

   1. Never
   2. Sometimes

      3. Daily
      4. Two times per day or more
      5. Other_____

Q6. Do you check your feet?

      1. Never
      2. Sometimes
      3. Twice a week
      4. Daily
      5. Other_____

Q7. Do you follow a meal plan?

      1. Never
      2. Sometimes
      3. Twice a week
      4. Daily
      5. Other_____

Q8. Do you exercise?

      1. Never
      2. Sometimes
      3. Twice a week
      4. Daily
      5. Other_____

Q9. Whom do you see for your diabetes care?

      1. Diabetes Specialist (Endocrinologist)
      2. General Doctor (Internist or Family Practitioner)
      3. Nurse Practitioner or Physician Assistant
      4. Other_____

Q10. How satisfied or dissatisfied are you with your diabetes care?

     Very   Very

	Dissatisfied				Satisfied
	1	2	3	4	5

Q11. When was your last A1C test?___Month___Year__Do not know

Q12. What was your last A1C value _____ %_____Do not know

Q13. Please list your medications:

_____   _____

_____   _____

_____   _____

_____   _____

_____   _____

_____   _____

Q14. Do you take an aspirin every day?   ____ Yes____No

Q15. Do you have any complications of your diabetes?	Yes	No
Eye problems (cataracts, glaucoma, blindness)	1	2
Nerve problems (burning, numbness, tingling)	1	2
Kidney problems (dialysis, transplant)	1	2
Heart problems (angina, heart attack)	1	2
Circulation problems (stroke, loss of limb)	1	2

Other_____

Now there will be just a few questions about depression:

Q16. There are many challenges to living with diabetes. Have you ever been diagnosed with depression?

_____Yes_____No

If No, skip to Question 18.

Q17. What treatment have you had for depression?

1. No treatment
2. Psychotherapy
3. Medication
4. Psychotherapy and Medication

The next five questions ask some personal information. All responses will be kept confidential:

Q18. When were you born?   _____Month_____Year

Q19. What is your gender?

1. Male
2. Female

Q20. What sort of insurance do you have?

1. Medicare only
2. Medicare and Medigap or other supplement
3. Medicaid
4. No insurance

Q21. Please rate your financial status:

1. Comfortable
2. Very Comfortable
3. Just getting by

    4. Can't make ends meet

Q22. Which of the following best describes your racial or ethnic identification?

    1. White (Caucasian)
    2. African American
    3. Hispanic
    4. Native American/American Indian
    5. Asian or Pacific Islander
    6. Other (please specify)_____

Q25. What is your marital status?

    1. Married
    2. Divorced
    3. Separated
    4. Widowed
    5. Never Married or Partnered
    6. Single
    7. Partnered

Please make any further comments you may have about the topics in this survey:

Thank you very much for participating in this important survey. All of your answers will remain anonymous and will be used for research purposes only.

APPENDIX B

CES-D, Self-Assessment Instrument for Depression

The CES-D

There are restrictions to copying this instrument.

It may be found at: http://www.chcr.brown.edu/pcoc/cesdscale.pdf

APPENDIX C

Letter of Recruitment and Consent to the Study

January 5, 2009

Dear Volunteer,

A group of faculty and student researchers at Boise State University are conducting a study of type 2 diabetes. Specifically, we are interested in knowing more about the diabetes self-management education you have received.

Attached to this letter you will find two documents. The first is a diabetes survey, the DD-S. This survey asks questions about how long you have had diabetes, diabetes education, complications and control. There are also a few questions related to depression. This survey also asks demographic information. Due to the make-up of Idaho's population, the combined answers to these questions may make an individual person identifiable. We will make every effort to protect your confidentiality. However, if you are uncomfortable answering any of these questions, you may leave them blank and complete the rest of the survey.

The second document, the CES-D, is a brief questionnaire that asks questions about your mood. This tool is not for diagnostic purposes and the results will not be shared with anyone outside the study. Both of these questionnaires are confidential and we ask that you not put your name or any other identifying information on them. Completion of both items will take approximately thirty minutes.

When you have completed both items, you may simply return them to us in the self-addressed postage-paid envelope that came in the same package as the DD-S and the CES-D. We ask that you return the envelope no later than January 30, 2009.

We certainly hope that you will consider completing these surveys, as your answers will provide important information about diabetes education and treatment. If you have any questions regarding the study, please do not hesitate to contact me at (208) 371-6787.

Sincerely,

Cynthia Clinkingbeard, MD

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College of Health Sciences

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